ACQUISITION STRATEGY PHASE I

Outline

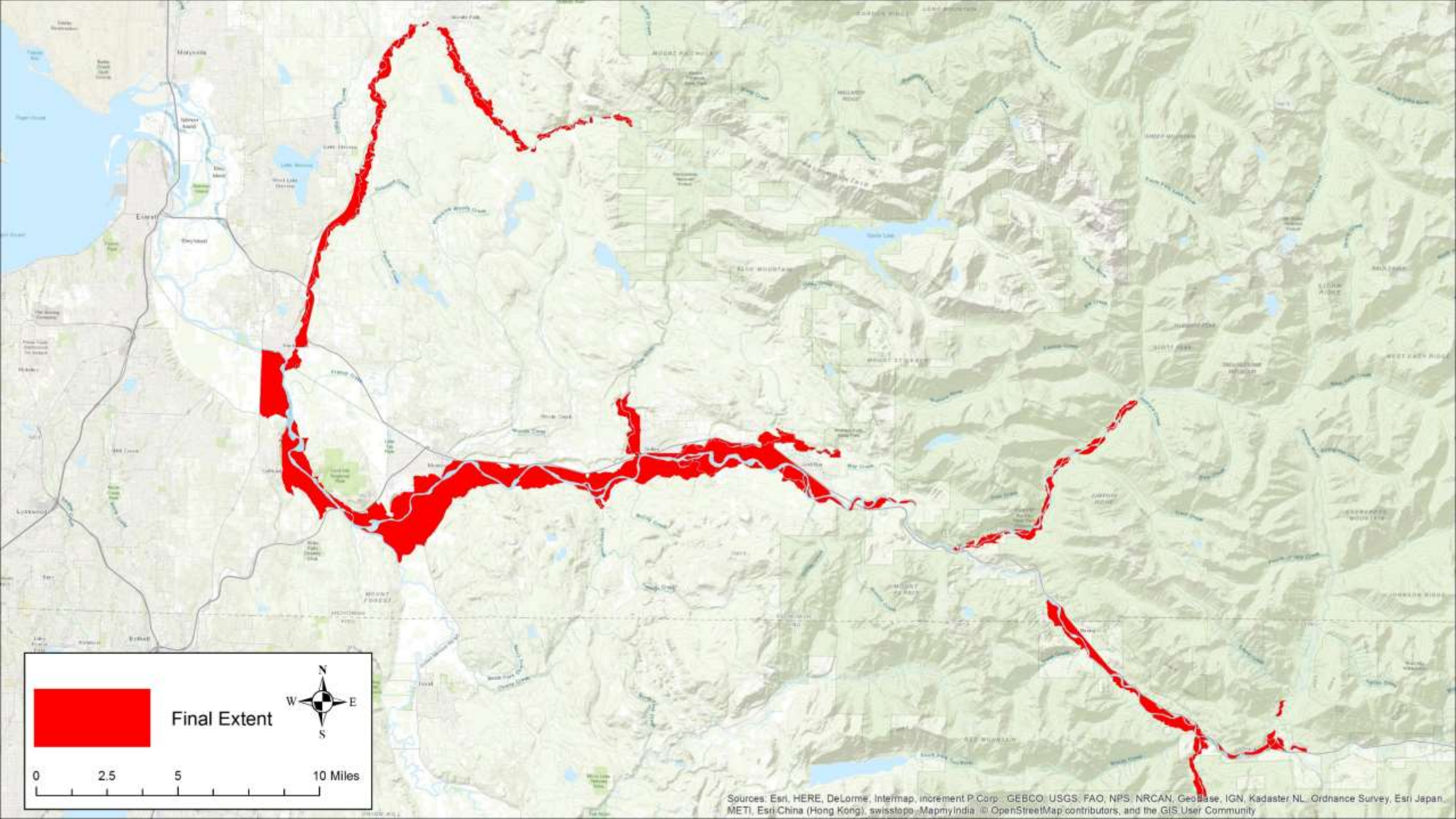
- Snohomish Basin Floodplain Acquisition Strategy
- Story Map
- Specific Opportunities:
  - Lund Property
  - BNSF Braided Reach Properties

Acquisition Strategy Purpose

- **Guidance for implementation of Salmon Conservation Plan**
- **Prioritize parcels for conservation/restoration of floodplain/instream processes**
- **Potential to obtain proactive acquisition dollars**
- **Capitalize on opportunistic property availability**

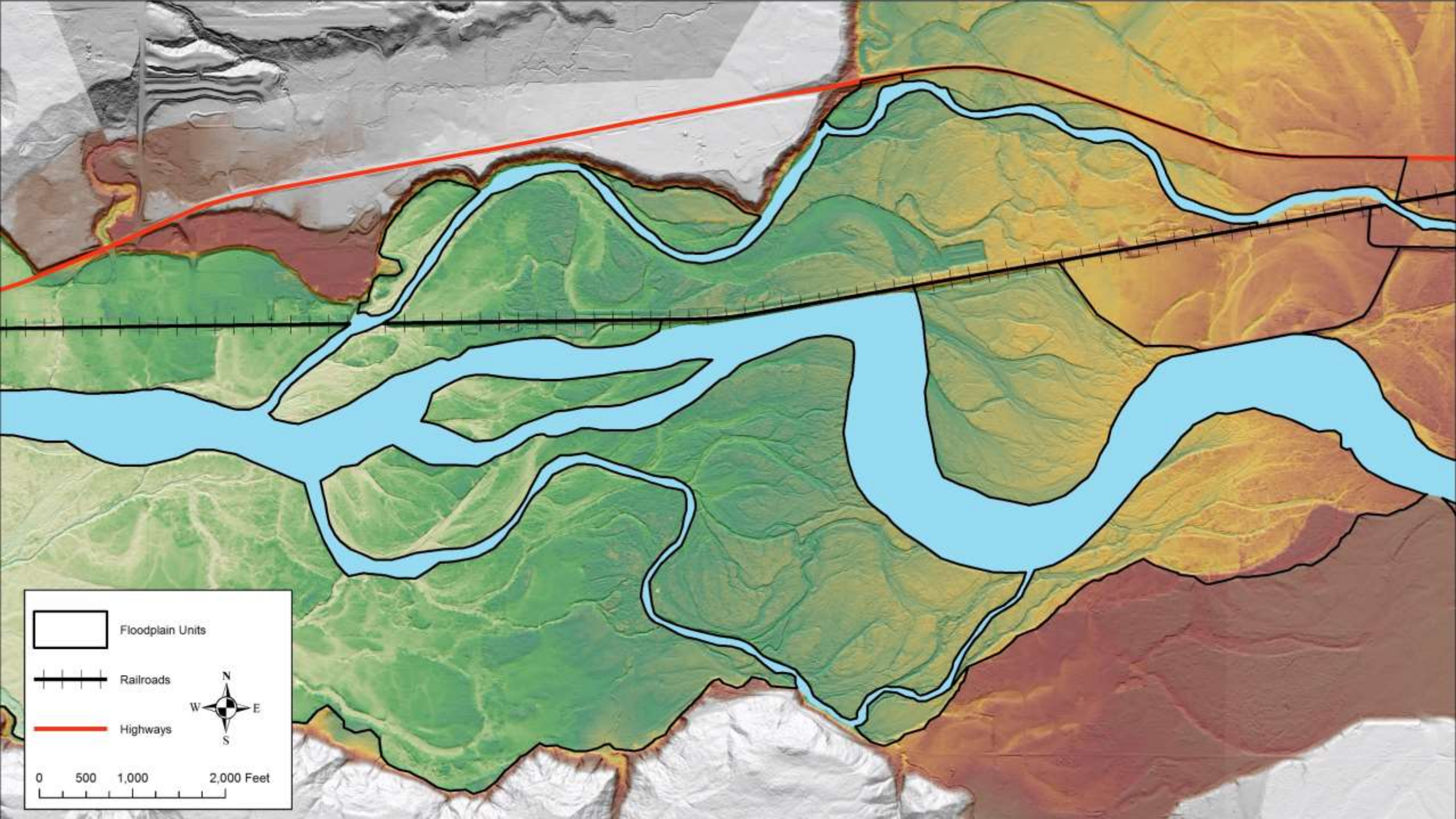
Acquisition Strategy Goals

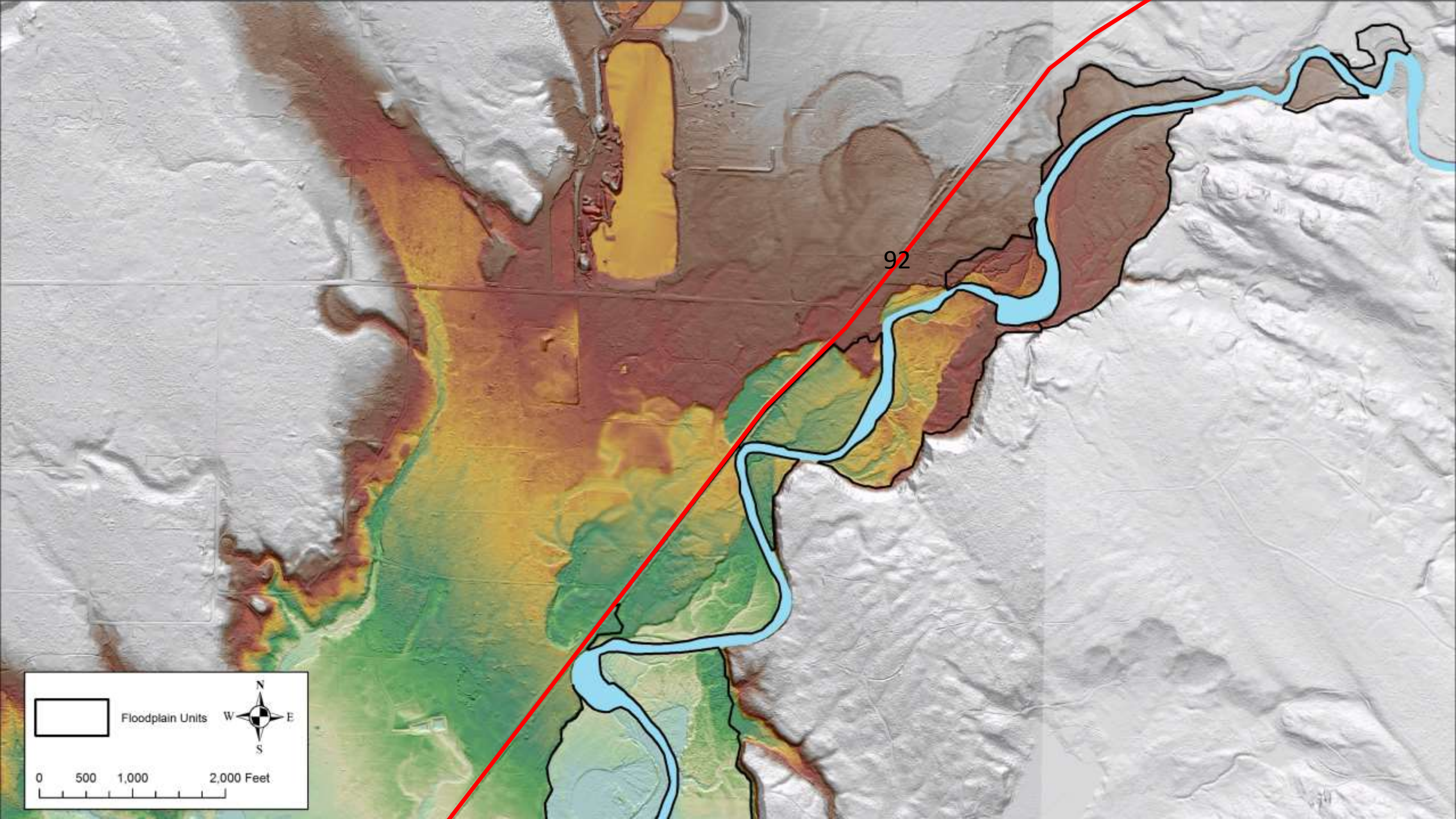
- **Establish corridors of protected floodplains**
- **Accelerate restoration project implementation**
- **Flood storage/conveyance**
- **Human safety**
- **Decrease flood damage claims**

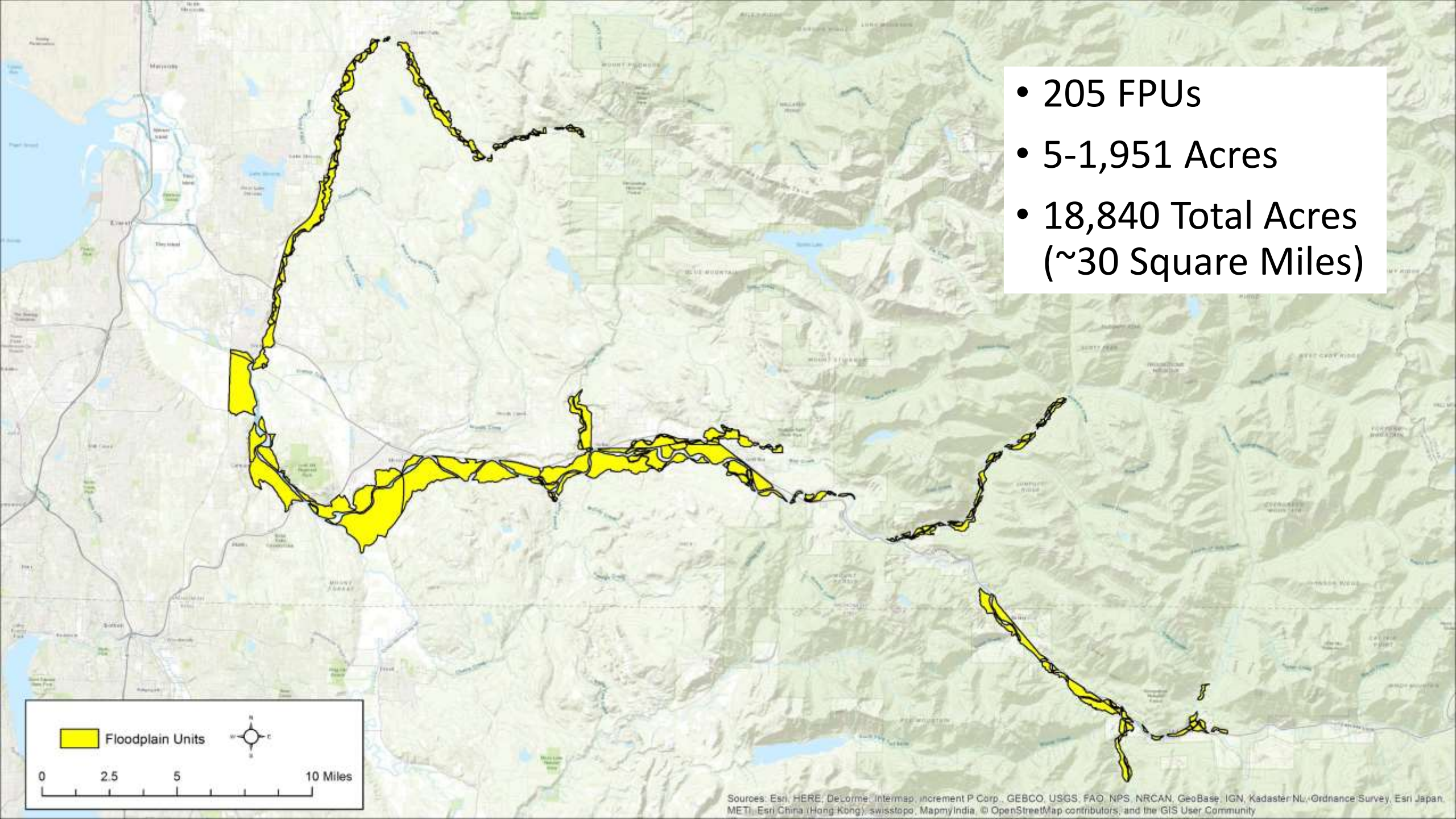

Final Extent
N
W
E
S
0
2.5
5
10 Miles
Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Floodplain Units

- **Discrete portion of the floodplain that are expected to be affected as a "unit" if channel migration is allowed to resume**
- **≤ 5' above 100 year floodplain elevation**
- **Do not span the adjacent stream BFW**
- **Constrained by major transportation corridors (RR grades, Highways, etc.)**
- **Larger than 5 acres and substantially larger than the adjacent BFW**
- **Split where hydrologically distinct**

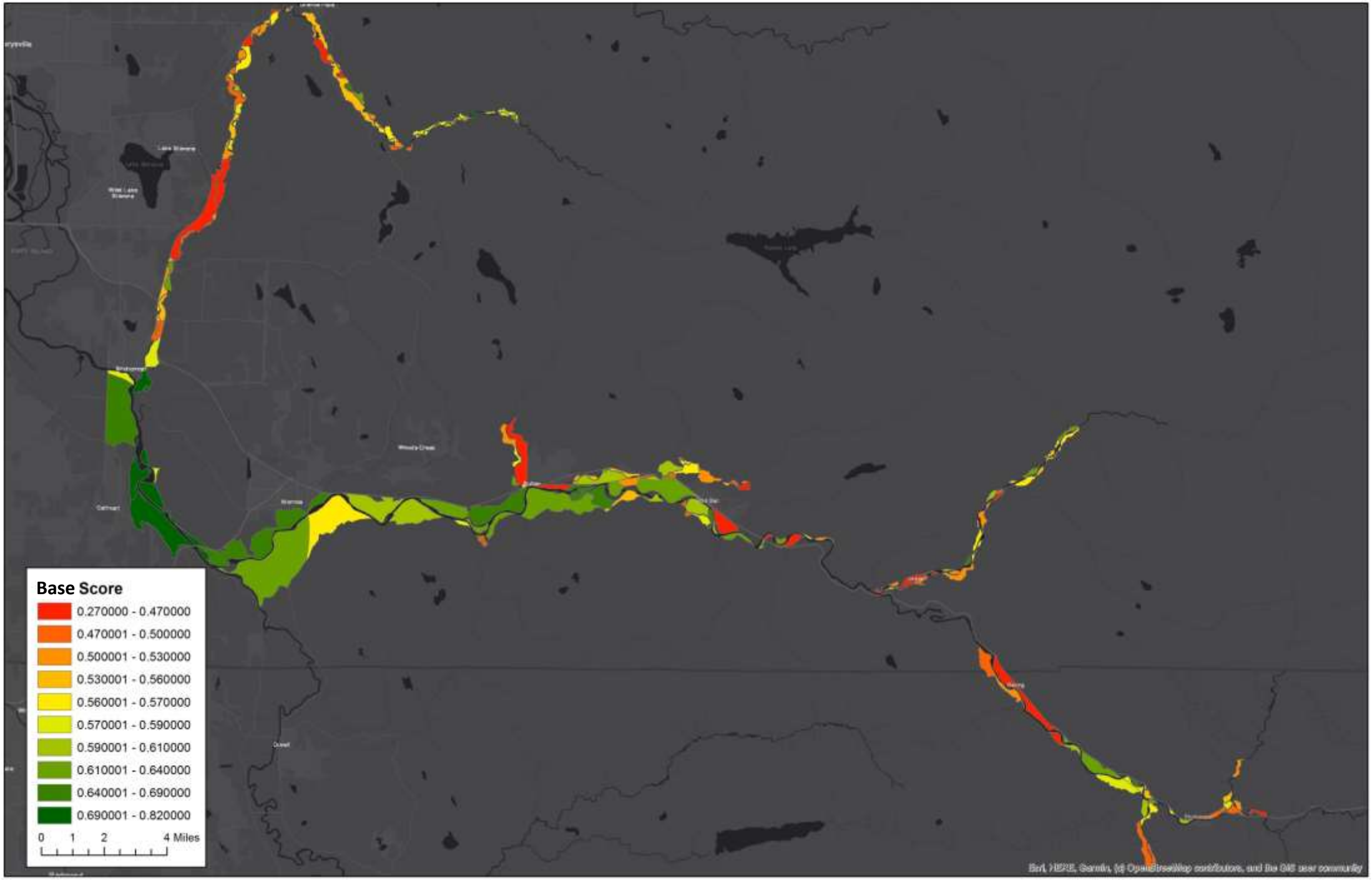

Floodplain Units
Railroads
Highways
N
W
E
S
0
500
1,000
2,000 Feet

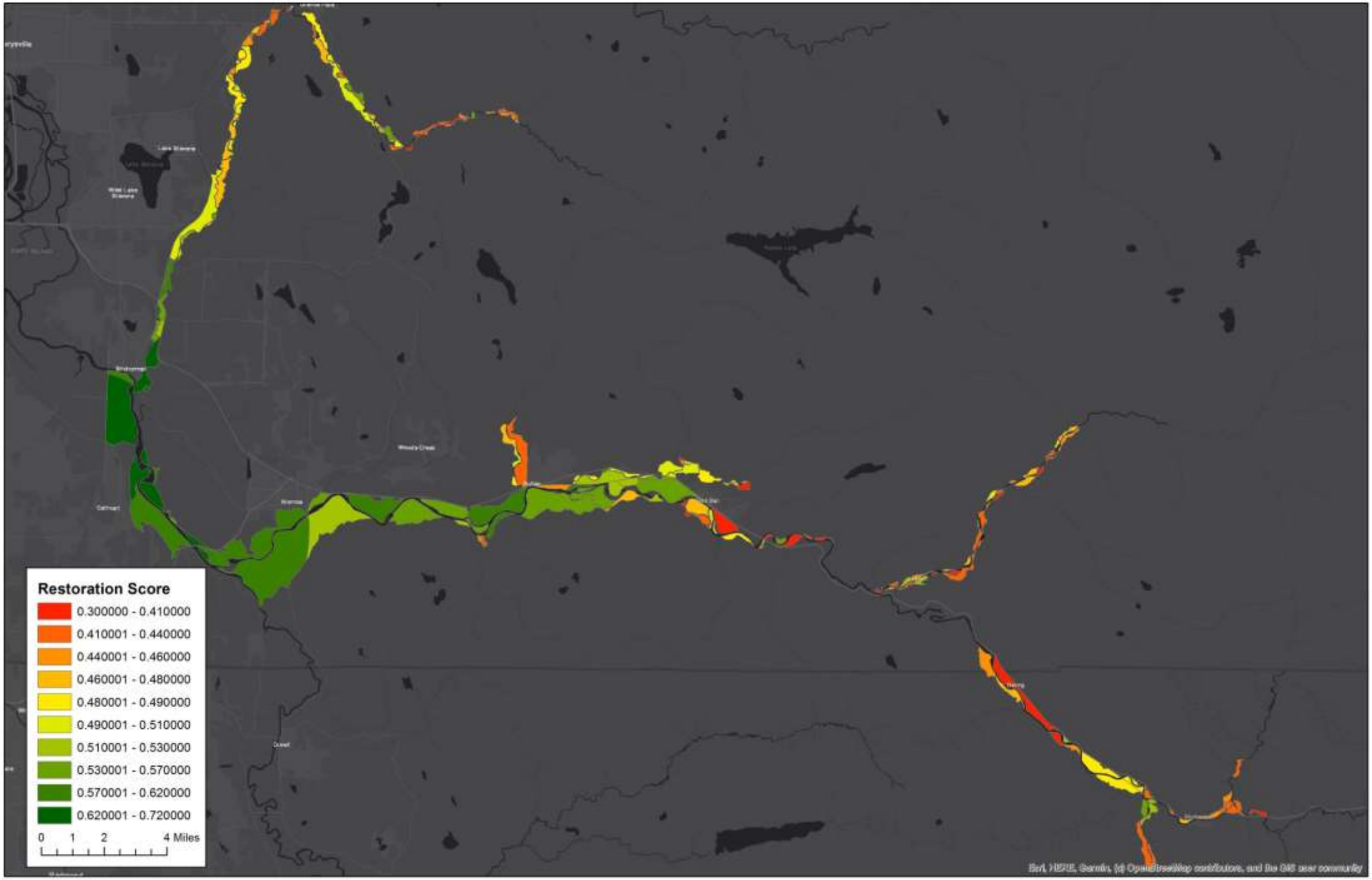

92
Floodplain Units
N
W
E
S
0
500
1,000
2,000 Feet

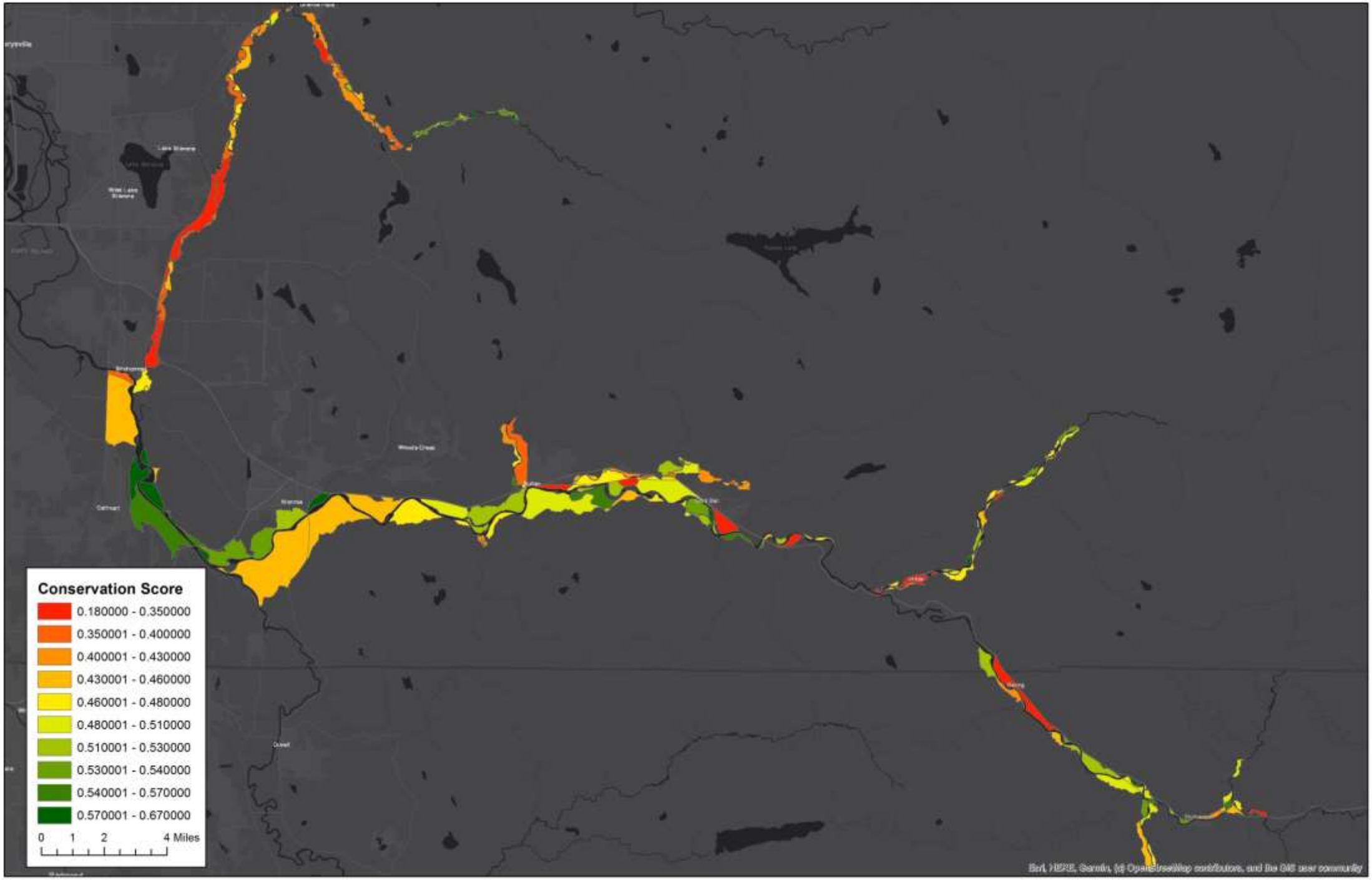


- 205 FPUs
- 5-1,951 Acres
- 18,840 Total Acres (~30 Square Miles)

Category	FPU Metric	Scoring Criteria
Importance	Relative Elevation	FPU Elevation Relative to the 100-Year Flood Elevation
	Flow Importance	Delivery, Discharge, Recharge, & Surface Storage
	Sub-Basin Strategy Group	FPU in Primary or Secondary Strategy Group
	Channel Frontage	Floodplain Channels and River Frontage
Feasibility	Land Use Type	Land Use Compatibility with Restoration/Conservation
	Number of Landowners	Number of Landowners in the FPU
	Landowner Density	Density of Landowners in the FPU
Degradation	Armoring	Percentage of FPU River Frontage Armored
	Channel Constriction	Actual BFW Compared to Expected BFW
	Sinuosity	River Centerline Vs. Euclidean Distance
	Water & Vegetation Cover	Percent Course Vegetation and Water Cover
	Flow Degradation	Delivery, Discharge, Recharge, & Surface Storage


Base Score
0.270000 - 0.470000
0.470001 - 0.500000
0.500001 - 0.530000
0.530001 - 0.560000
0.560001 - 0.570000
0.570001 - 0.590000
0.590001 - 0.610000
0.610001 - 0.640000
0.640001 - 0.690000
0.690001 - 0.820000
0 1 2 4 Miles


Restoration Score
0.300000 - 0.410000
0.410001 - 0.440000
0.440001 - 0.460000
0.460001 - 0.480000
0.480001 - 0.490000
0.490001 - 0.510000
0.510001 - 0.530000
0.530001 - 0.570000
0.570001 - 0.620000
0.620001 - 0.720000
0 1 2 4 Miles


Conservation Score
0.180000 - 0.350000
0.350001 - 0.400000
0.400001 - 0.430000
0.430001 - 0.460000
0.460001 - 0.480000
0.480001 - 0.510000
0.510001 - 0.530000
0.530001 - 0.540000
0.540001 - 0.570000
0.570001 - 0.670000
0 1 2 4 Miles

Parcel/Adjacency Scoring

- When prioritizing parcels in a funding limited situation
- Adjacency of specific parcels to other Protected Lands
- Site Specific Logistical Considerations
- Technical Committee or subcommittee conduct parcel level prioritization

Parcel Metric	Scoring Criteria
Adjacency	Adjacency to other Protected Lands

Protected Parcel Definition

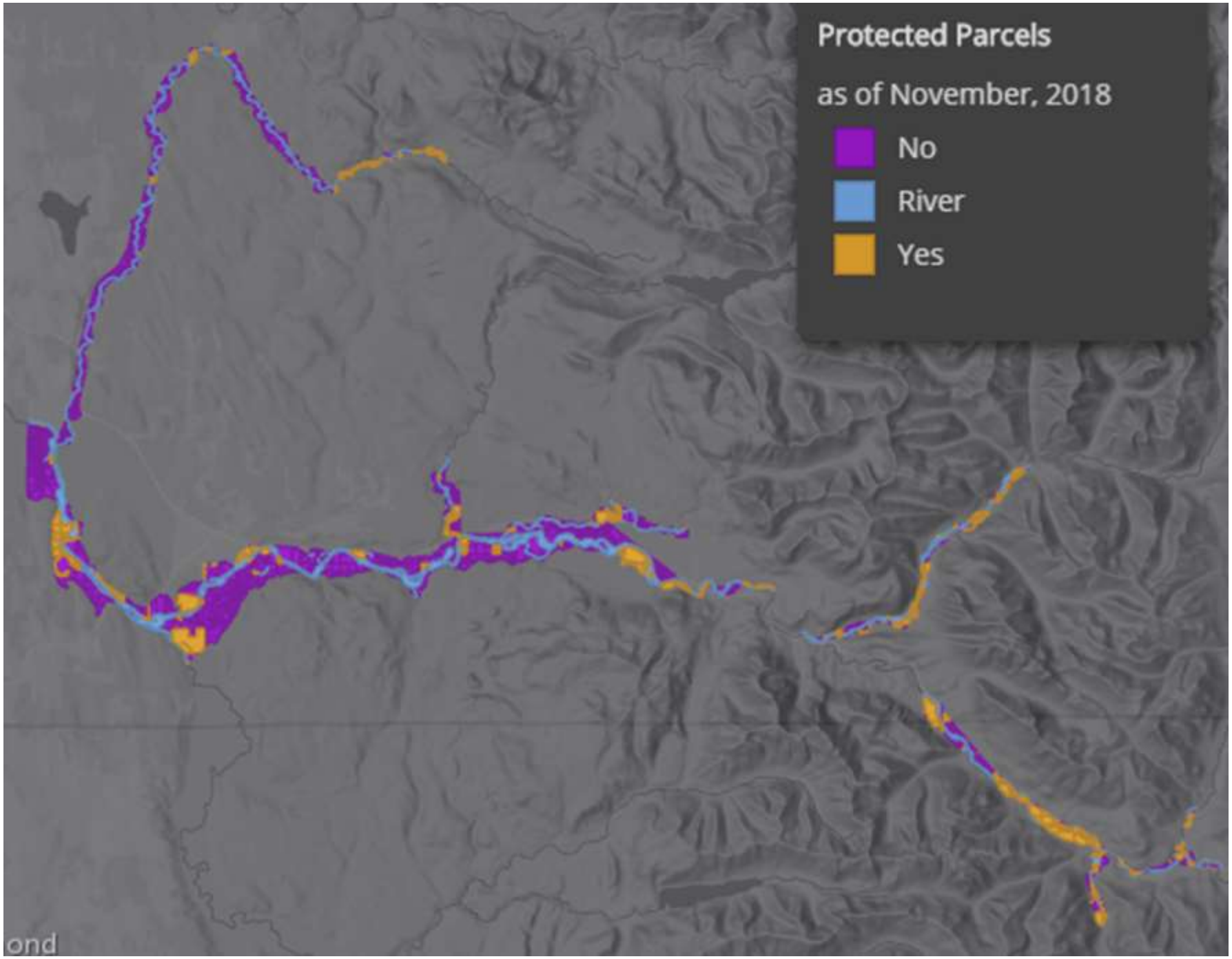
Under a conservation easement, managed under State, Federal, or industrial forest rules, or otherwise owned by a governmental entity or land trust <u>AND</u> managed for natural resources protection and long term riverine/floodplain natural process function.

Examples of Protected Parcels

- Most Forest Service Owned
- State Owned AND managed for natural process function
- County Owned AND managed for natural process function
- Industrial Timberland WITH CONSERVATION EASEMENT
- Tulalip Owned AND managed for natural process function
- Utility Owned AND managed for natural process function
- Mitigation Banks
- Land Trust Owned AND managed for natural process function

Examples of NOT Protected Parcels

- Leased Forest Service Lands (Cabins, etc.)
- Farmland INCLUDING farmland protection easements
- Industrial timber land WITHOUT conservation easements
- Public land NOT managed for natural process function
- BNSF Land
- Tulalip land NOT managed for natural process function
- Other Private Land
- Centennial Trail/abandoned railroads


Protected Parcels
as of November, 2018
No
River
Yes
ond

Parcel Scoring Metrics

- # Adjacent Protected Parcels
- Protected Parcel Perimeter Length
- % Perimeter Protected
- River Frontage Length
- % Perimeter River

Final Parcel Acquisition Scoring

- **Base Score =** Importance + Feasibility + Adjacency
- **Restoration Score =** Importance + Feasibility + Degradation + Adjacency
- **Conservation Score =** Importance + Feasibility + Inverse Degradation + Adjacency

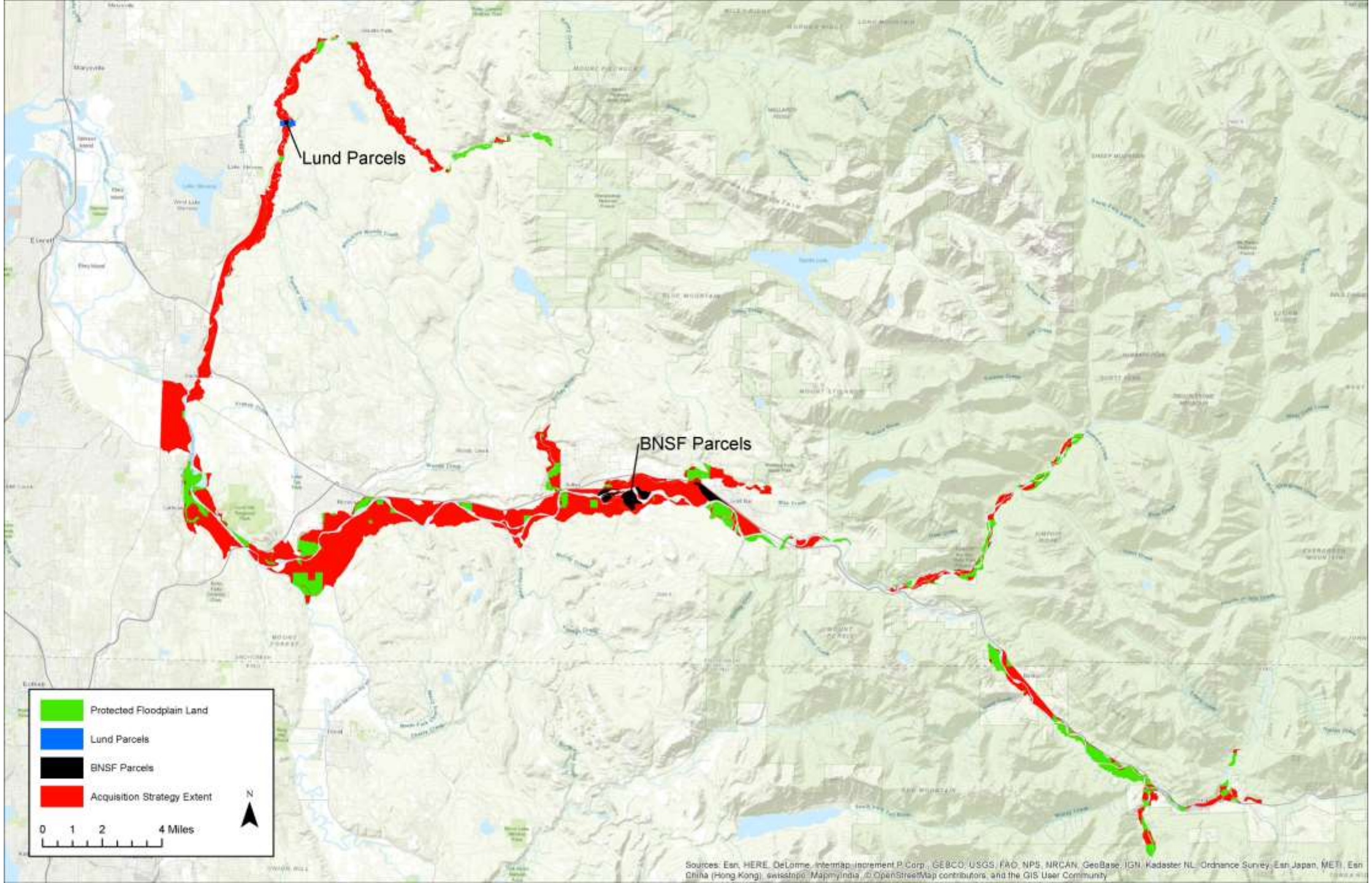
Story Map

- https://arcg.is/0KLvPj
- Username: TulalipGuest
- Password: Tulalip123

Specific Current Opportunities

- **Middle Pilchuck River**
  - **Lund Property**

- **Skykomish River Braided Reach**
  - **BNSF Properties**


Lund Parcels
BNSF Parcels
Protected Floodplain Land
Lund Parcels
BNSF Parcels
Acquisition Strategy Extent
N
0 1 2 4 Miles
Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Lund Property (Pilchuck River Floodplain)

- **~1 mile of streambank/shoreline protected**
- **~3,000 feet of Pilchuck River Frontage**
- **~40 acres of floodplain property protected**
- **Substantial previous and current efforts to build on**

Lund Ownership
0 0.5 1 2 Miles
N
Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Lund FPU Scores

Floodplain Unit Name	PIL_211
Base Score	0.51
Restoration Score	0.48
Conservation Score	0.40

Floodplain Unit Name	PIL_114
Base Score	0.63
Restoration Score	0.50
Conservation Score	0.49

Lund Parcel Scores

Parcel #	30063400400400
Acreage	9.45
Protection Status	No
Adjacent to River	Yes
Number of Adjacent Protected Parcels	0
River Frontage Length (in feet)	1,111
Protected Perimeter Length (in feet)	0
River Perimeter Percentage	38.5
Protected Perimeter Percentage	0.0

Parcel #	30063400400500
Acreage	19.03
Protection Status	No
Adjacent to River	Yes
Number of Adjacent Protected Parcels	0
River Frontage Length (in feet)	1,253
Protected Perimeter Length (in feet)	0
River Perimeter Percentage	37.4
Protected Perimeter Percentage	0.0

Legend
1990
50th St NE
River Rd
Google Earth
Image U.S. Geological Survey
N
600 ft

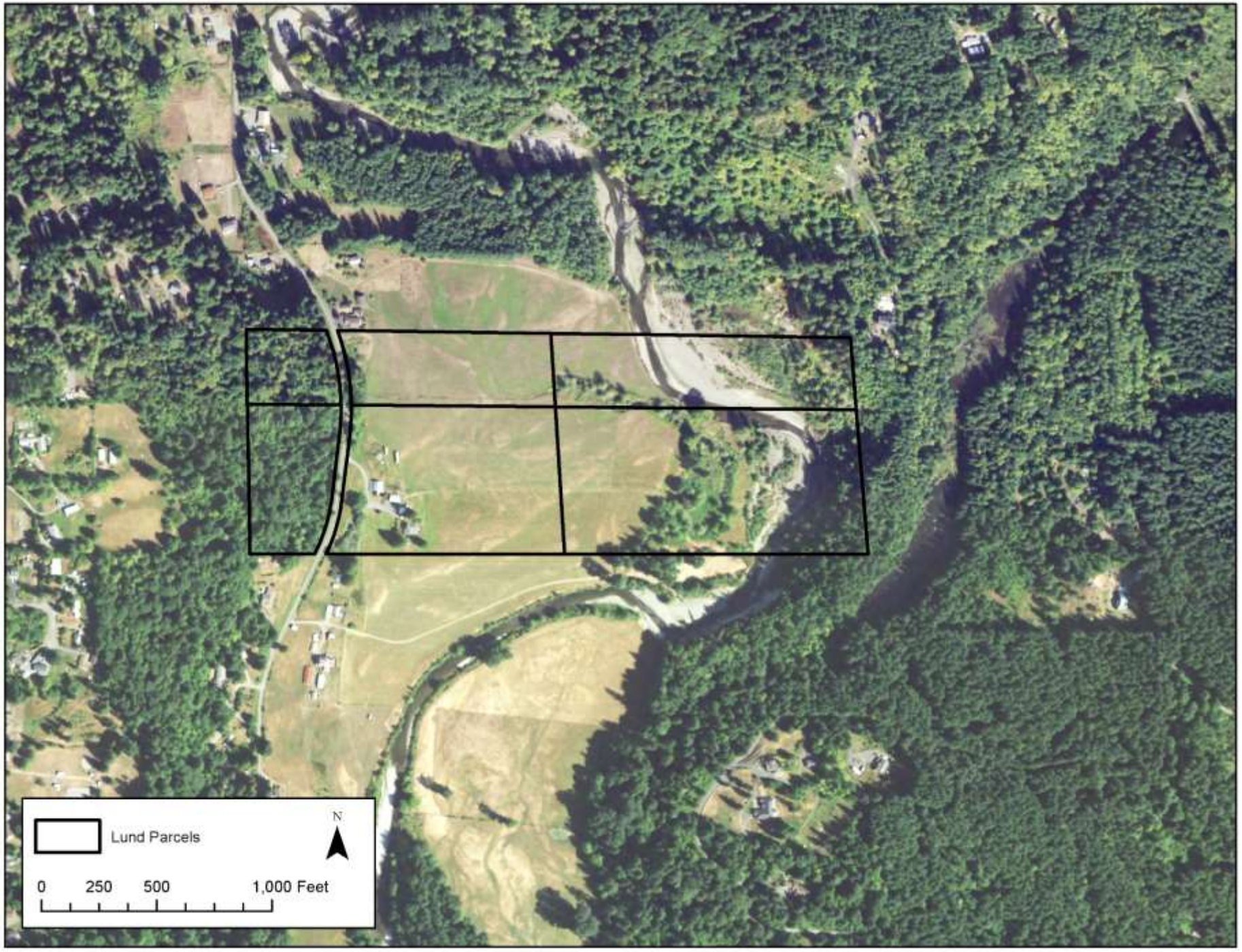
Legend
2006
50th St NE
River Rd
Google Earth
Image U.S. Geological Survey
N
600 ft

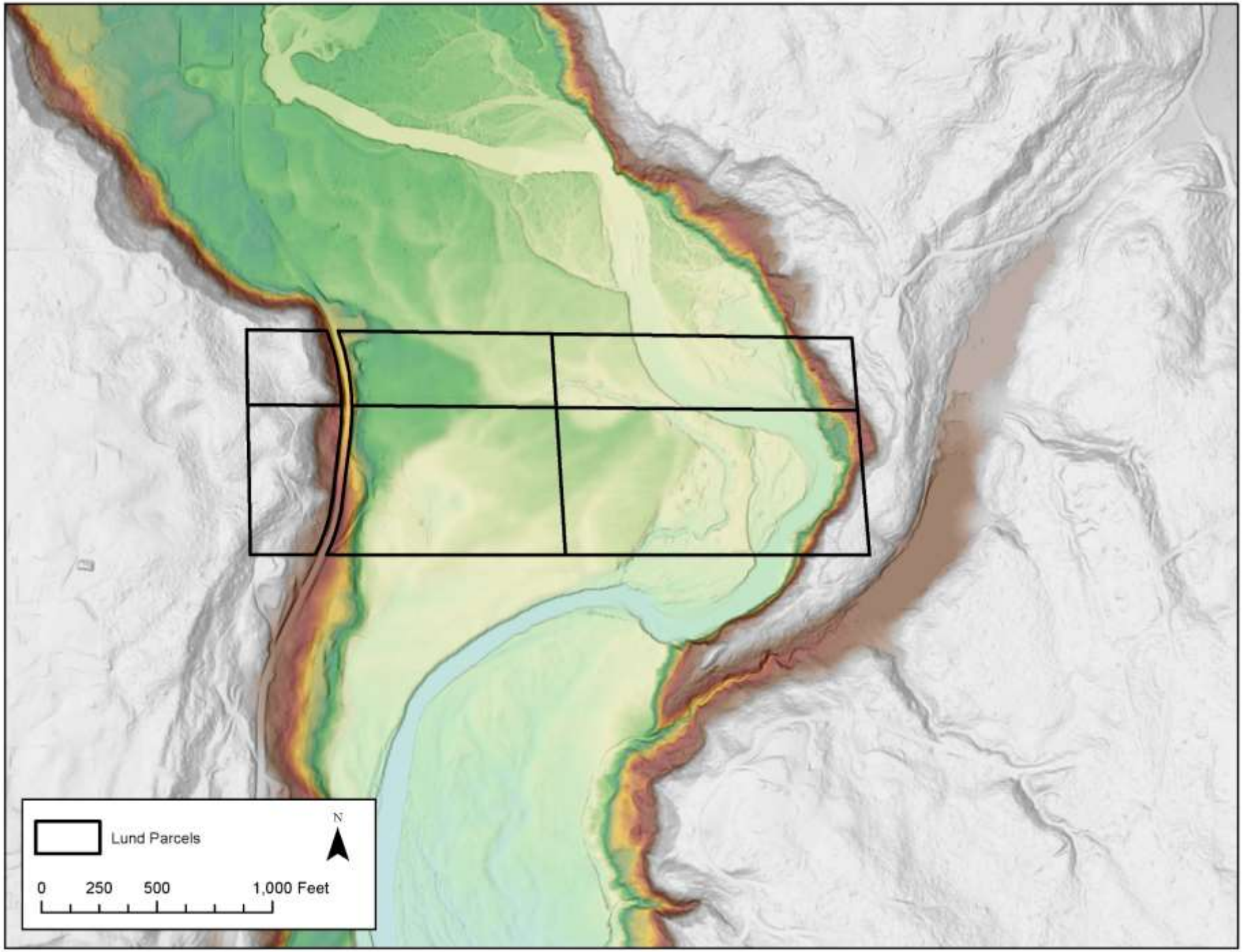
Legend
2007
50th St NE
River Rd
Google Earth
Image U.S. Geological Survey
N
600 ft

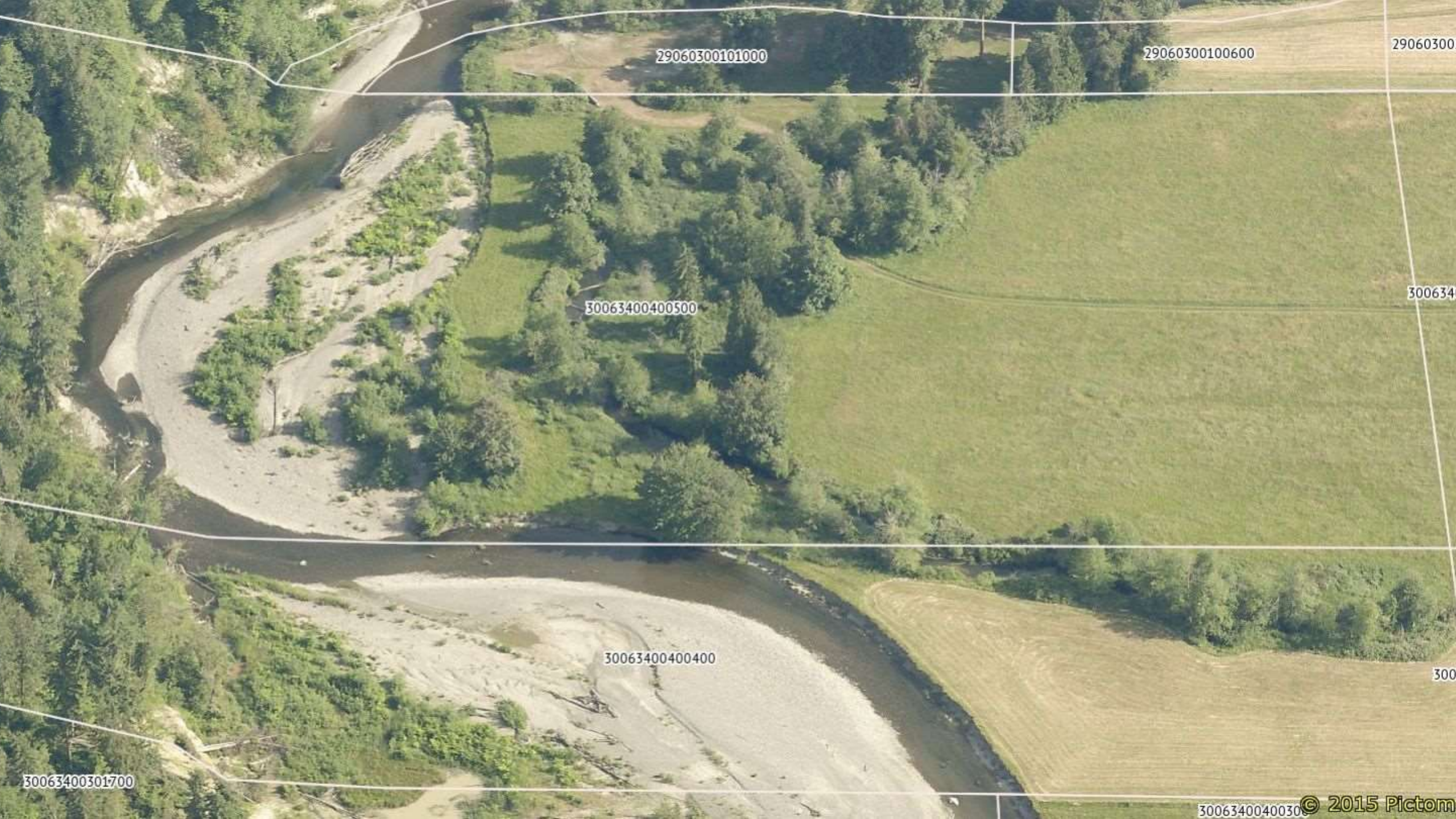
Legend
2009
50th St NE
River Rd
Google Earth
Image U.S. Geological Survey
N
600 ft

Legend
2015
50th St NE
River Rd
Google Earth
Image U.S. Geological Survey
N
600 ft

Legend
2019
50th St NE
River Rd
Google Earth
Image U.S. Geological Survey
N
600 ft


Lund Parcels
N
0
250
500
1,000 Feet


Lund Parcels
N
0
250
500
1,000 Feet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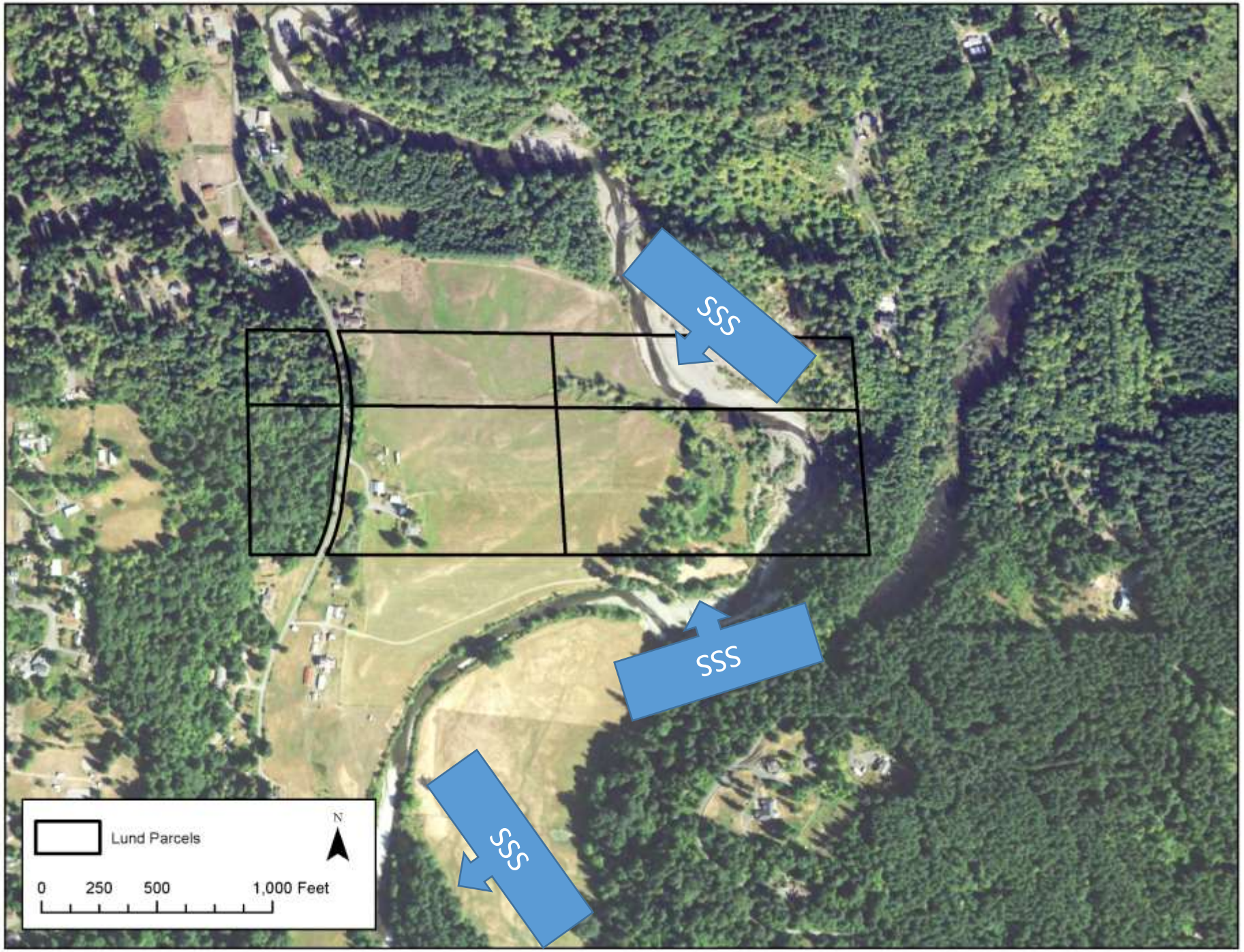
© 2015 Pictom

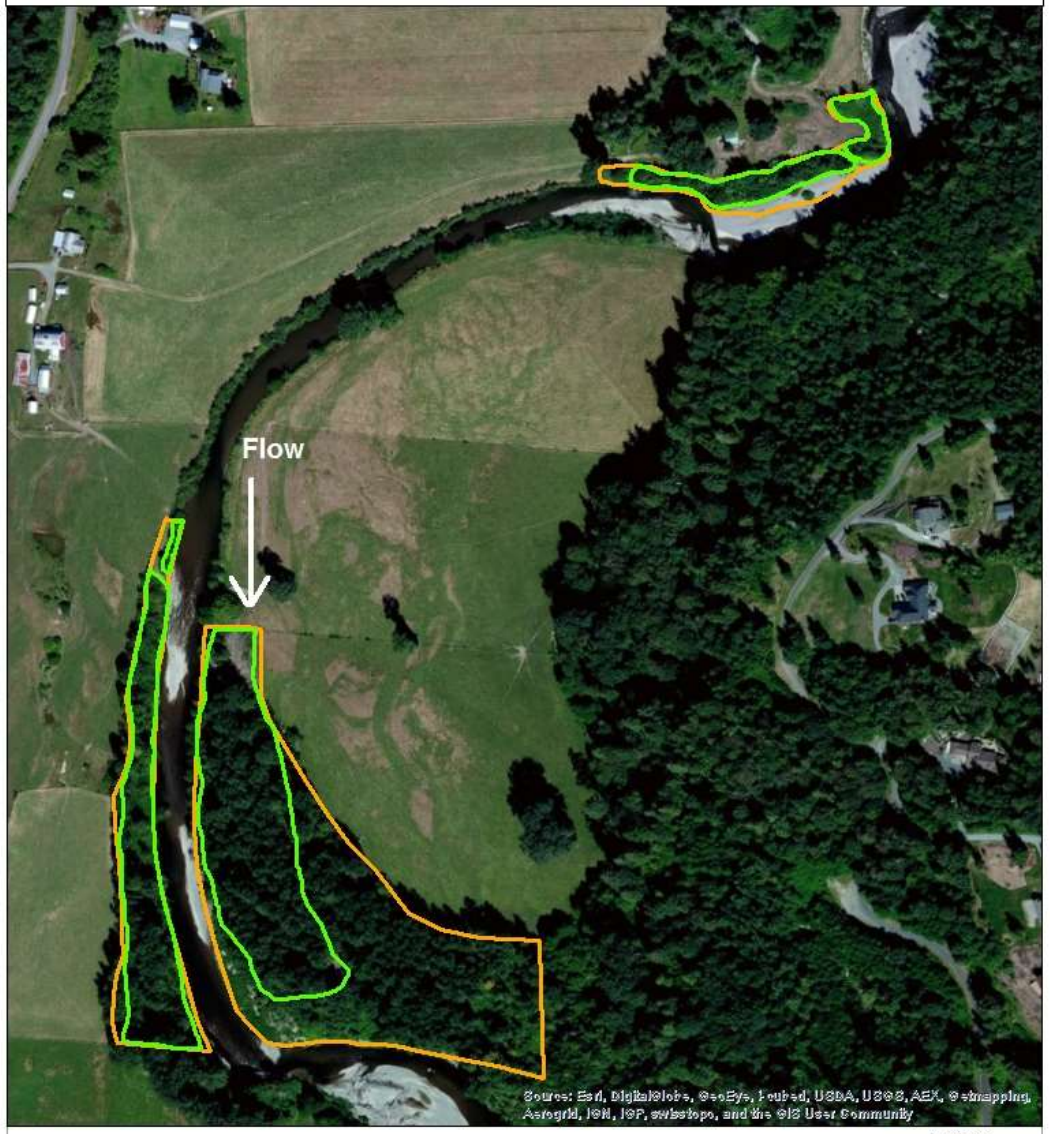
Lund Property Associated Projects

- Pilchuck River Riparian/Fish Habitat Restoration (07-1714 R)
  - Sound Salmon Solutions
  - Riparian enhancement, LWD installation, and planning on and adjacent to the Lund Property
- Middle Pilchuck River Reach Assessment & Design (09-1282 P)
  - Snohomish County
  - Assessment of habitat forming processes in the Middle Pilchuck, including the Lund Property
- Middle Pilchuck River Habitat Enchantement Project (11-1263 R)
  - Sound Salmon Solutions
  - Riparian enhancement on and adjacent to the Lund Property
- Middle Pilchuck LWD Design (15-1199 P)
  - Wild Fish Conservancy
  - preliminary designs for Engineered Log Jams on and adjacent to the Lund Property
- Integrated riparian stewardship in the Stillaguamish and Snohomish basins (SEANEP-2015-SnohCD-00013)
  - Snohomish Conservation District
  - Dept. of Ecology National Estuary Program Watershed Restoration and Protection grant currently obtaining appraisals for this property.


SSS
SSS
SSS
Lund Parcels
N
0
250
500
1,000 Feet

Pilchuck River Riparian/Fish Habitat Restoration

Middle Pilchuck As Built Design



Legend

- Final As Built Planting Area (6.11 ac)
- Weed Control Area (11.89 ac)

N

WASHINGTON STATE Recreation and Conservation Office

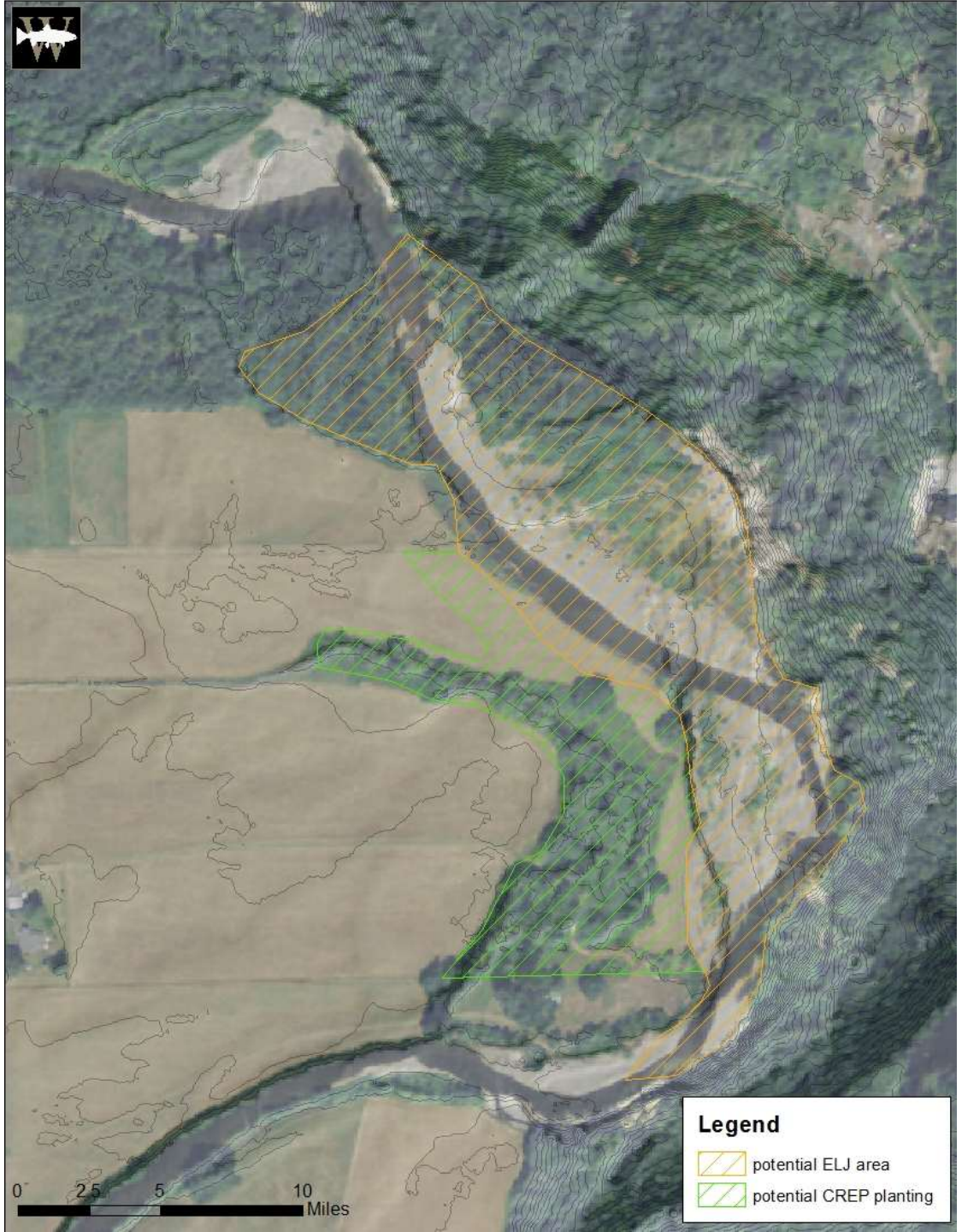
Sound Salmon Solutions

Feet

0 125 250 500 750

KAL 6-26-14

Middle Pilchuck LWD Design



Wild Fish Feasibility Study

- Hoped to design a project that would decrease erosive pressure on the right bank of the river while improving in stream habitat through the use of ELJ's
- Not able to develop project designs due to existing geologic hazards at the site that were identified during the feasibility assessment.
  - rapid bank erosion right bank of the river
  - bank erosion on the left bank, up against the valley wall
  - could occur catastrophically

Middle Pilchuck River Reach Assessment

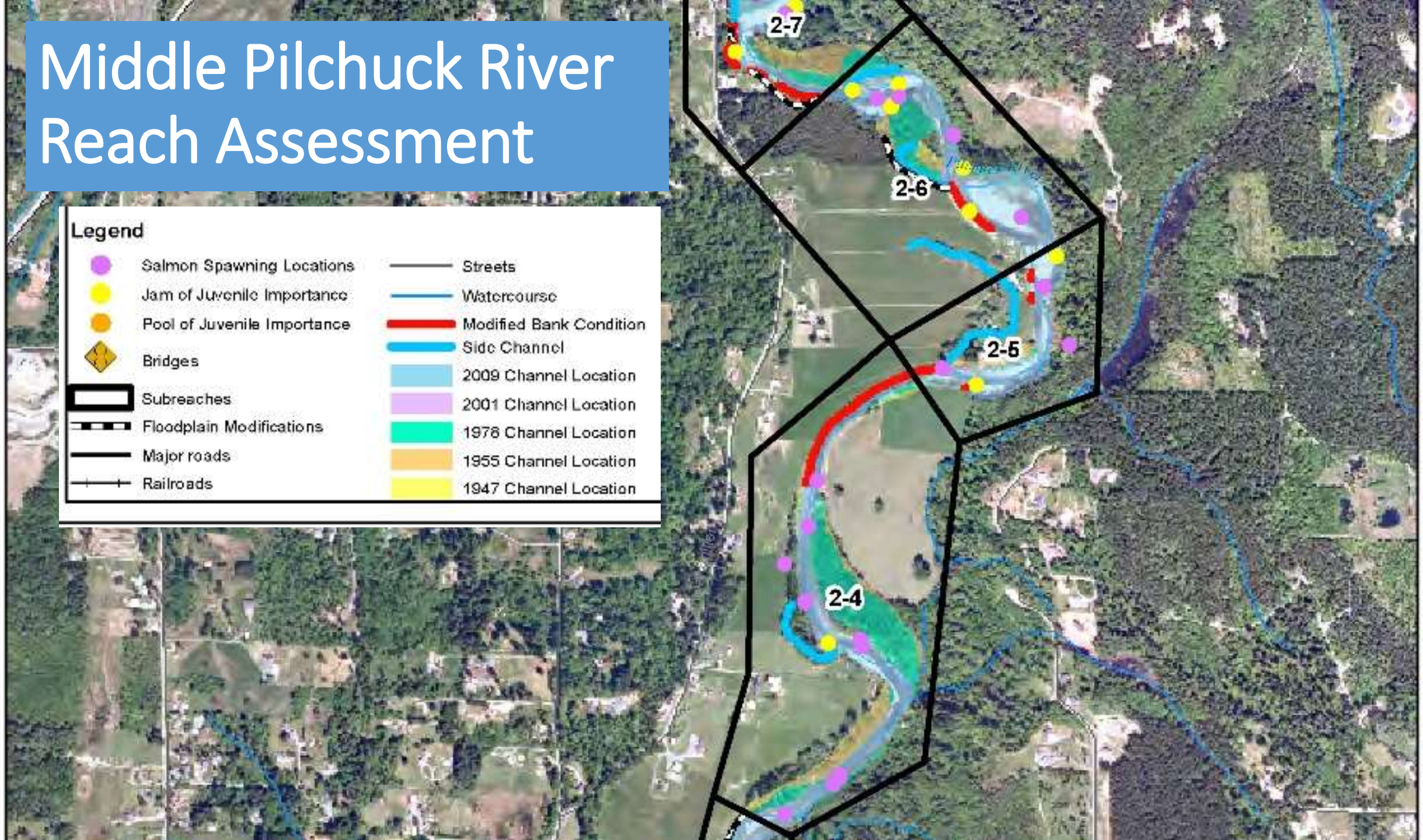


Table 3-1 Project Matrix

Reach	1							2							3					
Sites	1-1	1-2	1-3	1-4	1-5	1-6	1-7	2-1	2-2	2-3	2-4	2-5	2-6	2-7	3-1	3-2	3-3	3-4	3-5	3-6
Project types																				
Install boulders to create pools																				x
Install log jam(s) to create pools (FPR)				x				x	x		x							x	x	
Install log jam to protect island			x									x	x	x			x			
Install log jam to reactivate side channel			x		x		x	x			x		x		x		x			
Install lwd / flood fence to split channel			x		x	x	x					x	x	x			x			
Install LWD to enhance edge habitat	x					x		x	x								x?			
Channel Migration							x		x							x	x?			
Reconnect Side Channel		x	x		x		x	x	x				x				x		x	
Riparian planting / enhancement		x		x	x		x										x			
Enhance riprap w bioengineering	x	x		x																
Remove levee		x	x				x			x							x			
Home buyouts										x										
Criteria / rating																				
Increases target habitat function	M	L	H	L	L	L	H	H	H	L	M	H	M	H	M	L	H	M	M	M
Potential for habitat preservation													H		H					
Geomorphically feasible	L	M	H	M	H	L	H	M	H	L	H/M	L	H	M	M	H	M	H	M/H	H
Landowner benefits		M		L	M	H			L				L	L	H		H			

Middle Pilchuck River Reach Assessment

- Types of recommended projects
  - **Construct wood structures**
  - **Remove or modify structures** to encourage channel migration and edge complexity
  - **Re-connect side channels**
  - **Replace riprap banks** with bioengineered banks where appropriate
  - **Restore riparian** forest and wetlands

Middle Pilchuck River Reach Assessment

- Location of recommended projects
  - Proposed activity **addresses habitat limitations**
  - Proposed activity is **geomorphically feasible** (works with river process)
  - Proposed activity is **supported by landowners**

Project Name: Lund Riparian Conservation Buffer - DRAFT Buffer Options

Address: 4427 Schwartzmiller Rd., Lake Stevens, WA 98258
PLS: Sec 34, T30N, R06E
Snohomish County Parcels: 30063400400400, 30063400400500, 30063400301800, 30063400301900

Created by KM 8-21-2017
Last modified KM 9-07-2017

Lund Property Conservation Easement Buffer Options

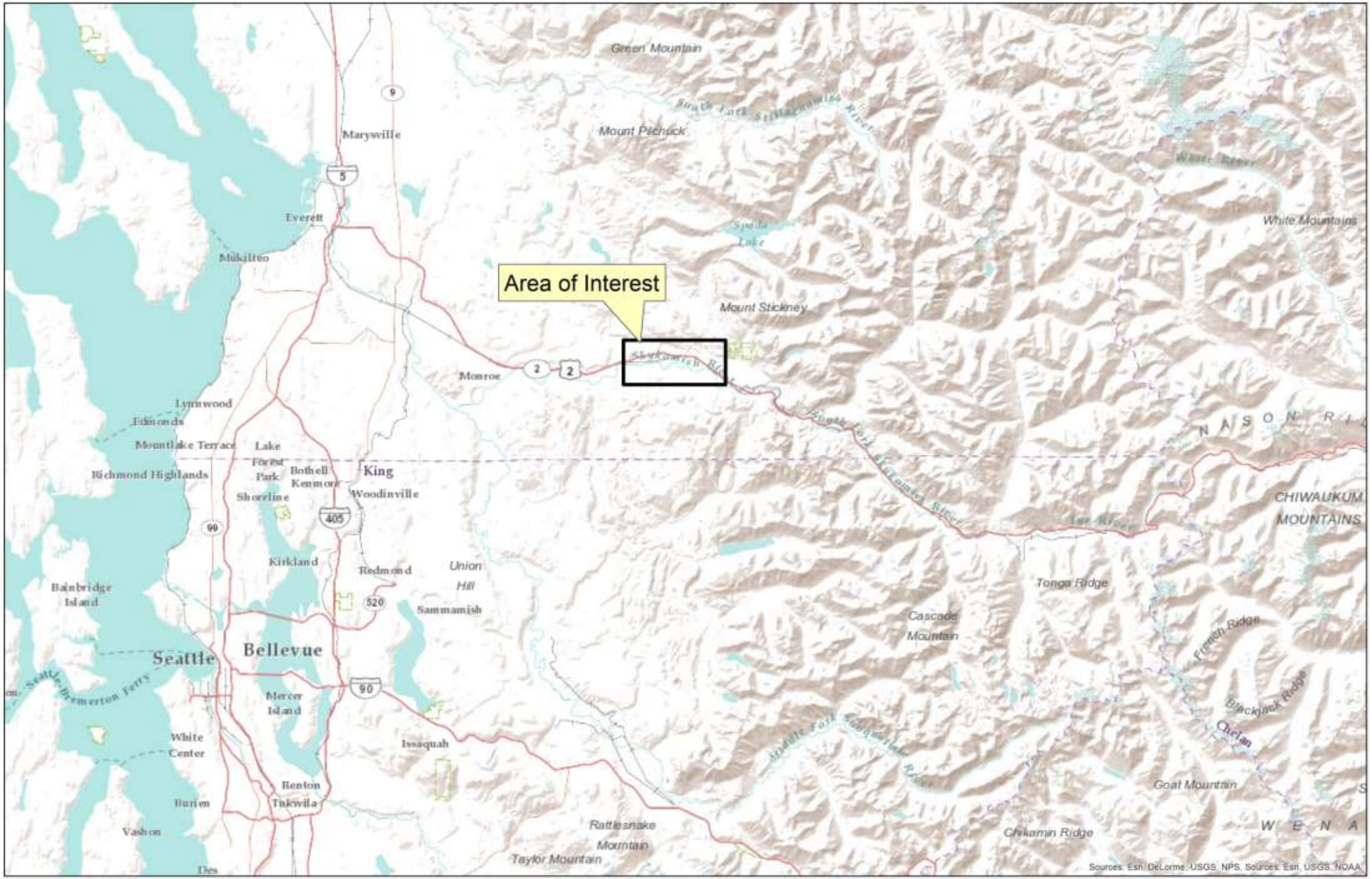
- Lund Bank Location_2015
- Lund_Potential bank location (possible avulsion path)
- ApproxBankErosionPolygon
- ProposedBufferA (10.75 ac)
- ProposedBufferB (12.98 ac)
- Lund_Parcels

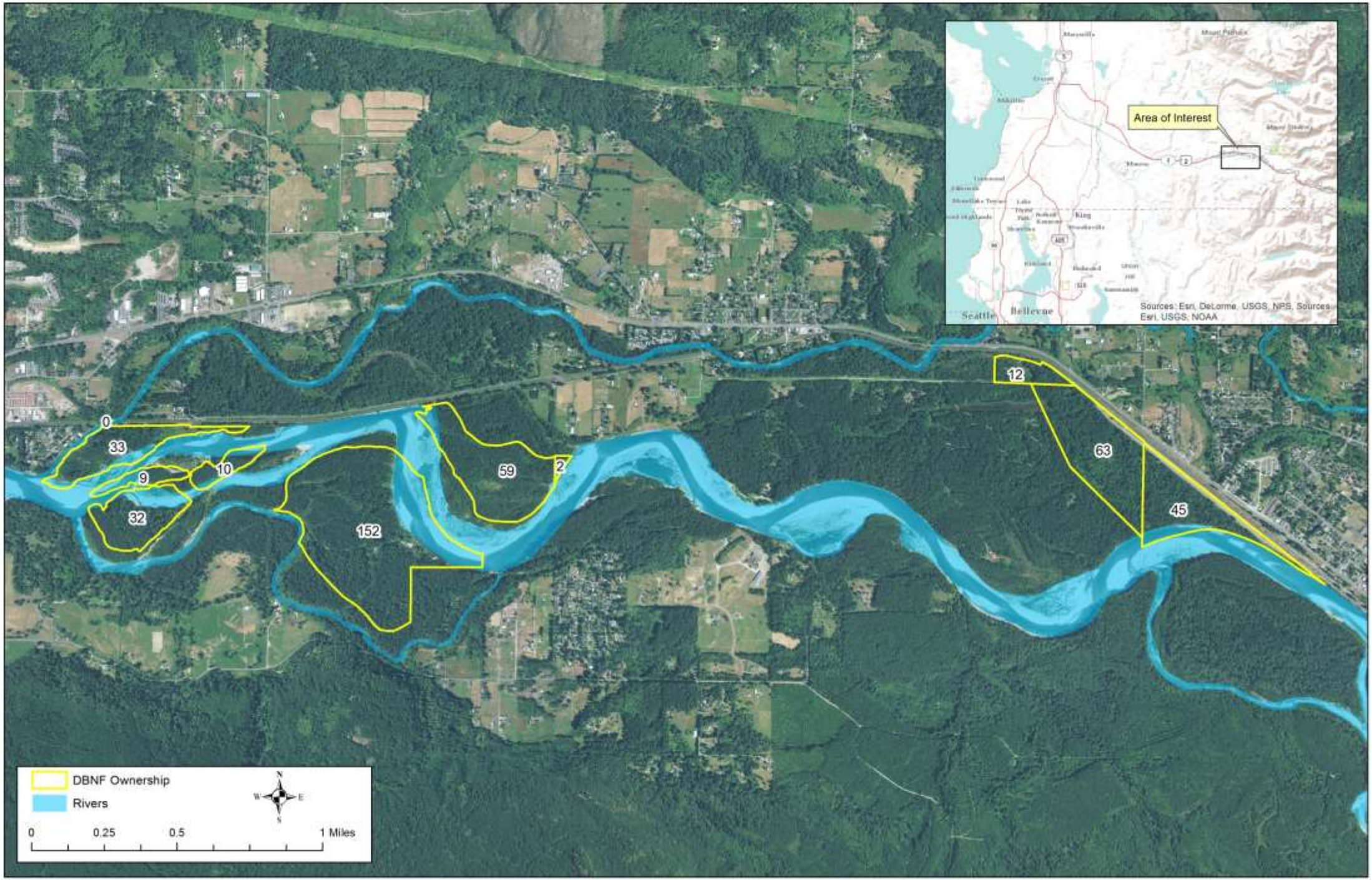
Integrated riparian stewardship in the Stillaguamish and Snohomish basins (SCD)

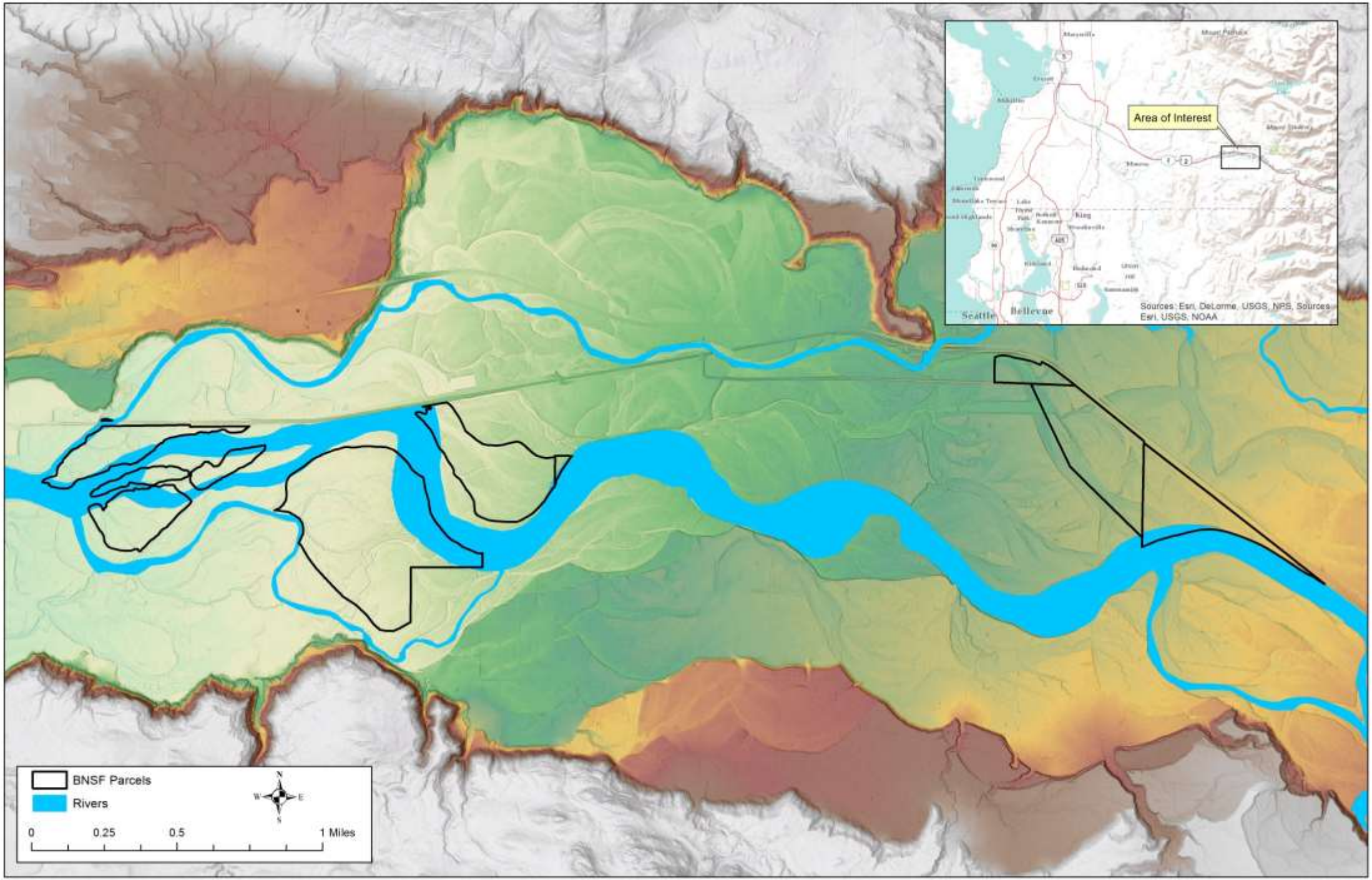
- On the Lund Property:
  - Landowner has sought to place bank armoring
  - Acquisition would allow natural channel migration and revegetation
  - Initially proposed conservation easement purchase
  - Now landowner wants fee-simple acquisition
  - SCD currently obtaining appraisals

BNSF Braided Reach Property (Skykomish River Floodplain)

- **Up to ~7 Miles of River/Side Channel Frontage**
- **Up to ~417 Acres of Floodplain Property**
- **Some of the Most Pristine/Functional Habitat in the Snohomish Basin**


Area of Interest
Green Mountain
Mount Pilchuck
Marysville
Everett
Mukilteo
Mount Stickney
Monroe
Lynnwood
Edmonds
Mountlake Terrace
Lake Forest Park
Bothell
Kenmore
King
Woodinville
Richmond Highlands
Shoreline
Kirkland
Redmond
Union Hill
Sammamish
Bainbridge Island
Seattle
Bellevue
Mercer Island
White Center
Issaquah
Renton
Tukwila
Burien
Vashon
Rattlesnake Mountain
Taylor Mountain
Cascade Mountain
Tonga Ridge
Chikamin Ridge
Goat Mountain
French Ridge
Blackjack Ridge
Chelan
White Mountains
CHIWAUKUM MOUNTAINS
NASON RI
WENA
Sources: Esri, DeLorme, USGS, NPS, Sources: Esri, USGS, NOAA


Area of Interest
Sources: Esri, DeLorme, USGS, NPS, Sources: Esri, USGS, NOAA
Seattle
Bellevue
0
33
9
10
32
152
59
2
12
63
45
DBNF Ownership
Rivers
N
W
E
S
0
0.25
0.5
1 Miles


Area of Interest
Sources: Esri, DeLorme, USGS, NPS, Sources: Esri, USGS, NOAA
Seattle
Bellevue
BNSF Parcels
Rivers
N
W
E
S
0
0.25
0.5
1 Miles

BNSF FPU Scores

Floodplain Unit Name	Sky_209
Base Score	0.72
Restoration Score	0.59
Conservation Score	0.5

Floodplain Unit Name	Sky_303
Base Score	0.73
Restoration Score	0.56
Conservation Score	0.5

Floodplain Unit Name	Sky_210
Base Score	0.66
Restoration Score	0.49
Conservation Score	0.56

Floodplain Unit Name	Sky_212
Base Score	0.66
Restoration Score	0.50
Conservation Score	0.55

Floodplain Unit Name	WAL_103
Base Score	0.70
Restoration Score	0.50
Conservation Score	0.55

BNSF Parcel Scores

Parcel #	27080400100900
FPU Name(s)	SKY_209; SKY_303; SKY_302
Acreage	84
Protection Status	No
Adjacent to River	Yes
Number of Adjacent Protected Parcels	0
River Frontage Length (in feet)	16,371
Protected Perimeter Length (in feet)	0
River Perimeter Percentage	86.6
Protected Perimeter Percentage	0.0

Parcel #	27080300200500
FPU Name(s)	SKY_302; SKY_210
Acreage	211.5
Protection Status	No
Adjacent to River	Yes
Number of Adjacent Protected Parcels	0
River Frontage Length (in feet)	9,947
Protected Perimeter Length (in feet)	0
River Perimeter Percentage	54.0
Protected Perimeter Percentage	0.0

BNSF Parcel Scores

Parcel #	27080200200700
FPU Name(s)	SKY_210
Acreage	1.6
Protection Status	No
Adjacent to River	Yes
Number of Adjacent Protected Parcels	0
River Frontage Length (in feet)	482
Protected Perimeter Length (in feet)	0
River Perimeter Percentage	41.9
Protected Perimeter Percentage	0.0

Parcel #	28083600401800
FPU Name(s)	WAL_103
Acreage	11.8
Protection Status	No
Adjacent to River	No
Number of Adjacent Protected Parcels	0
River Frontage Length (in feet)	0
Protected Perimeter Length (in feet)	0
River Perimeter Percentage	0.0
Protected Perimeter Percentage	0.0

BNSF Parcel Scores

Parcel #	27080100100700
FPU Name(s)	Sky_212
Acreage	62.6
Protection Status	No
Adjacent to River	Yes
Number of Adjacent Protected Parcels	0
River Frontage Length (in feet)	61
Protected Perimeter Length (in feet)	0
River Perimeter Percentage	0.8
Protected Perimeter Percentage	0.0

Parcel #	27090600200300
FPU Name(s)	Sky_212
Acreage	45.3
Protection Status	No
Adjacent to River	Yes
Number of Adjacent Protected Parcels	0
River Frontage Length (in feet)	3,401
Protected Perimeter Length (in feet)	0
River Perimeter Percentage	37.8
Protected Perimeter Percentage	0.0

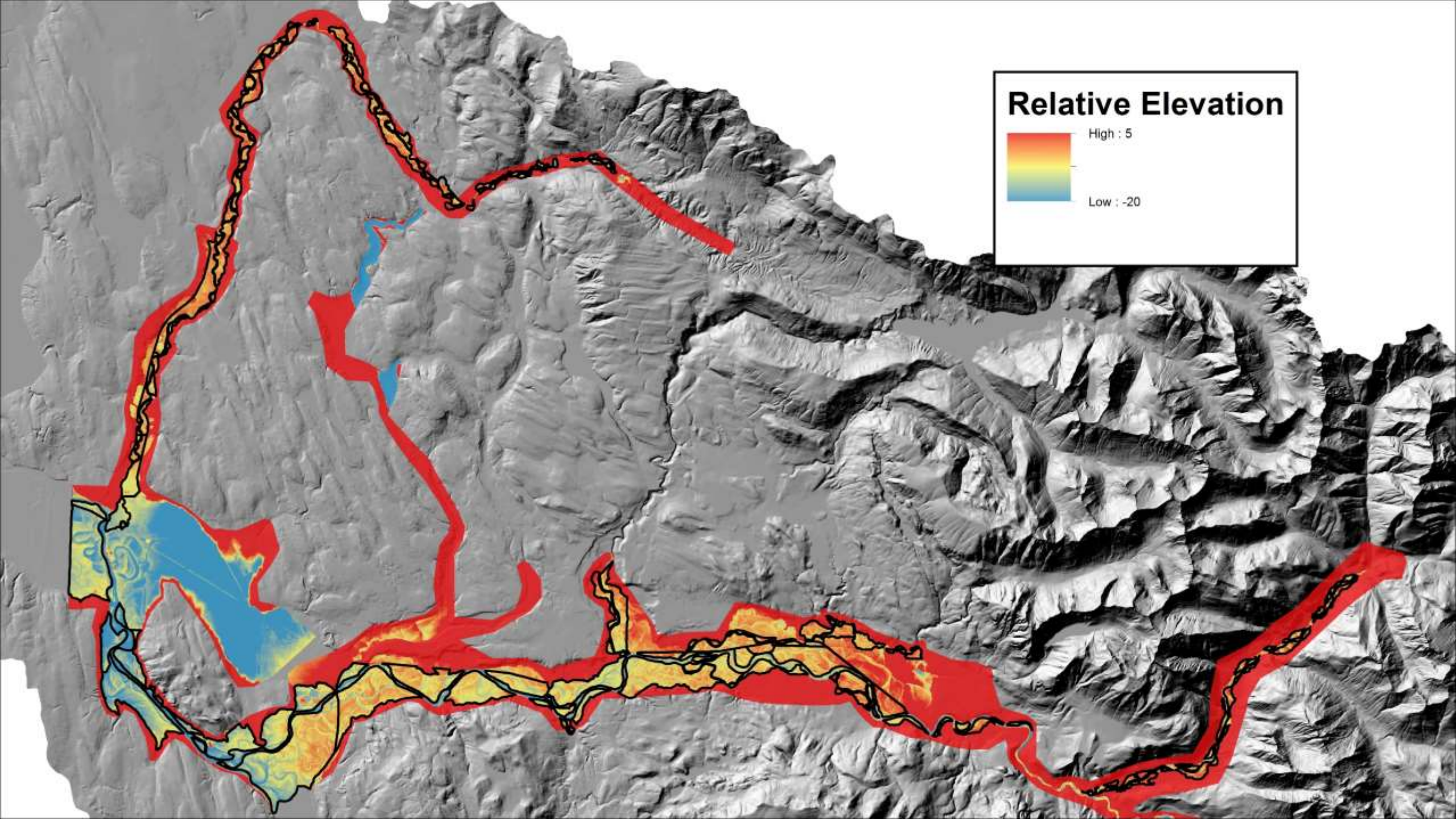
Questions?

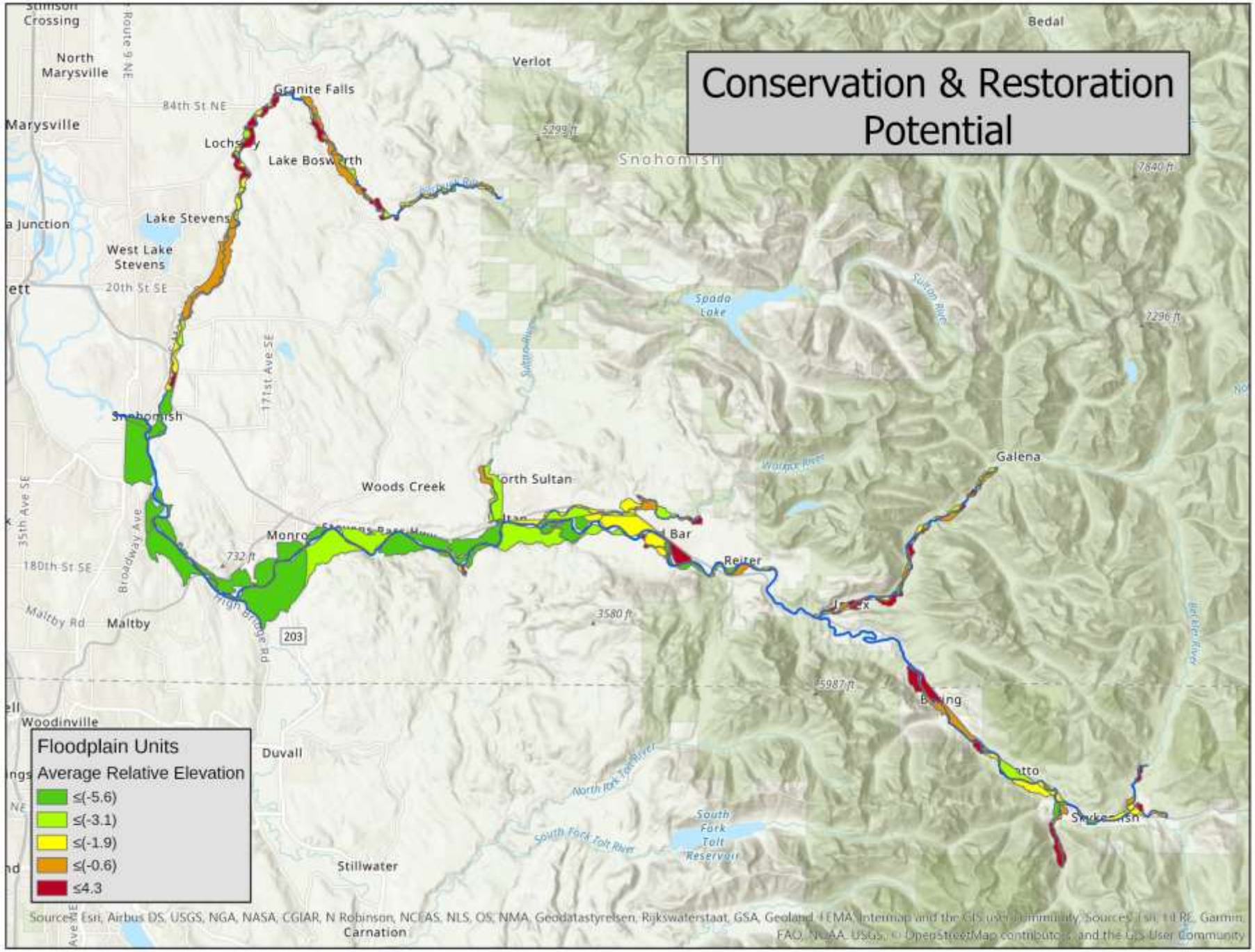
Importance Metrics

- **Relative Elevation**
- **Flow Importance**
- **Sub-Basin Strategy Group**
- **Habitat Potential**

Floodplain Elevation

- Premise: Floodplain Units having a lower average depth relative to the FEMA 100-year flood elevation are more desirable targets for restoration/conservation.


Relative Elevation
High : 5
Low : -20


Conservation & Restoration Potential
Floodplain Units
Average Relative Elevation
≤(-5.6)
≤(-3.1)
≤(-1.9)
≤(-0.6)
≤4.3
Stimson Crossing
North Marysville
Marysville
Granite Falls
Verlot
Bedal
Lake Stevens
West Lake Stevens
Snohomish
Woods Creek
North Sultan
Galena
Monroe
Maltby
Woodinville
Duvall
Stillwater
Carnation
Snoqualmie
Spada Lake
South Fork Tolt Reservoir
Source: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community, Sources: Esri, HERE, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community

Flow Importance

- Premise: Floodplain Units of more importance to water flow quantity and timing are more desirable targets for restoration/conservation.

Important Area for Water Process =

Delivery X **Movement** X **Loss**

Surface Storage X **Recharge, & Discharge**

P - Precipitation

RS – Snow & rain-on-snow area

WLS – Depressional Wetlands & Lakes

STS – Unconfined & Moderately Confined Floodplains

I_R – High Perm Deposits

I_DI – High Perm Floodplains & Slope Wetlands

All areas assumed to be forested & have equal evapotranspiration

$$I_DE\left[\frac{P}{MV} + \frac{RS}{MV}\right] \times I_SS\left[\frac{WLS}{\text{Max Value}} + \frac{STS}{\text{Max Value}}\right] \times I_GW\left[\frac{I_R}{\text{Max Value}} + \frac{I_DI}{\text{Max Value}}\right]$$

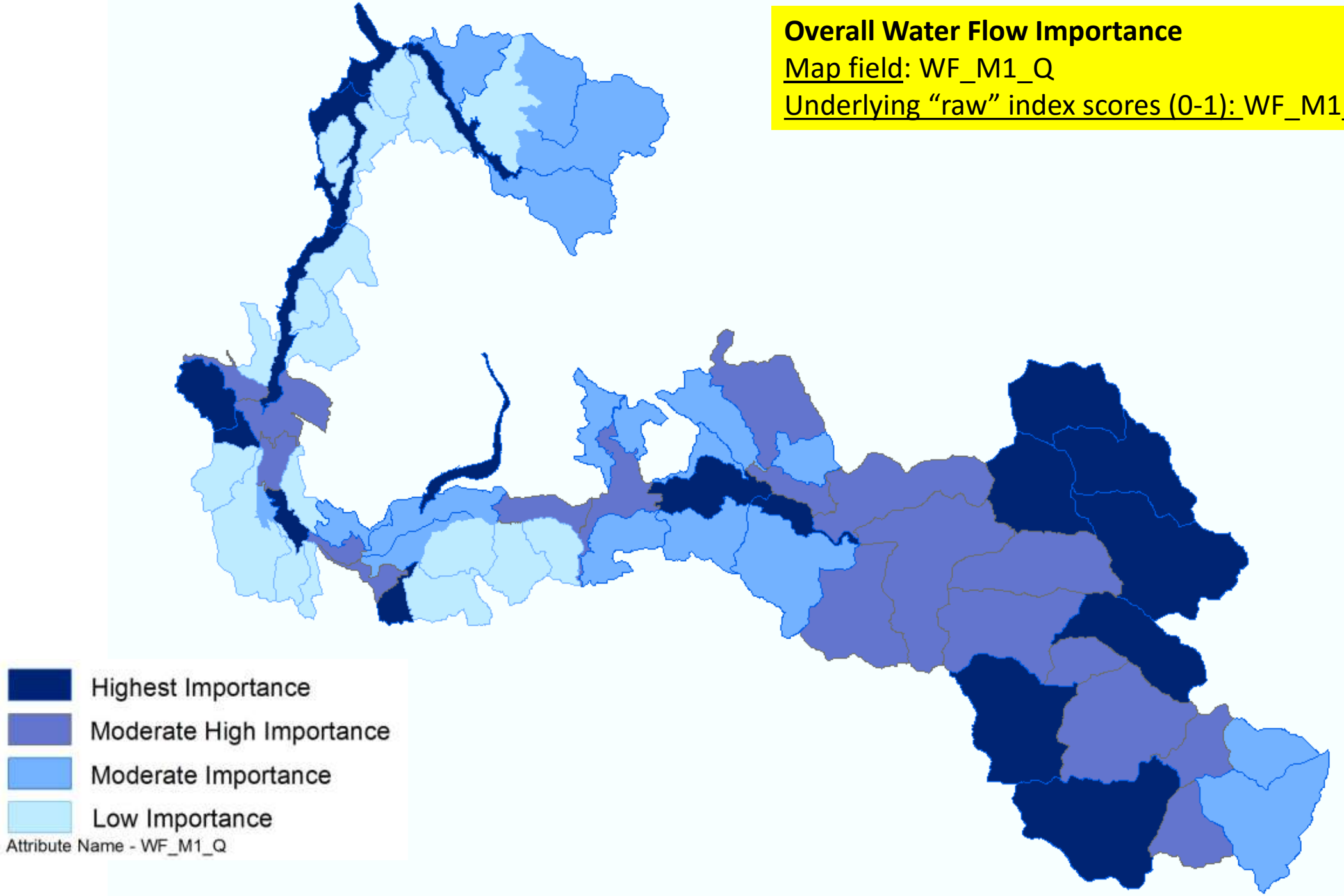
Max Score = 1 X **Max Score = 1** X **Max Score = 1** = **Max 8**

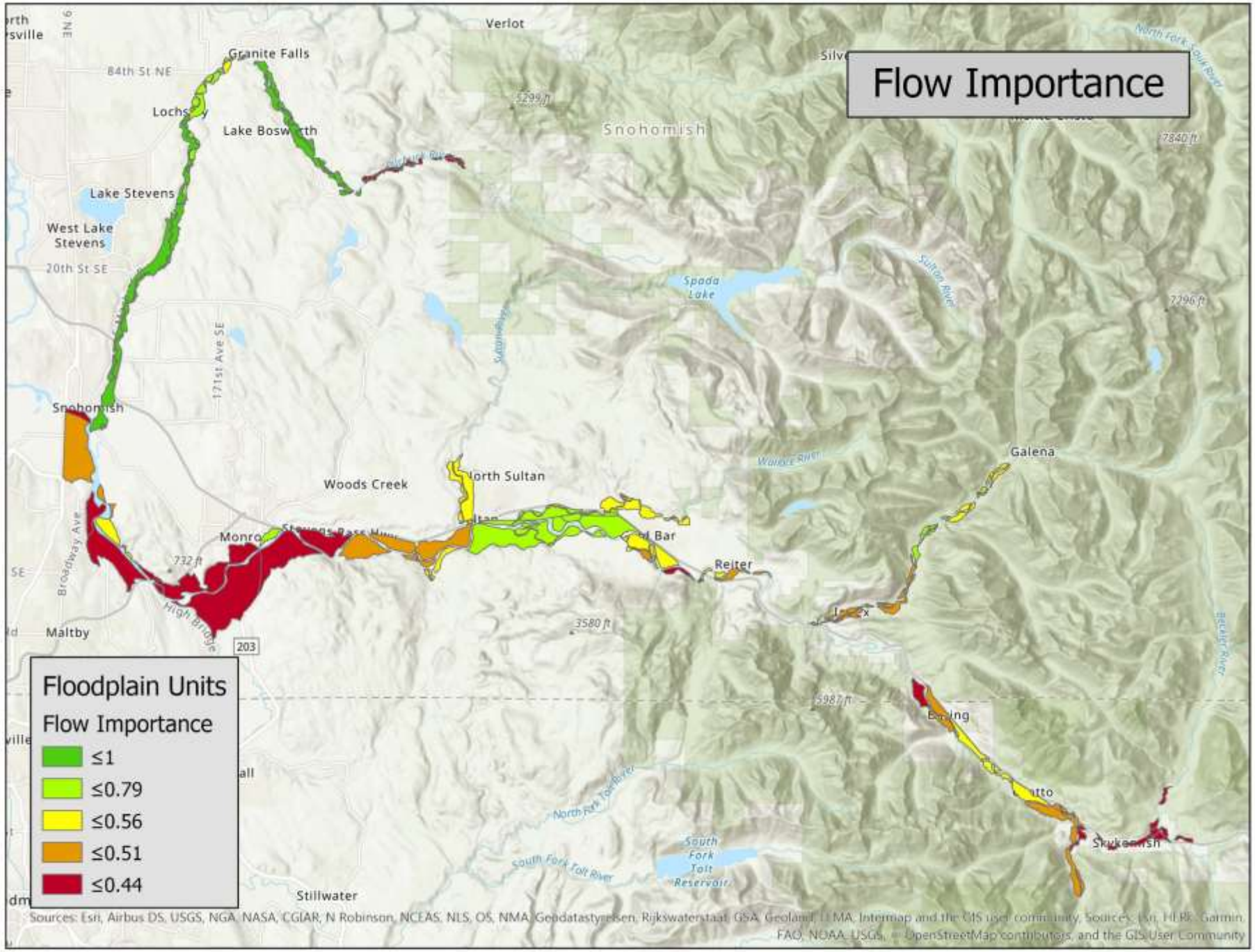
Model 1

Overall Water Flow Importance

Map field: WF_M1_Q

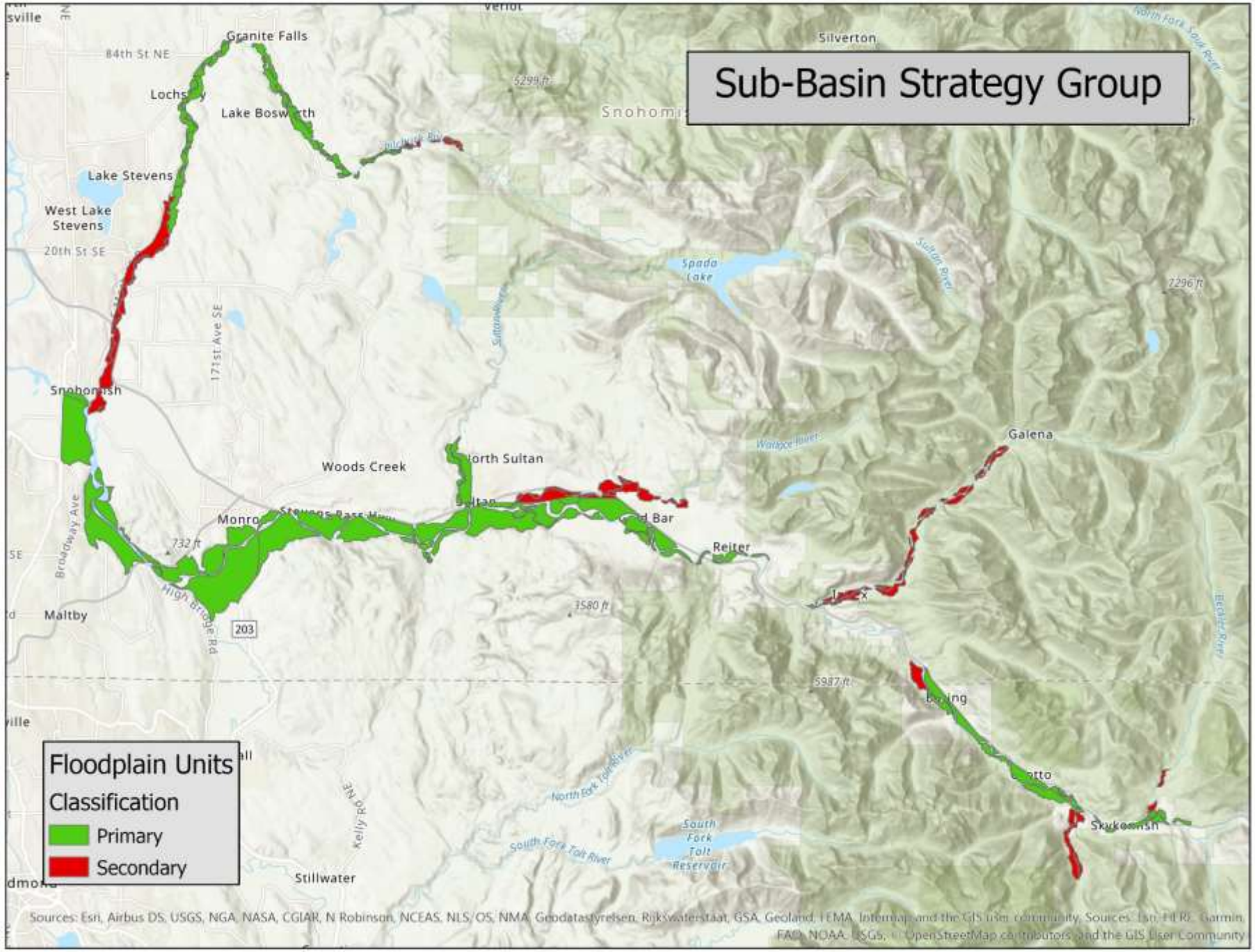
Underlying “raw” index scores (0-1): WF_M1_Cal




Flow Importance
Floodplain Units
Flow Importance
≤1
≤0.79
≤0.56
≤0.51
≤0.44
Granite Falls
Lake Stevens
West Lake Stevens
Snohomish
Woods Creek
Galena
Reiter
Maltby
Stillwater
Spada Lake
Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community, Sources: Esri, HERE, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community

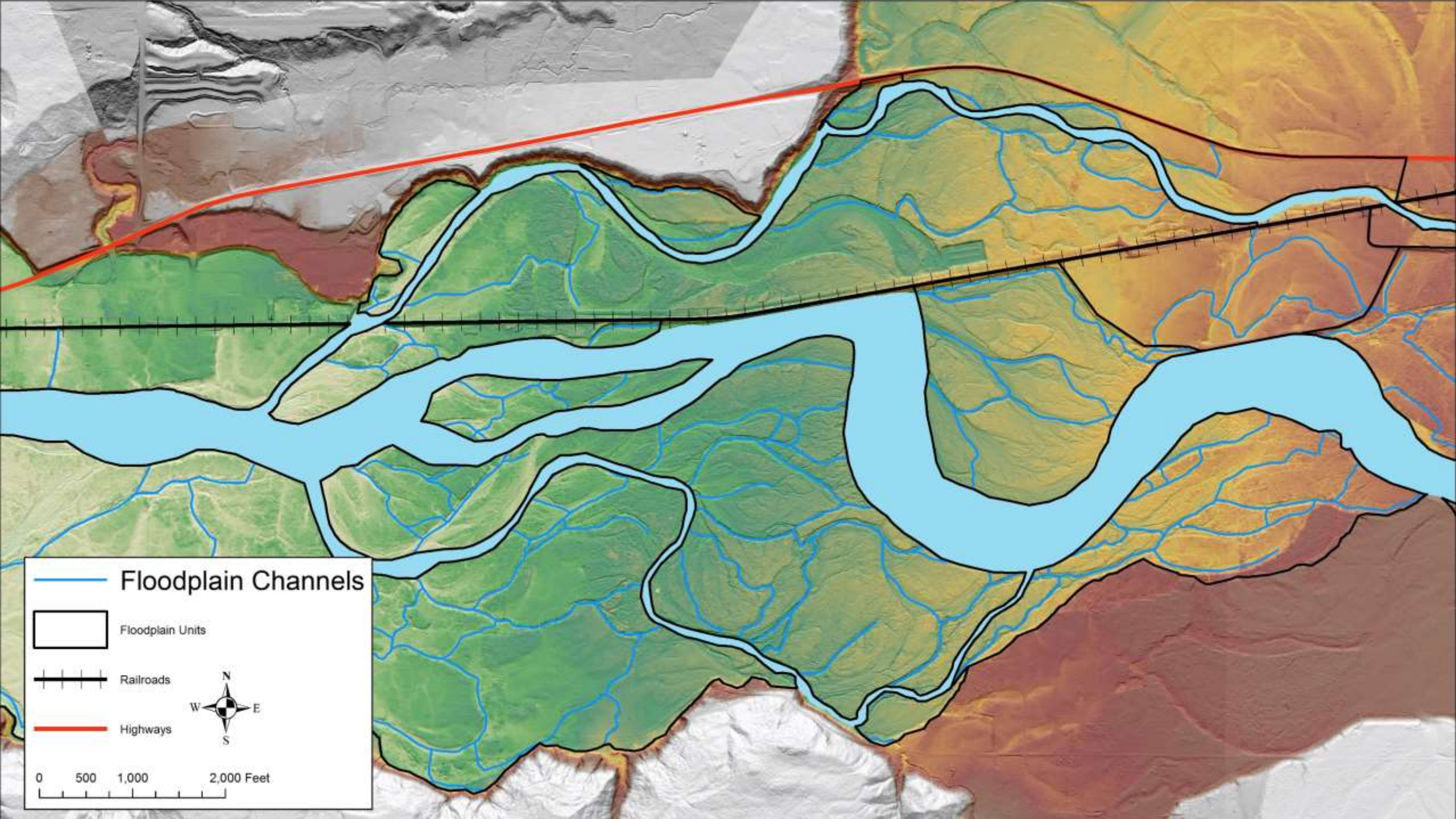
Sub Basin Strategy Group

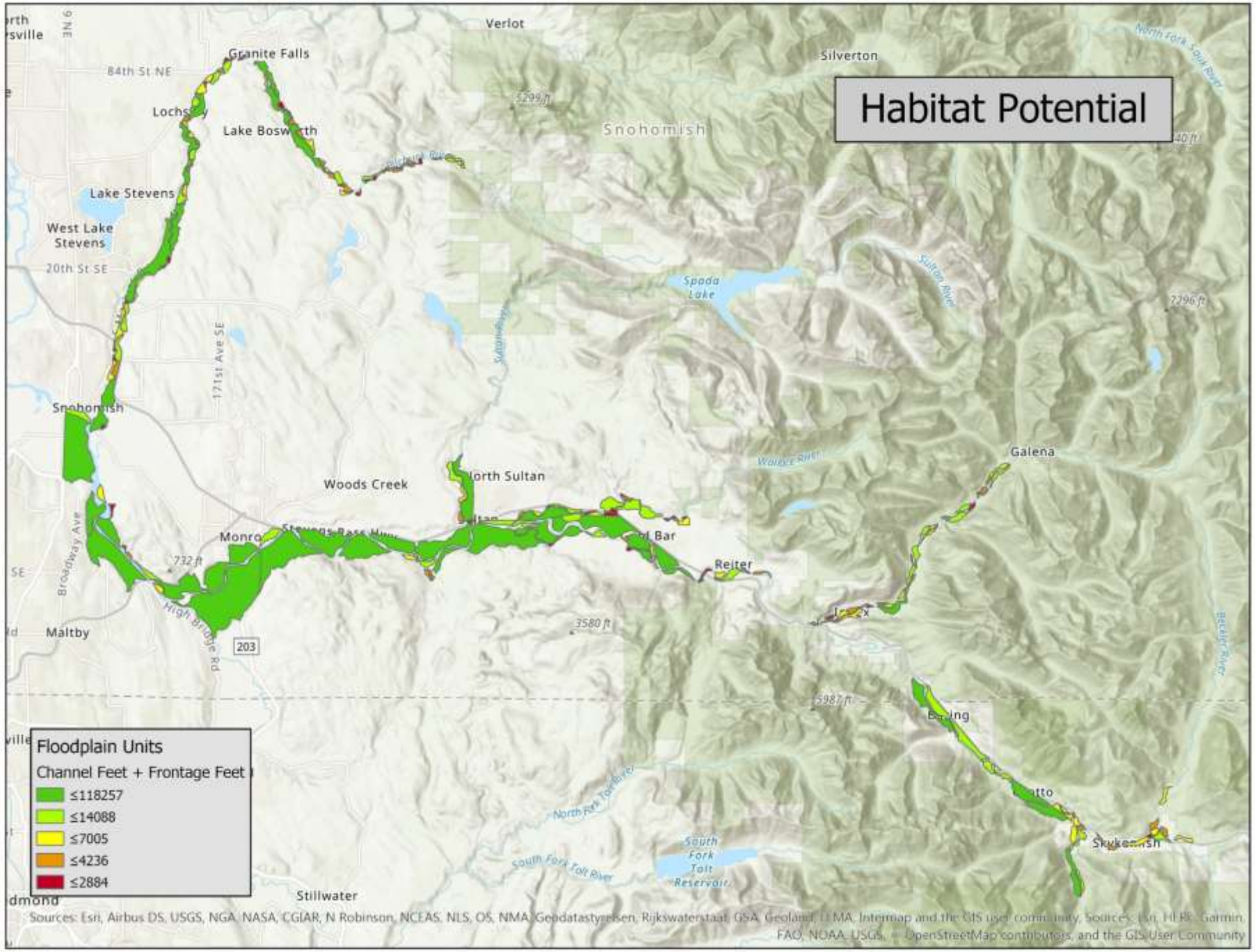
- Premise: Primary strategy groups are more desirable targets for restoration/conservation than secondary groups.


Sub-Basin Strategy Group
Floodplain Units
Classification
Primary
Secondary
Granite Falls
84th St NE
Lake Bosworth
Lake Stevens
West Lake Stevens
20th St SE
171st Ave SE
Snohomish
Woods Creek
North Sultan
Monroe
Stevens Pass Hwy
Broadway Ave
High Bridge Rd
Maltby
203
Reiter
Galena
Silverton
Spada Lake
Sultan River
Wallace River
Beckler River
North Fork Tolt River
South Fork Tolt River
South Fork Tolt Reservoir
Kelly Rd NE
Stillwater
Skykomish
5299 ft
7296 ft
732 ft
3580 ft
5987 ft
Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS/OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community, Sources: Esri, HERE, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors and the GIS User Community

Habitat Potential

- Premise: Floodplain Units with a higher length of river frontage and potential floodplain channels are more desirable targets for restoration/conservation.


Floodplain Channels
Floodplain Units
Railroads
Highways
N
W
E
S
0
500
1,000
2,000 Feet


Habitat Potential
Floodplain Units
Channel Feet + Frontage Feet
≤118257
≤14088
≤7005
≤4236
≤2884
Granite Falls
Verlot
Silverton
Snohomish
Lake Stevens
West Lake Stevens
Spada Lake
Woods Creek
Galena
Reiter
Maltby
Stillwater
Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community, Sources: Esri, HERE, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community

Feasibility Metrics

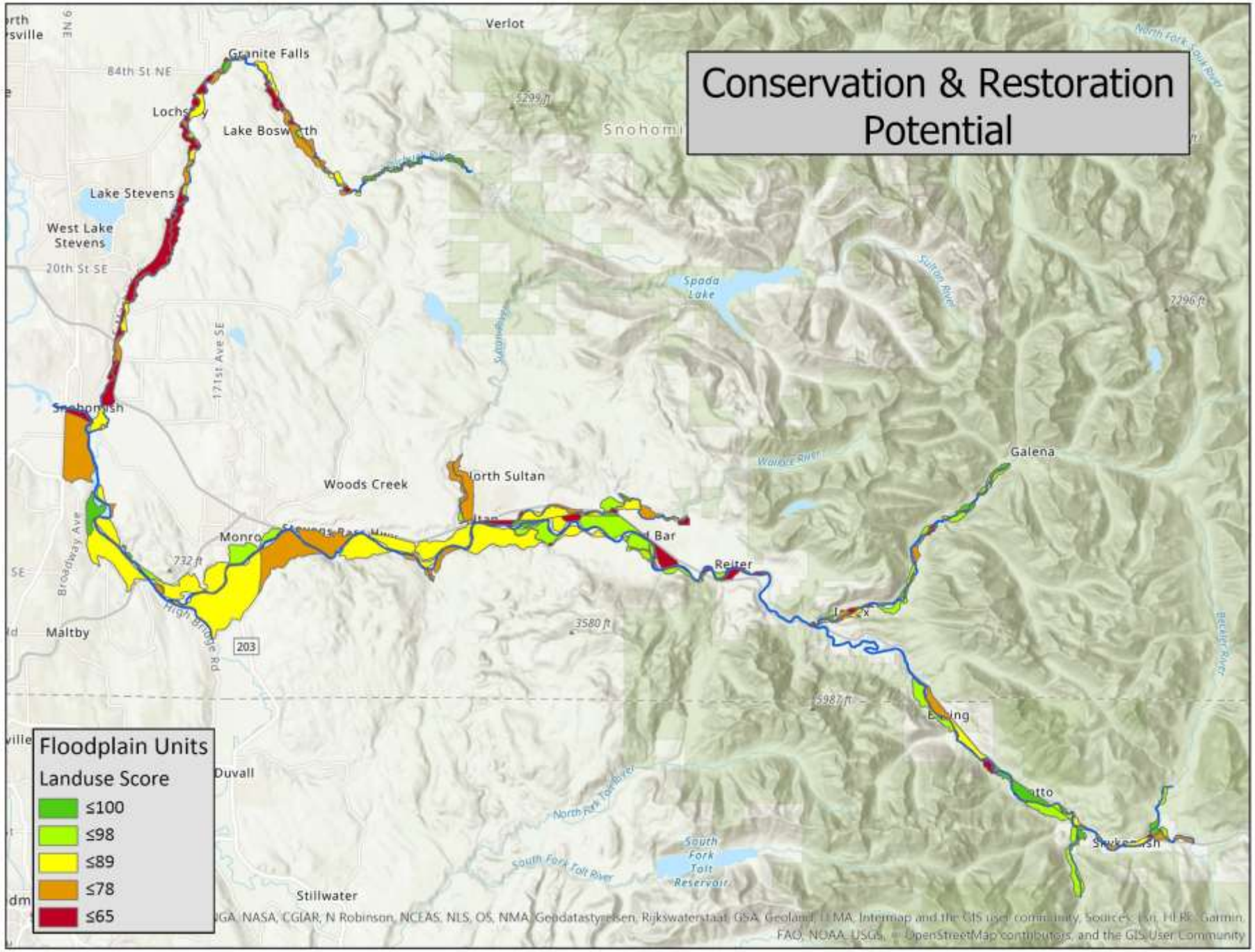
- **Land Use Type**
- **Number of Landowners**
- **Landowner Density**

Land Use Types

- Premise: Floodplain Units having a larger percentage of area in land uses more compatible with restoration/conservation (i.e. forestry, open space, agricultural, etc.) are more desirable targets for restoration/conservation.

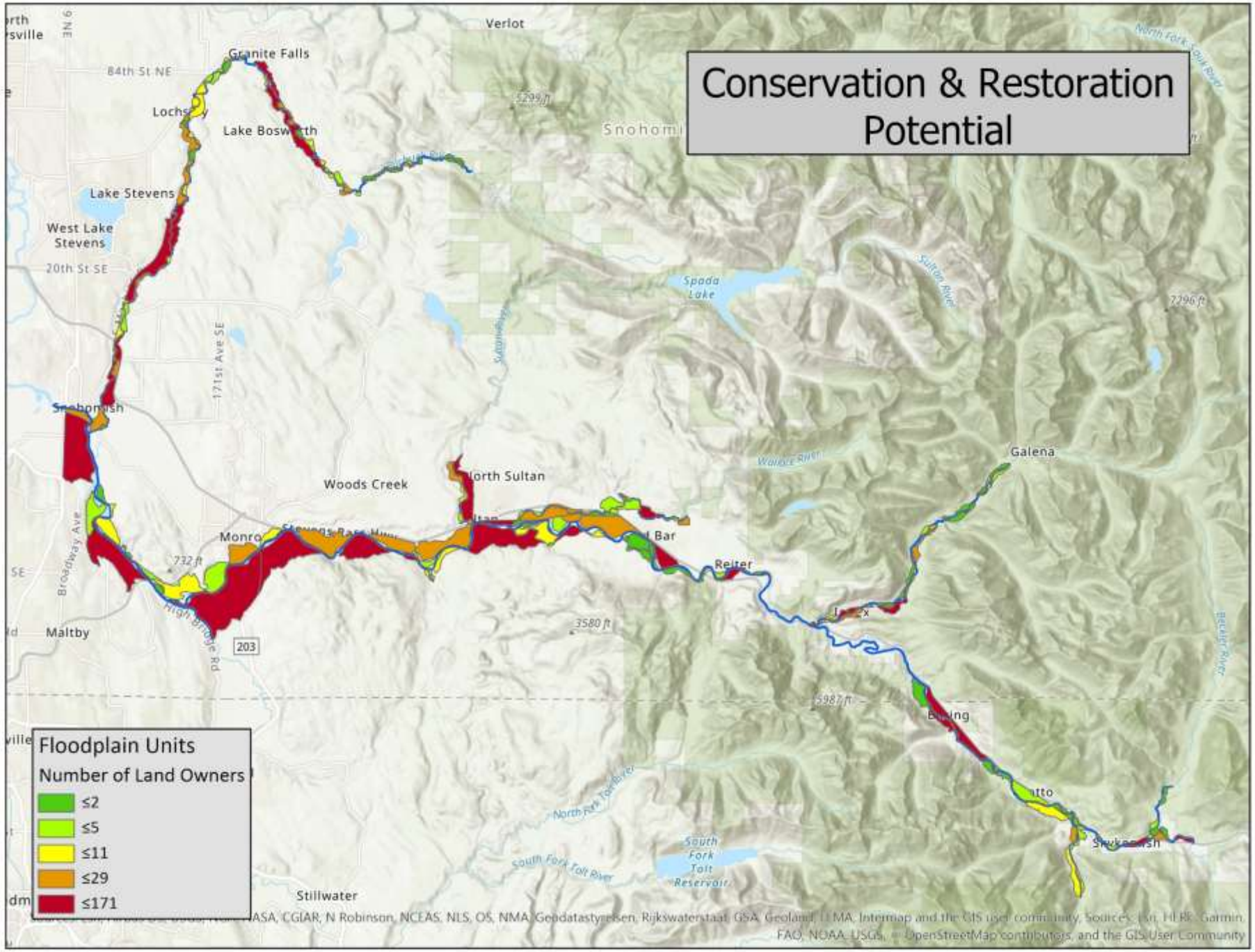
Land Use Types

- 100 = Water Area
- 100 = Undeveloped/Vacant
- 100 = Mining
- 90 = Forestry
- 90 = Park/Open Space
- 80 = Agriculture (current tax use)
- 70 = Recreation
- 50 = Agriculture (other than current use)
- 50 = Residential
- 30 = Social or Governmental Services
- 20 = Infrastructure (transportation/utility)
- 10 = Commercial
- 10 = Industrial


Conservation & Restoration Potential
Floodplain Units
Landuse Score
≤100
≤98
≤89
≤78
≤65
Granite Falls
Lake Stevens
West Lake Stevens
Woods Creek
Galena
Reiter
Maltby
Duvall
Stillwater
Spada Lake
South Fork Tolt Reservoir
Broadway Ave
171st Ave SE
20th St SE
84th St NE
203

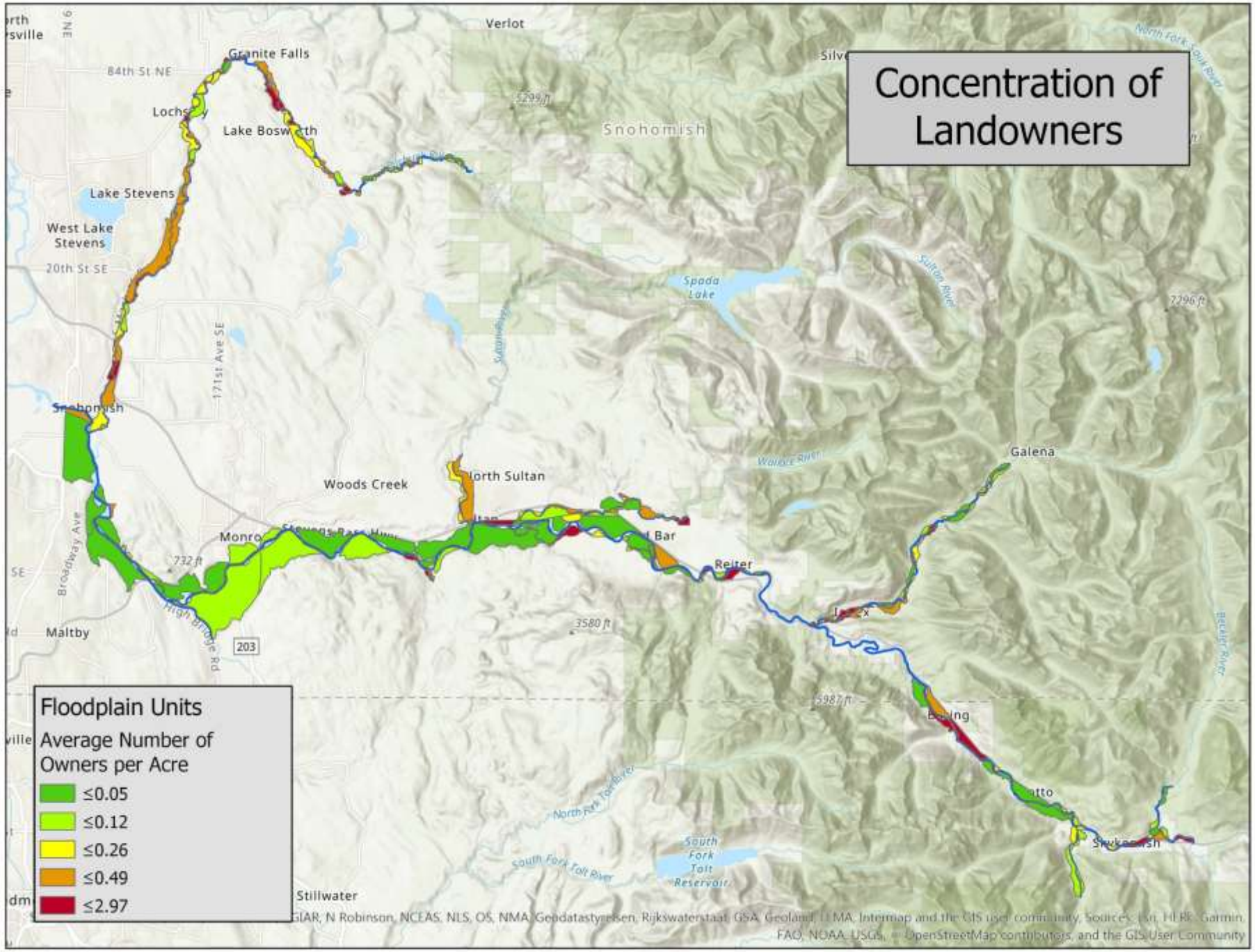
Number of Landowners

- Premise: Floodplain Units held by fewer landowners are more desirable targets for conservation/restoration.


Conservation & Restoration Potential
Floodplain Units
Number of Land Owners
≤2
≤5
≤11
≤29
≤171
Granite Falls
Lake Stevens
West Lake Stevens
Woods Creek
Galena
Maltby
Stillwater
Spada Lake
South Fork Tolt Reservoir
Reiter
Verlot
84th St NE
20th St SE
171st Ave SE
Broadway Ave
High Bridge Rd
Sultan River
Wallace River
North Fork Tolt River
South Fork Tolt River
Beckler River
North Fork Skykomish River
732 ft
3580 ft
5987 ft
7296 ft
5299 ft
203
ASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community, Sources: Esri, HERE, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community

Landowners Density

- Premise: Floodplain Units with a lower density of landowners are more desirable targets for conservation/restoration.

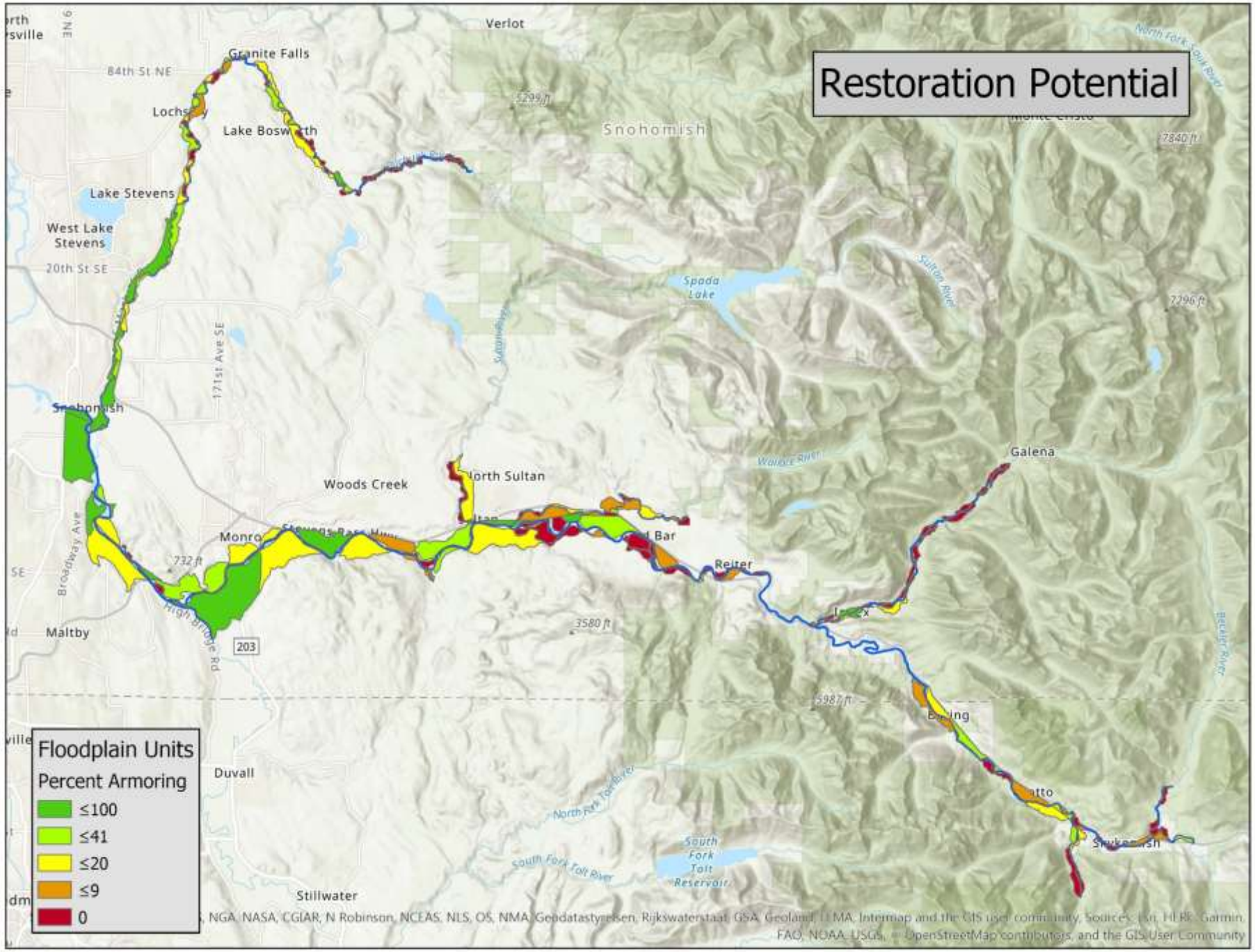

Concentration of Landowners
Floodplain Units
Average Number of Owners per Acre
≤0.05
≤0.12
≤0.26
≤0.49
≤2.97
Granite Falls
Verlot
Snohomish
Lake Stevens
West Lake Stevens
Lake Bosworth
Spada Lake
Woods Creek
North Sultan
Galena
Reiter
Maltby
Stillwater
South Fork Tolt Reservoir
84th St NE
20th St SE
171st Ave SE
Broadway Ave
High Bridge Rd
Sultan River
Wallace River
North Fork Tolt River
South Fork Tolt River
Beckler River
5299 ft
7296 ft
732 ft
3580 ft
5987 ft
203

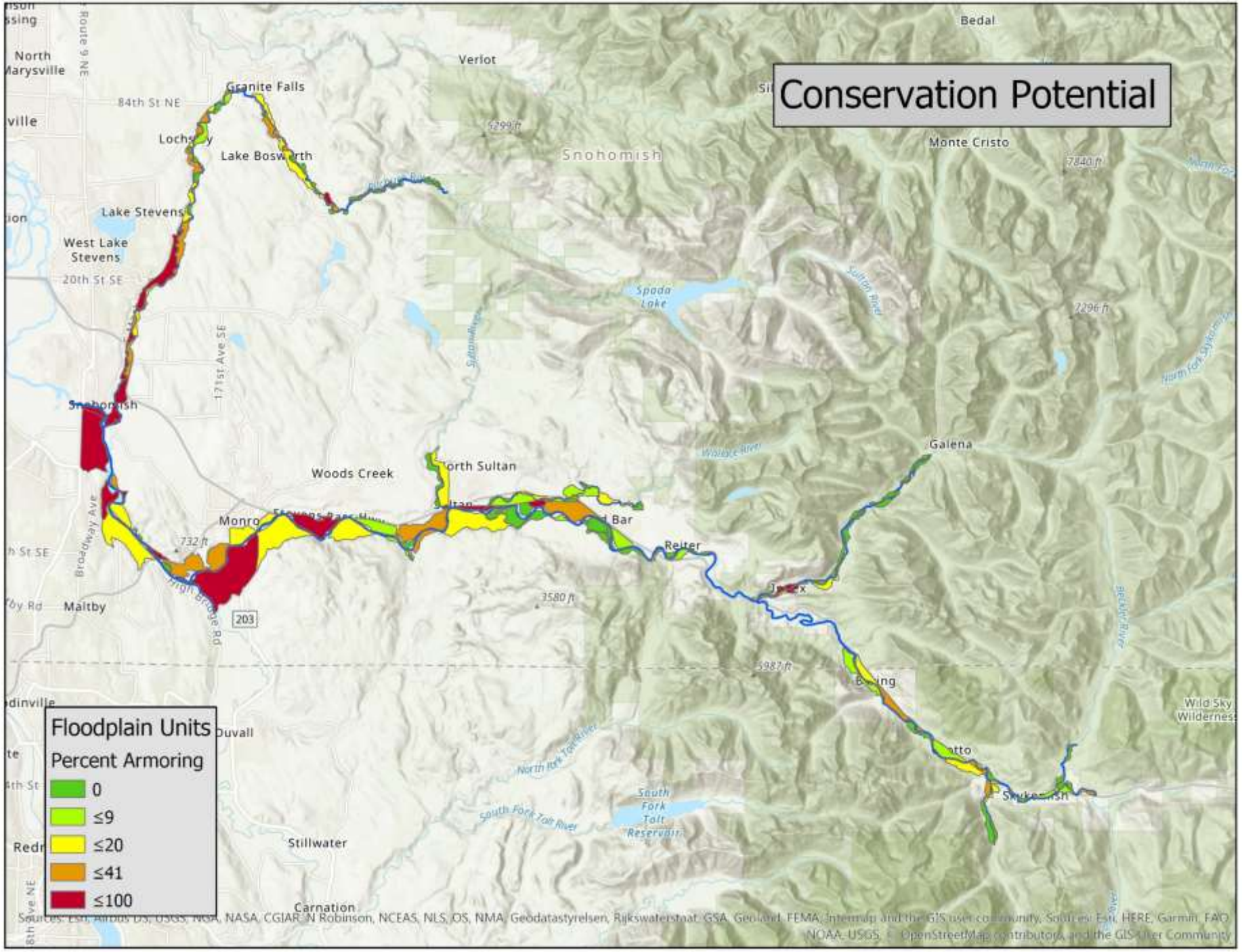
Degradation Metrics

- **Armoring**
- **Channel Constriction**
- **Sinuosity**
- **Water and Vegetation Cover**
- **Flow Degradation**

Armoring

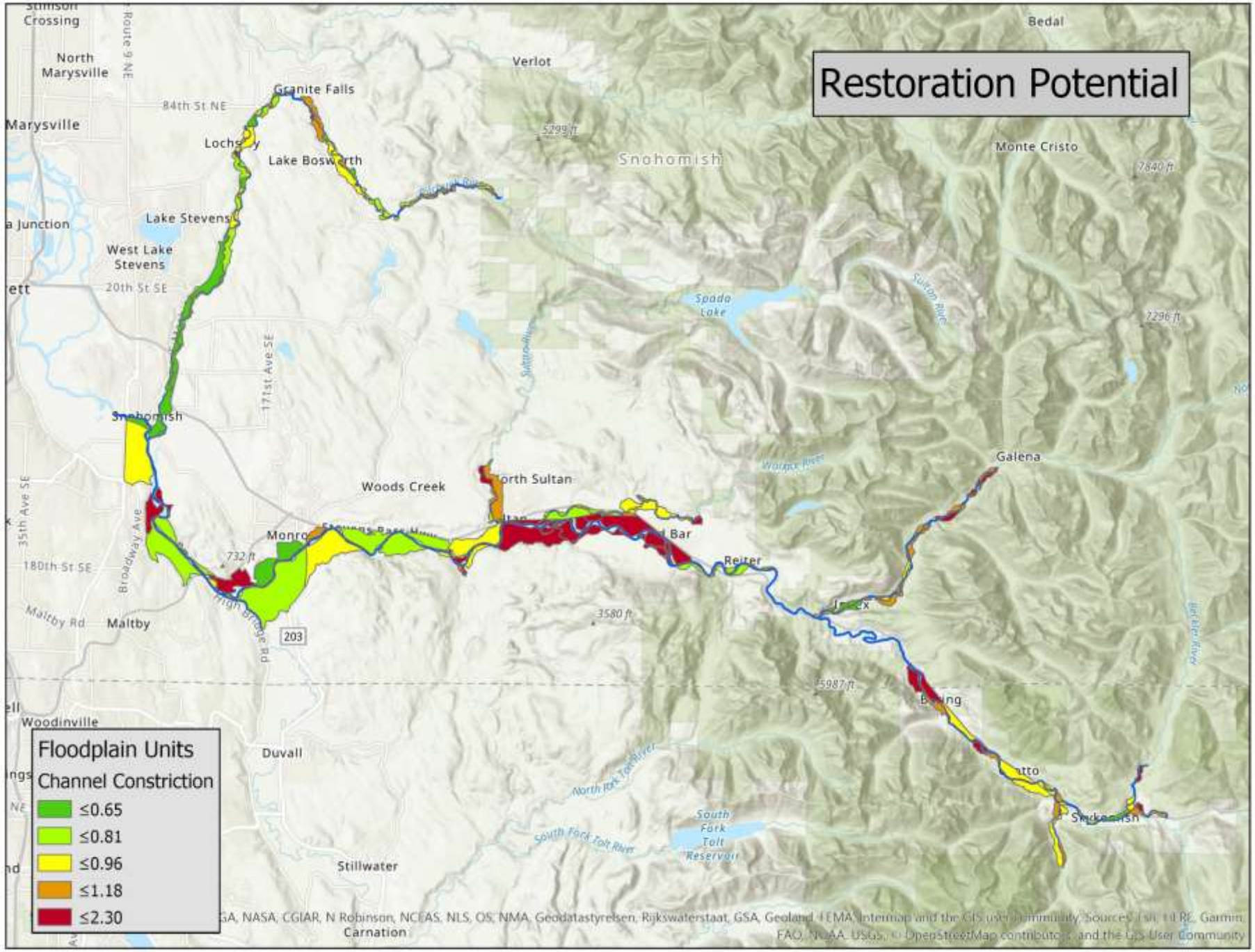
- Premise: Floodplain Units with a greater proportion of armoring are more desirable targets for restoration. Floodplain units with a lesser proportion of armoring are more desirable targets for conservation.

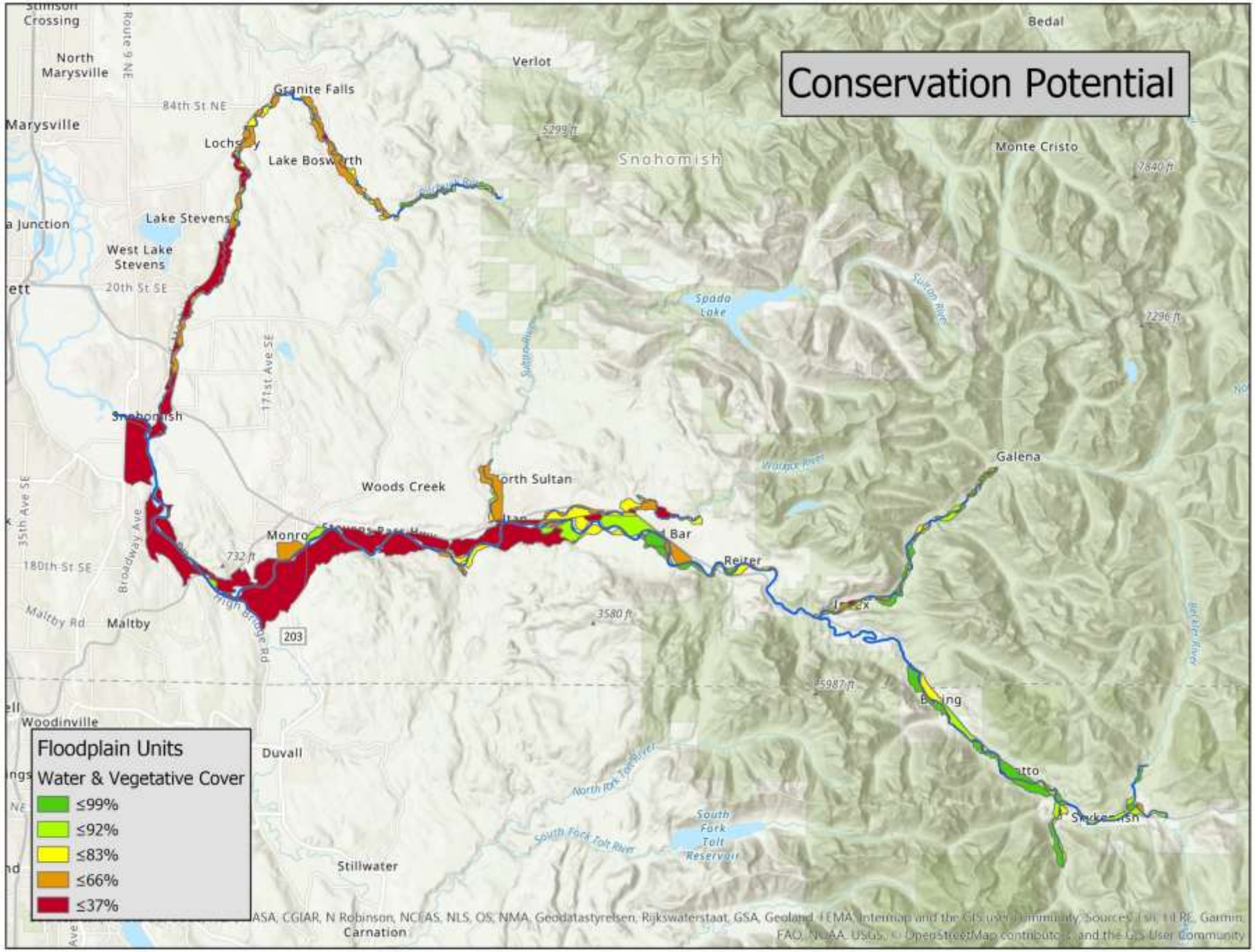

Restoration Potential
Floodplain Units
Percent Armoring
≤100
≤41
≤20
≤9
0
Granite Falls
Verlot
Snohomish
Lake Stevens
West Lake Stevens
Lake Bosworth
Spada Lake
Woods Creek
North Sultan
Galena
Reiter
Maltby
Duvall
Stillwater
South Fork Tolt Reservoir
84th St NE
20th St SE
171st Ave SE
Broadway Ave
High Bridge Rd
203
Sultan River
Wallace River
North Fork Tolt River
South Fork Tolt River
Beckler River
7840 ft
7296 ft
5299 ft
3580 ft
5987 ft
732 ft


Conservation Potential
Floodplain Units
Percent Armoring
0
≤9
≤20
≤41
≤100
Granite Falls
Lake Bosworth
Lake Stevens
West Lake Stevens
Snohomish
Woods Creek
North Sultan
Monroe
Maltby
Duvall
Stillwater
Carnation
Verlot
Snoqualmie
Snohomish
Monte Cristo
Galena
Reiter
Bedal
Spada Lake
South Fork Tolt Reservoir
Wild Sky Wilderness
84th St NE
20th St SE
171st Ave SE
Broadway Ave
Route 9 NE
203

Channel Constriction

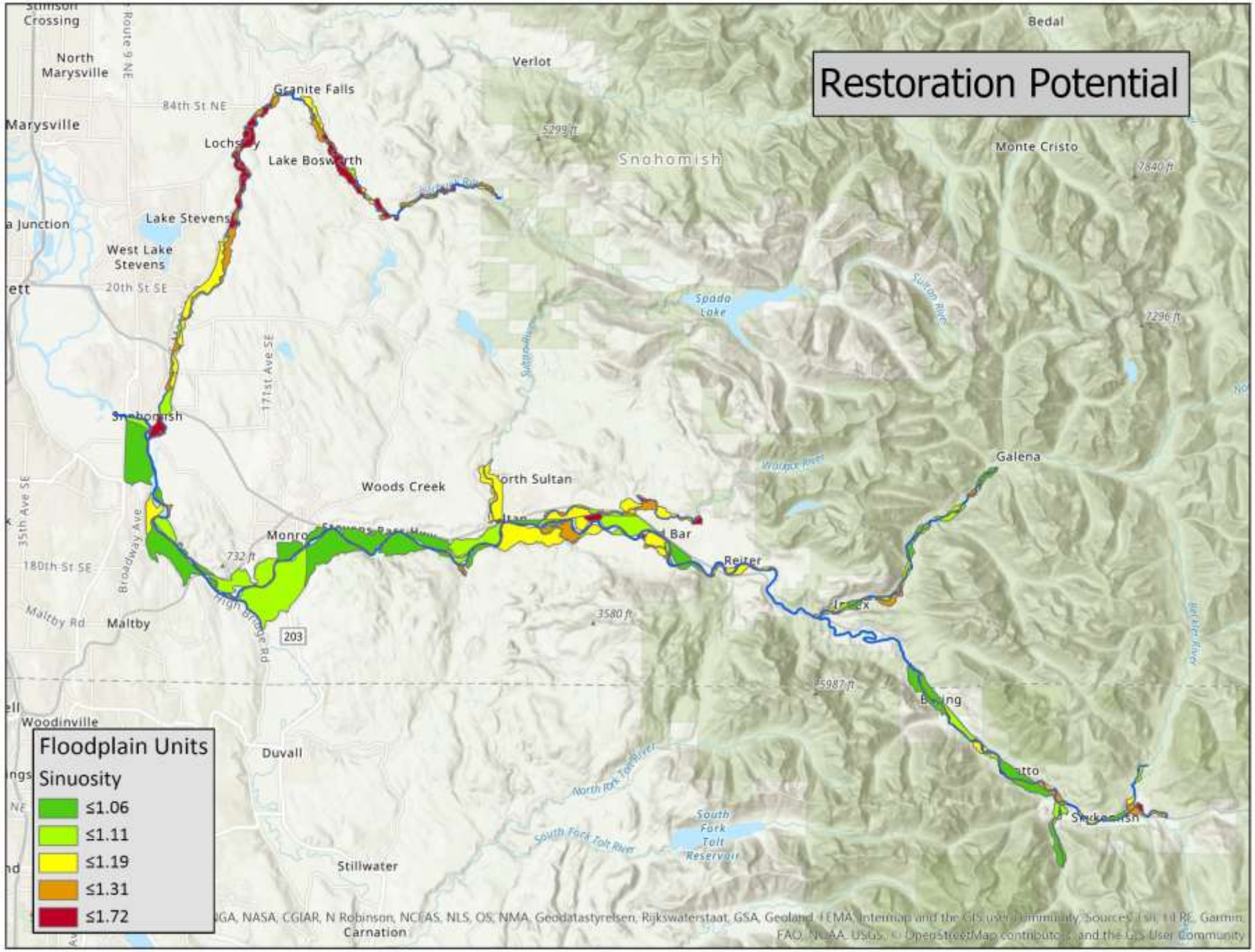
- Premise: Floodplain Units along more constricted river channels are more desirable targets for restoration. Floodplain units along less constricted river channels are more desirable targets for conservation.

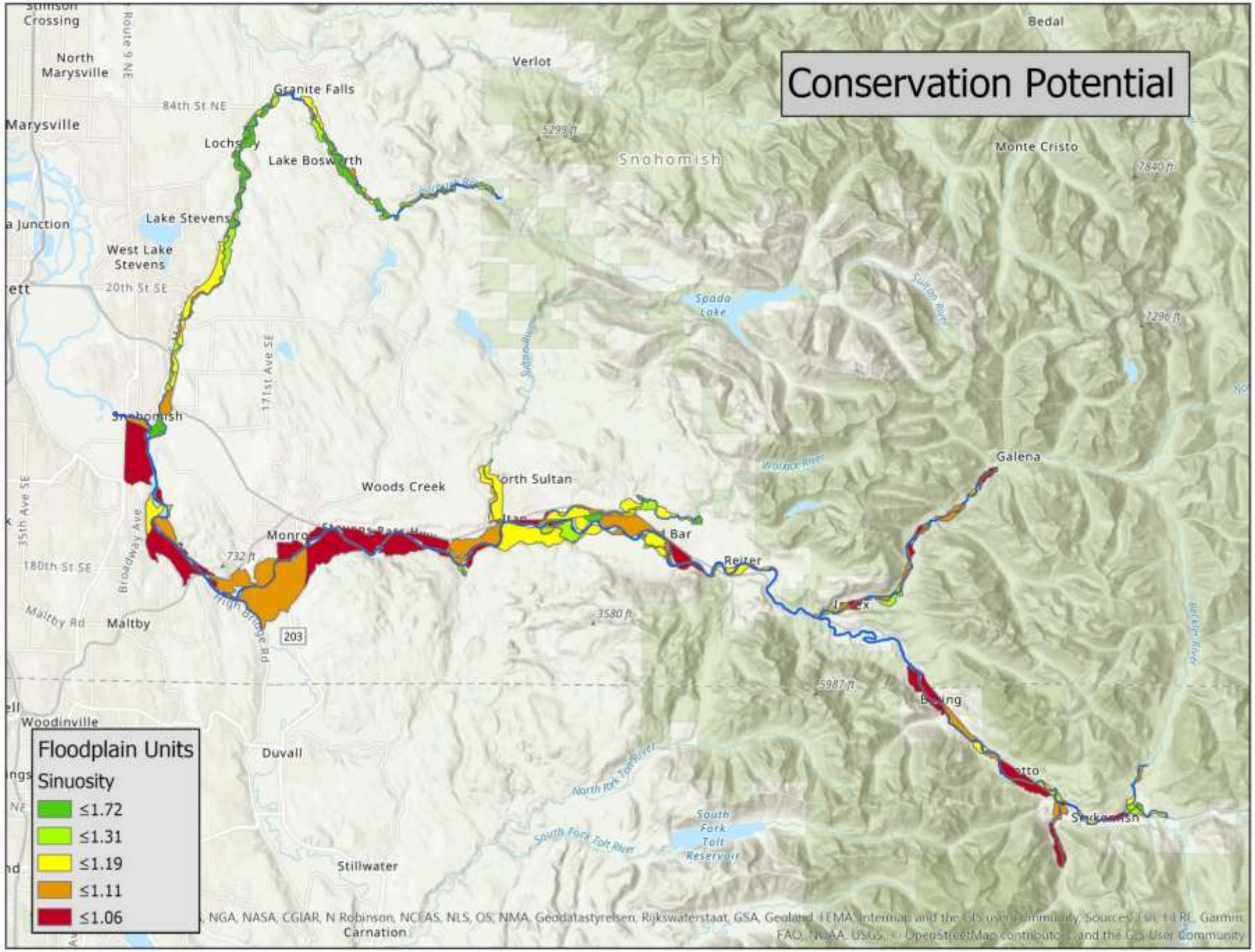

Restoration Potential
Floodplain Units
Channel Constriction
≤0.65
≤0.81
≤0.96
≤1.18
≤2.30
Stimson Crossing
North Marysville
Marysville
Granite Falls
84th St NE
Lake Bosworth
Lake Stevens
West Lake Stevens
20th St SE
Snohomish
Woods Creek
Monroe
Maltby
Woodinville
Duvall
Stillwater
Carnation
Verlot
Snohomish
Spada Lake
Monte Cristo
Bedal
Galena
Reiter
Index
Baring
Sultan
Sultan River
Wallace River
South Fork Tolt Reservoir
North Fork Tolt River
South Fork Tolt River
Maltby Rd
Broadway Ave
171st Ave SE
35th Ave SE
180th St SE
203
5299 ft
7840 ft
7296 ft
732 ft
3580 ft
5987 ft


Conservation Potential
Floodplain Units
Water & Vegetative Cover
≤99%
≤92%
≤83%
≤66%
≤37%
Stimson Crossing
North Marysville
Marysville
Granite Falls
Verlot
Bedal
Monte Cristo
Lake Bosworth
Lake Stevens
West Lake Stevens
Snohomish
Woods Creek
North Sultan
Monroe
Galena
Reiter
Maltby
Woodinville
Duvall
Stillwater
Carnation
Spada Lake
South Fork Tolt Reservoir
Snoqualmie River
Sultan River
Skykomish River
Tolt River
84th St NE
20th St SE
180th St SE
Maltby Rd
Broadway Ave
35th Ave SE
171st Ave SE
Route 9 NE
203
5299 ft
7840 ft
7296 ft
732 ft
3580 ft
5987 ft
ASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community, Sources: Esri, HERE, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community

Sinuosity

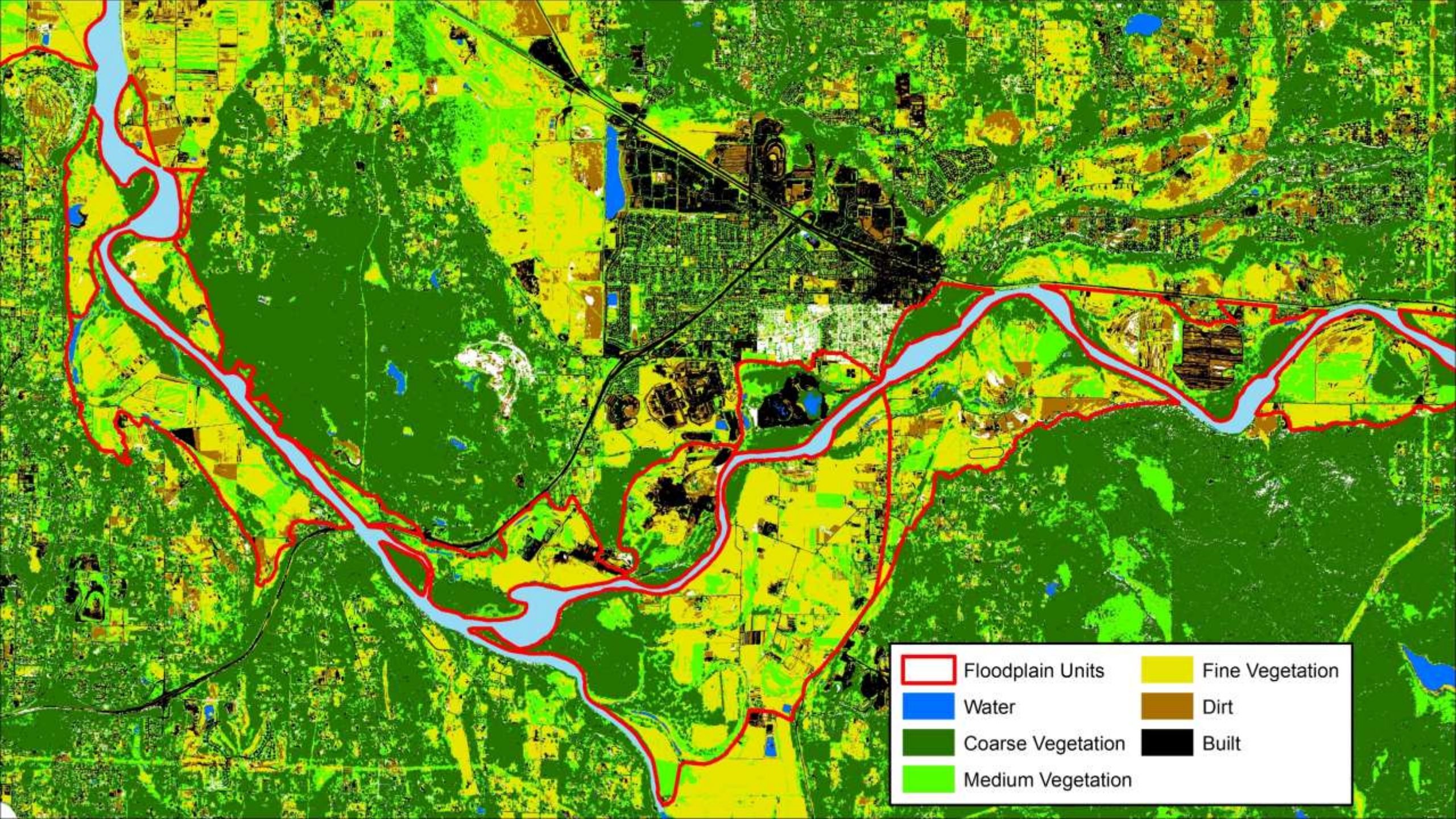
- Premise: Floodplain Units along less sinuous river channels are more desirable targets for restoration. Floodplain units along more sinuous river channels are more desirable targets for conservation.

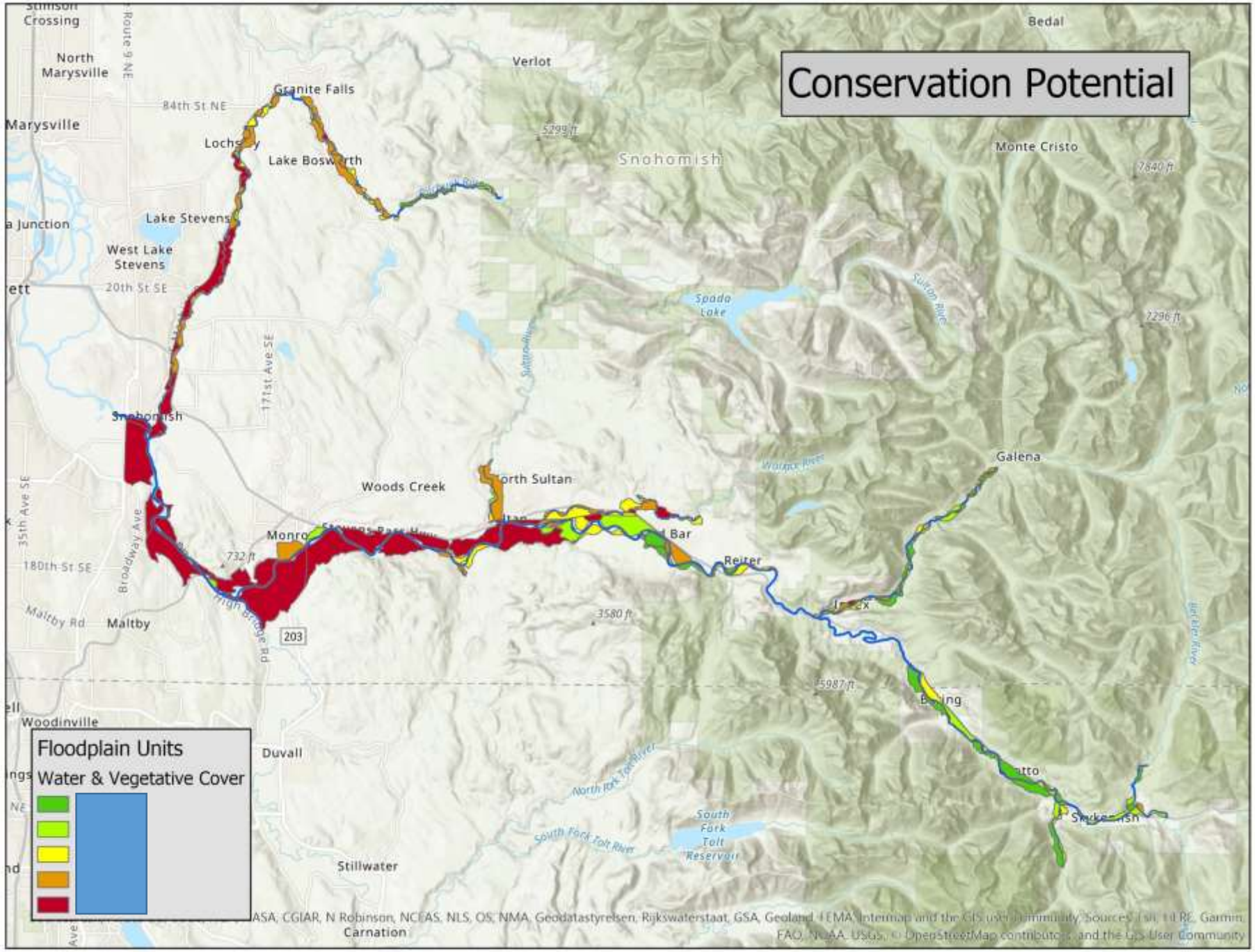

Restoration Potential
Floodplain Units
Sinuosity
≤1.06
≤1.11
≤1.19
≤1.31
≤1.72
Stilson Crossing
North Marysville
Marysville
Route 9 NE
84th St NE
Granite Falls
Verlot
Bedal
Monte Cristo
Snohomish
Lake Bosworth
Lake Stevens
West Lake Stevens
20th St SE
Spada Lake
Sultan River
171st Ave SE
Snohomish
Woods Creek
North Sultan
Galena
Monroe
Bar
Reiter
Index
Broadway Ave
35th Ave SE
180th St SE
Maltby Rd
Maltby
203
Woodinville
Duvall
Stillwater
Carnation
North Fork Tolt River
South Fork Tolt River
South Fork Tolt Reservoir
Snoqualmie River
Bear Creek
Snoqualmie
5299 ft
7840 ft
7296 ft
732 ft
3580 ft
5987 ft

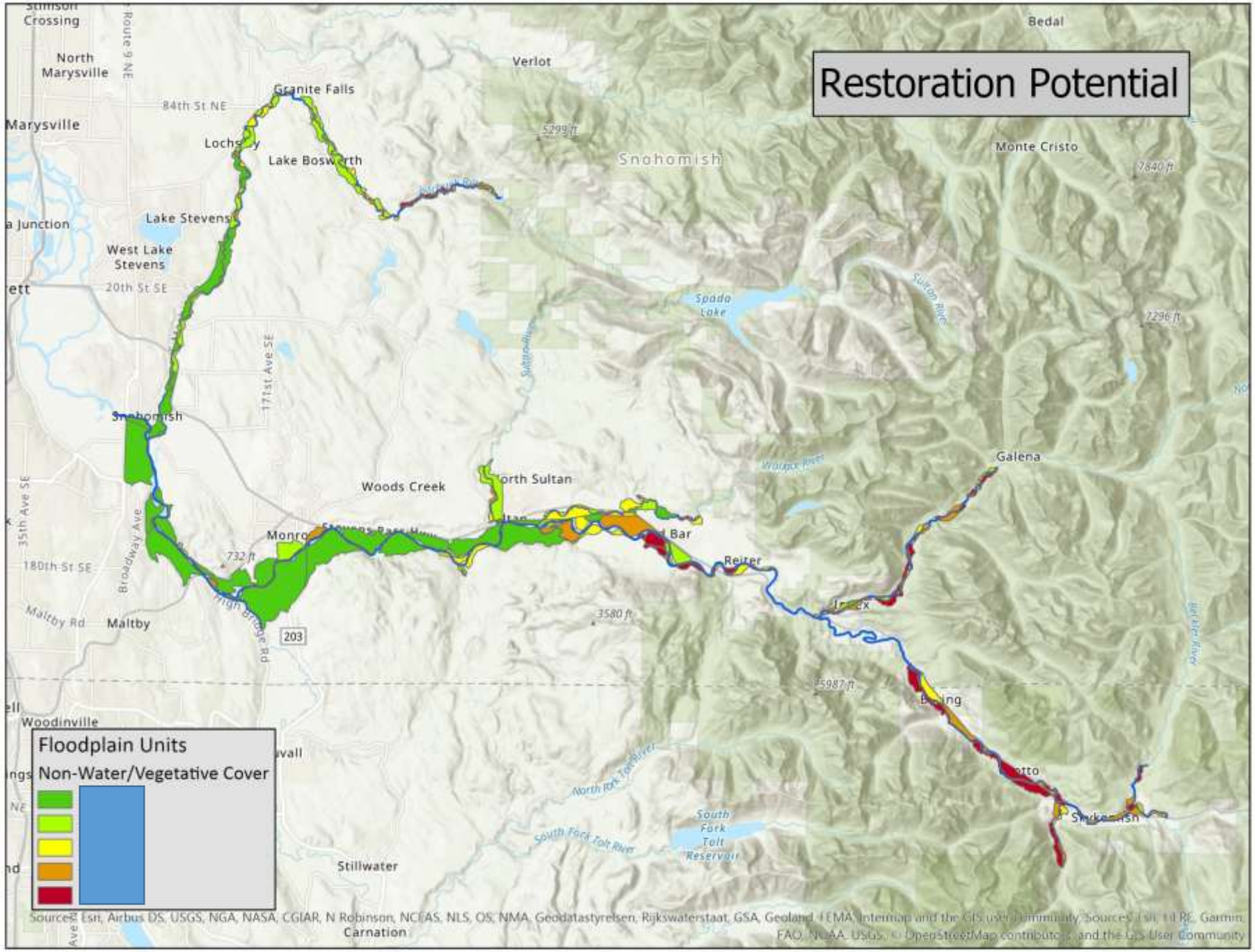

Conservation Potential
Floodplain Units
Sinuosity
≤1.72
≤1.31
≤1.19
≤1.11
≤1.06
Stimson Crossing
North Marysville
Marysville
Granite Falls
Verlot
Bedal
Monte Cristo
Snohomish
Lake Stevens
West Lake Stevens
Spada Lake
Woods Creek
North Sultan
Galena
Reiter
Maltby
Woodinville
Duvall
Stillwater
Carnation
South Fork Tolt Reservoir
Snoqualmie River
Skykomish River
Sultan River
Wallace River
Tye River
Tolt River
South Fork Tolt River
North Fork Tolt River
84th St NE
20th St SE
180th St SE
Maltby Rd
Broadway Ave
35th Ave SE
171st Ave SE
Route 9 NE
203
5299 ft
7840 ft
7296 ft
732 ft
3580 ft
5987 ft

Water and Vegetation Cover

- Premise: Floodplain Units with lower water and course vegetation coverage are more desirable targets for restoration. Floodplain units with higher water and course vegetation coverage are more desirable targets for conservation.


Floodplain Units
Water
Coarse Vegetation
Medium Vegetation
Fine Vegetation
Dirt
Built


Conservation Potential
Floodplain Units
Water & Vegetative Cover
Stilson Crossing
North Marysville
Marysville
Granite Falls
Lake Bosworth
Lake Stevens
West Lake Stevens
Snohomish
Woods Creek
Monroe
Maltby
Woodinville
Duvall
Stillwater
Carnation
Verlot
Snohomish
Monte Cristo
Spada Lake
Galena
Reiter
Bedal


Restoration Potential
Floodplain Units
Non-Water/Vegetative Cover
Stimson Crossing
North Marysville
Marysville
Granite Falls
84th St NE
Lake Bosworth
Lake Stevens
West Lake Stevens
20th St SE
Snohomish
Woods Creek
Monroe
Maltby
Woodinville
Stillwater
Carnation
Verlot
Snohomish
Spada Lake
Sultan River
Monte Cristo
Bedal
Galena
Reiter
Index
Baring
Skykomish
South Fork Tolt Reservoir
South Fork Tolt River
North Fork Tolt River
Maltby Rd
Broadway Ave
35th Ave SE
180th St SE
171st Ave SE
203
5299 ft
7840 ft
7296 ft
732 ft
3580 ft
5987 ft

Flow Degradation

- Premise: Floodplain Units with more degraded water flow quantity and timing are more desirable targets for restoration. Floodplain Units with less degraded water flow quantity and timing are more desirable targets for conservation.

Degradation to Water Process =

Delivery | **Movement** | **Loss**

Timing X **Surface Storage** X **Recharge, Lateral Flow, & Discharge** X

IMP – Impervious Cover

FL –Forest Loss

D_WS- Depressional Wetland Loss From Urban & Rural Land Cover

D_STS – Loss of Floodplains

D_R – Loss of Recharge from Urban Land Cover

D_DI – Loss of Discharge From Roads & Wells, Floodplains, & Slope Wetlands

IMP – Impervious cover

$$D_DE\left[\frac{IMP + FL}{Max\ Value}\right] \times D_SS\left[\frac{D_WS}{Max\ Value} + \frac{D_STS}{Max\ Value}\right] \times D_GW\left[\frac{D_R}{Max\ Value} + \frac{D_DI}{Max\ Value}\right] \times D_L\left[\frac{IMP}{MV}\right]$$

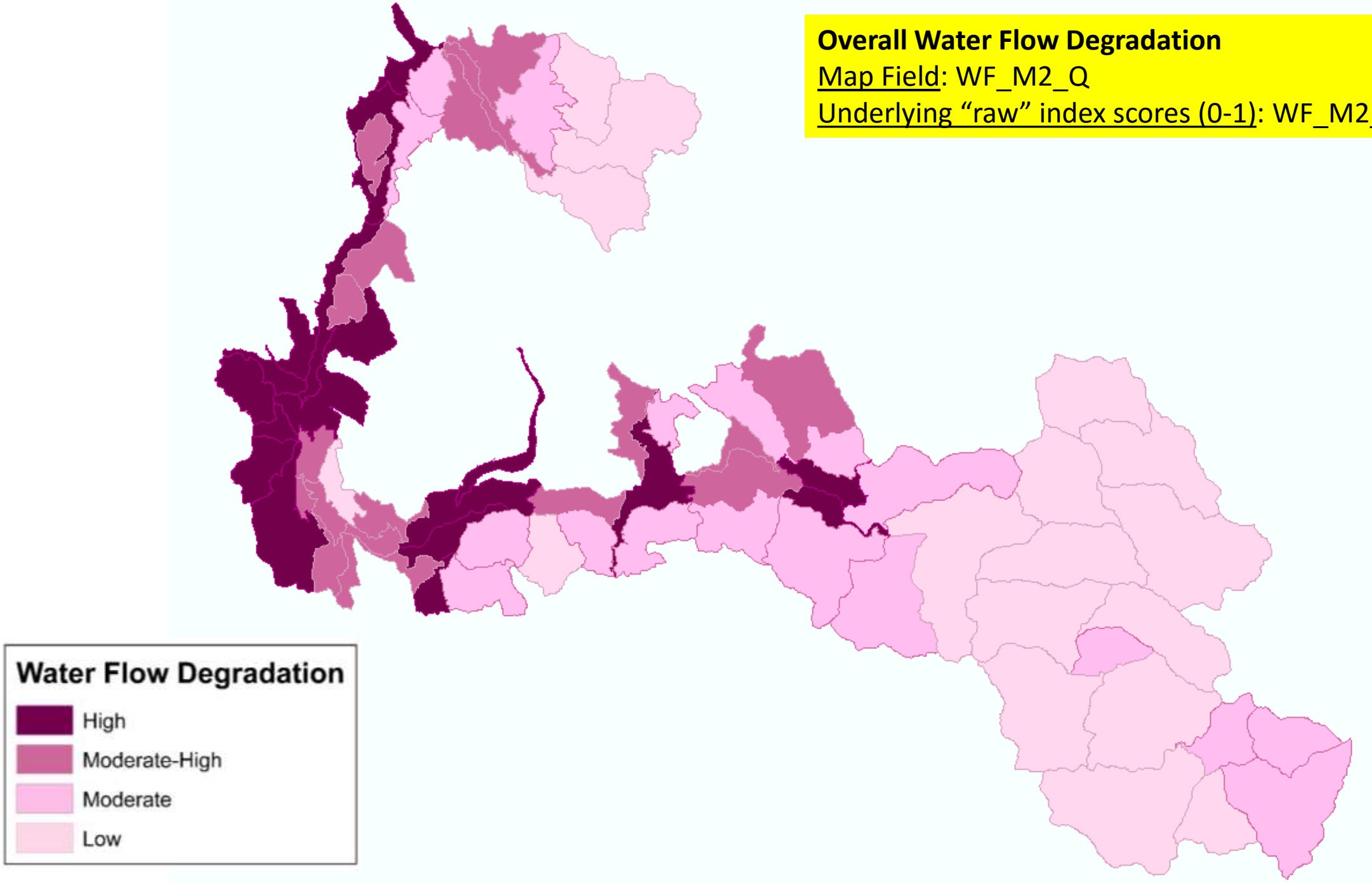
Max Score = 1 X Max Score = 1 X Max Score = 1 X Max Score = 1 = Max 16

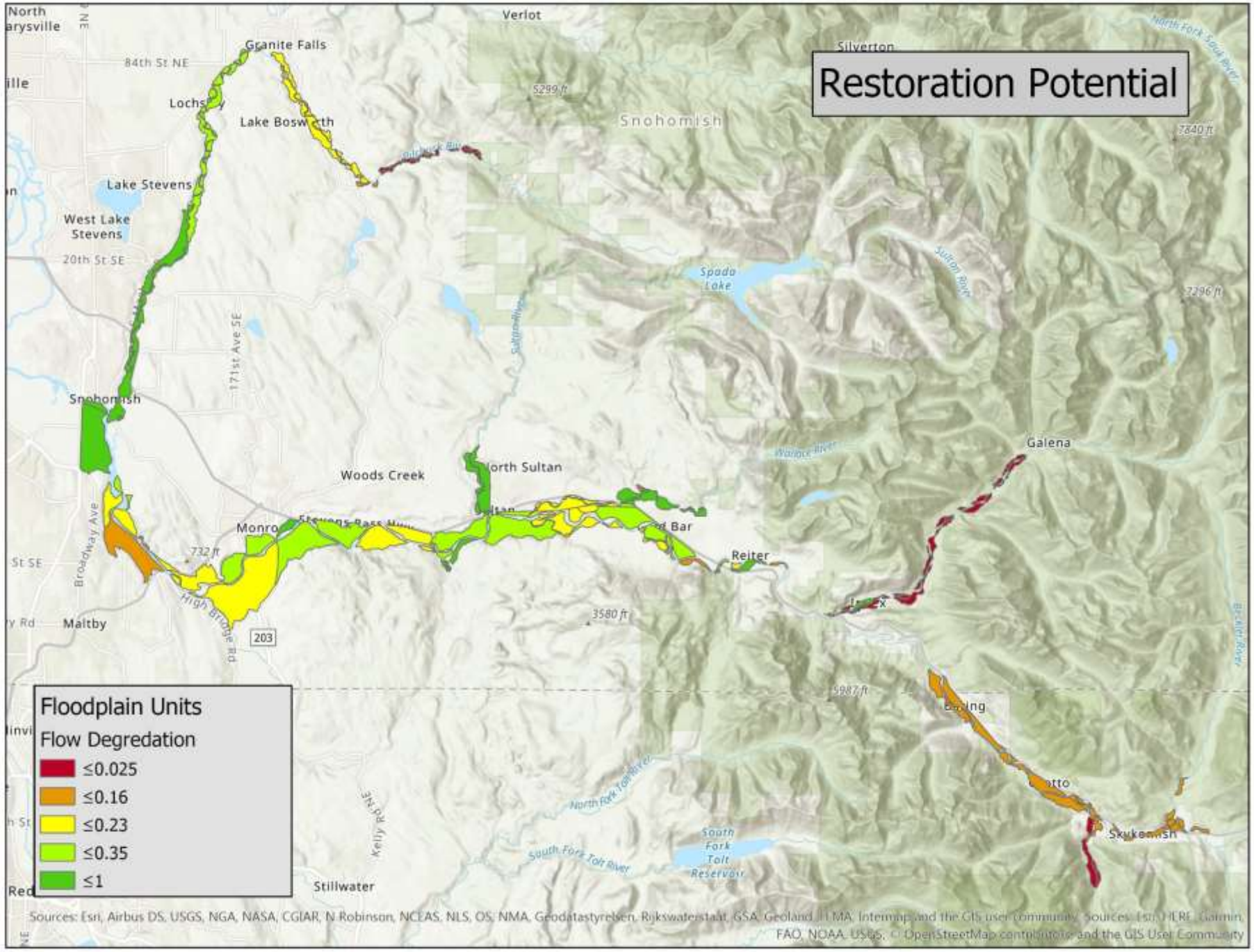
Model 2

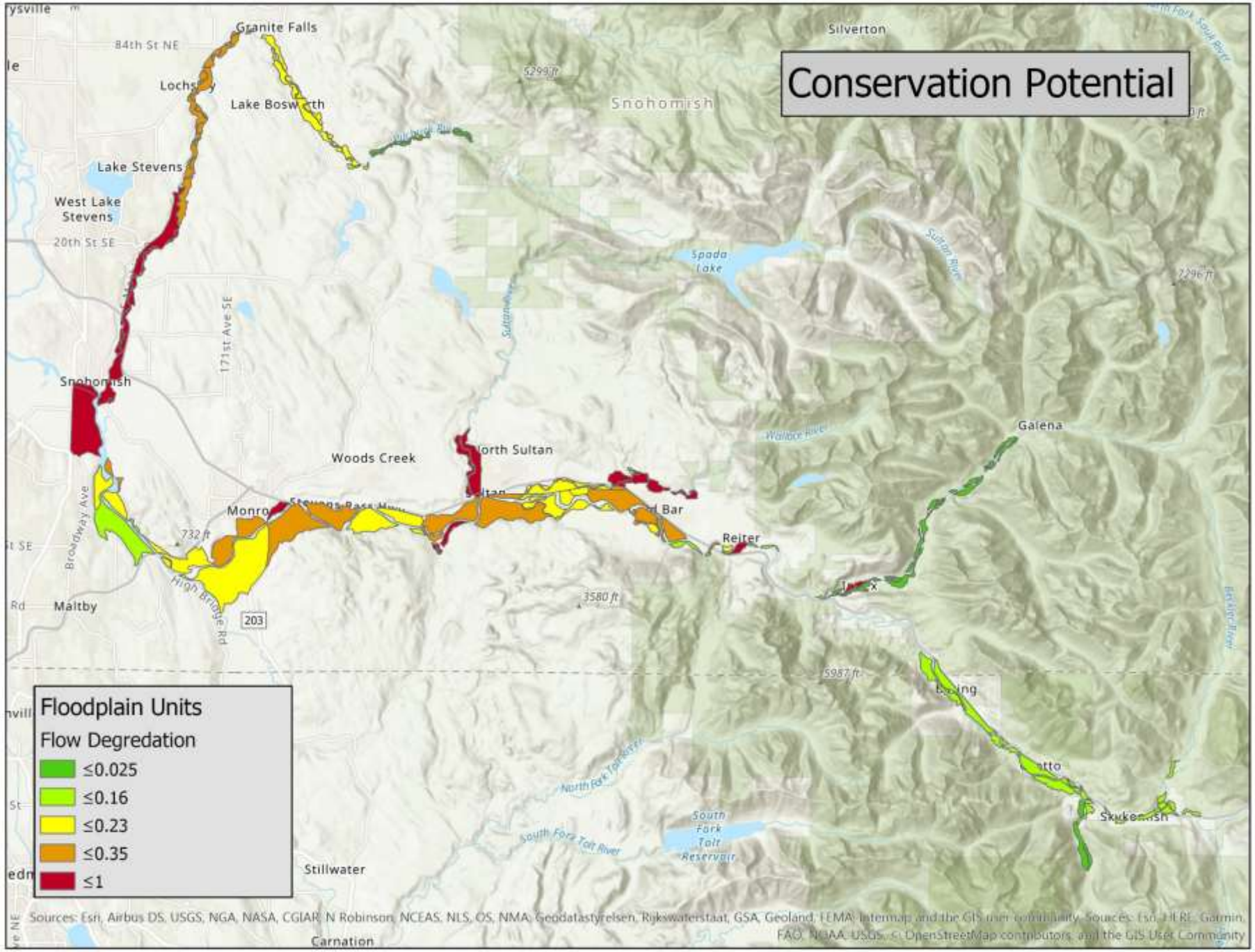
Overall Water Flow Degradation

Map Field: WF_M2_Q

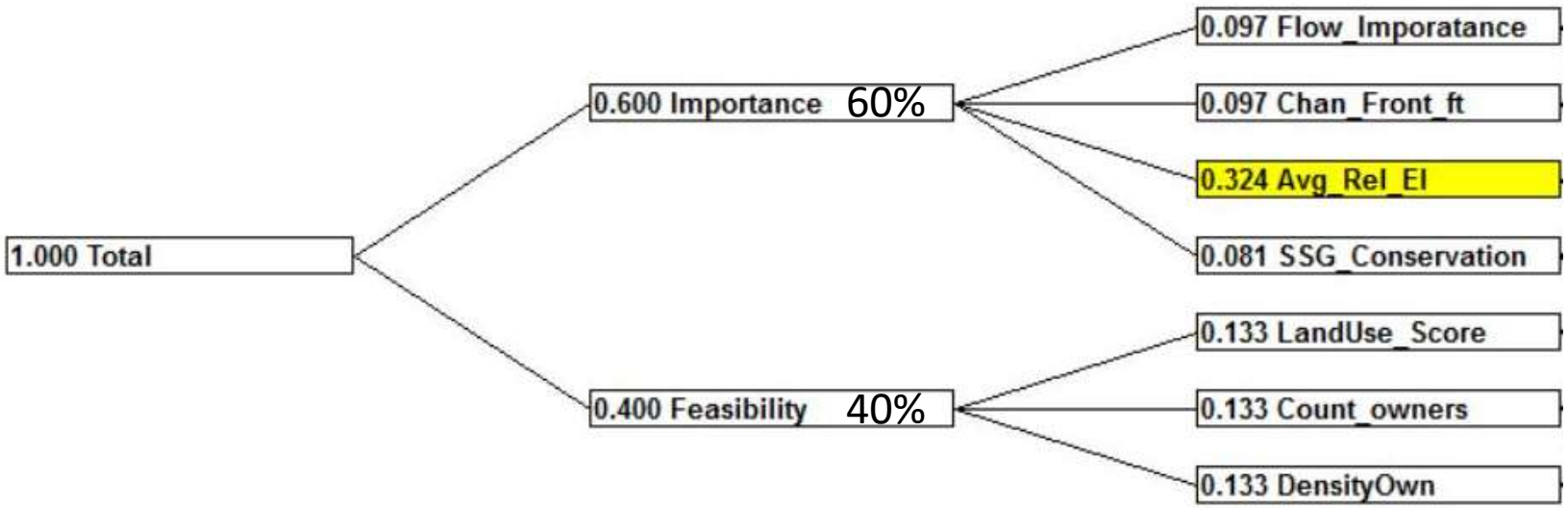
Underlying "raw" index scores (0-1): WF_M2_Cal




Restoration Potential
Floodplain Units
Flow Degredation
≤0.025
≤0.16
≤0.23
≤0.35
≤1
Granite Falls
Lake Stevens
West Lake Stevens
Snohomish
Woods Creek
Monroe
Maltby
Reiter
Galena
Silverton
Verlot
Stillwater
Spada Lake
South Fork Tolt Reservoir
Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap, and the GIS user community, Sources: Esri, HERE, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community

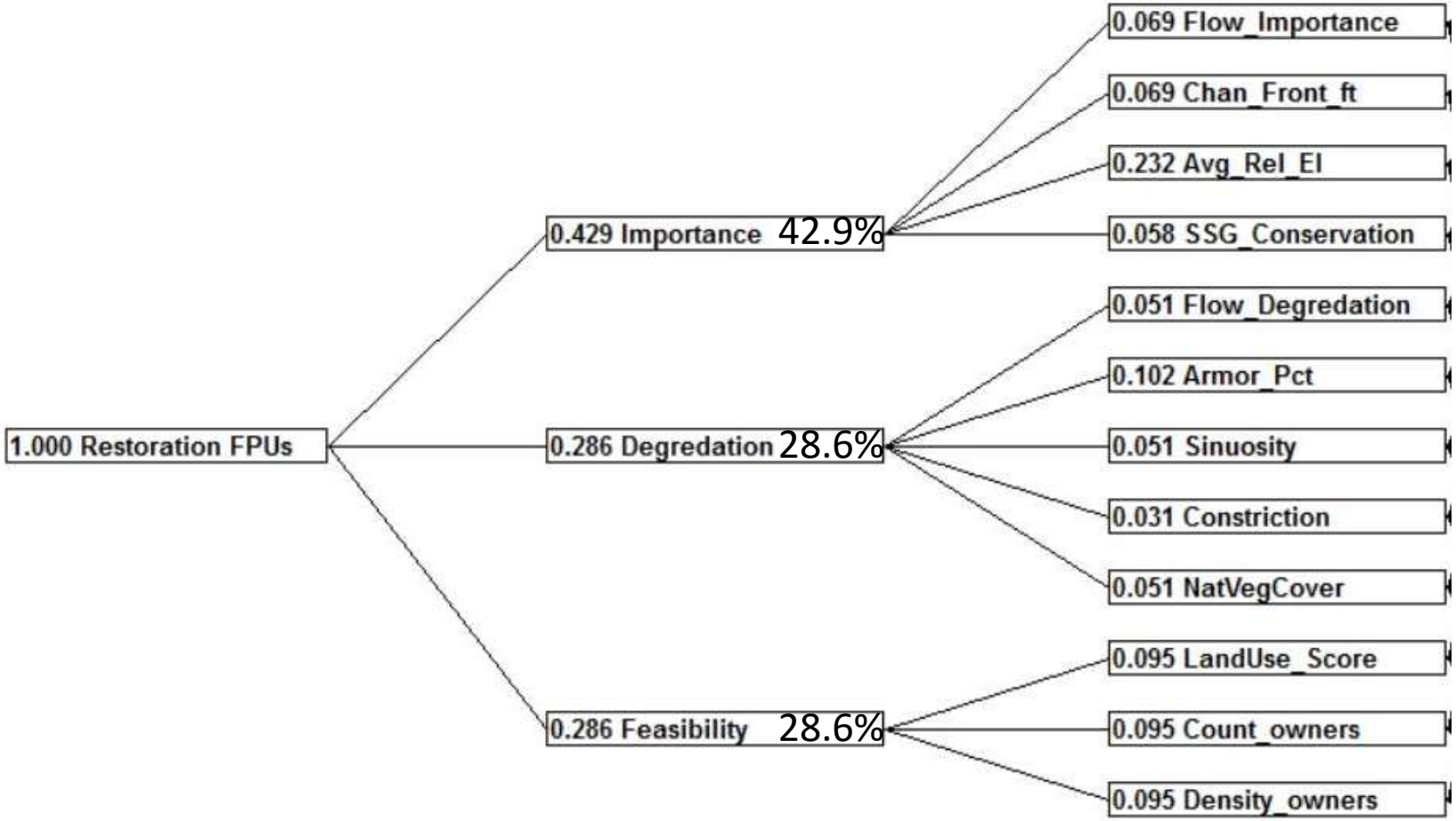

Conservation Potential
Floodplain Units
Flow Degredation
≤0.025
≤0.16
≤0.23
≤0.35
≤1
Granite Falls
84th St NE
Lake Stevens
West Lake Stevens
20th St SE
171st Ave SE
Snohomish
Woods Creek
Monroe
Maltby
Broadway Ave
High Bridge Rd
203
Stillwater
Carnation
Silverton
Snohomish
Spada Lake
Galena
Reiter
Sultan River
Wallace River
South Fork Tolt River
South Fork Tolt Reservoir
North Fork Tolt River
Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap, and the GIS user community, Sources: Esri, HERE, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community

Base FPU Score Weighting



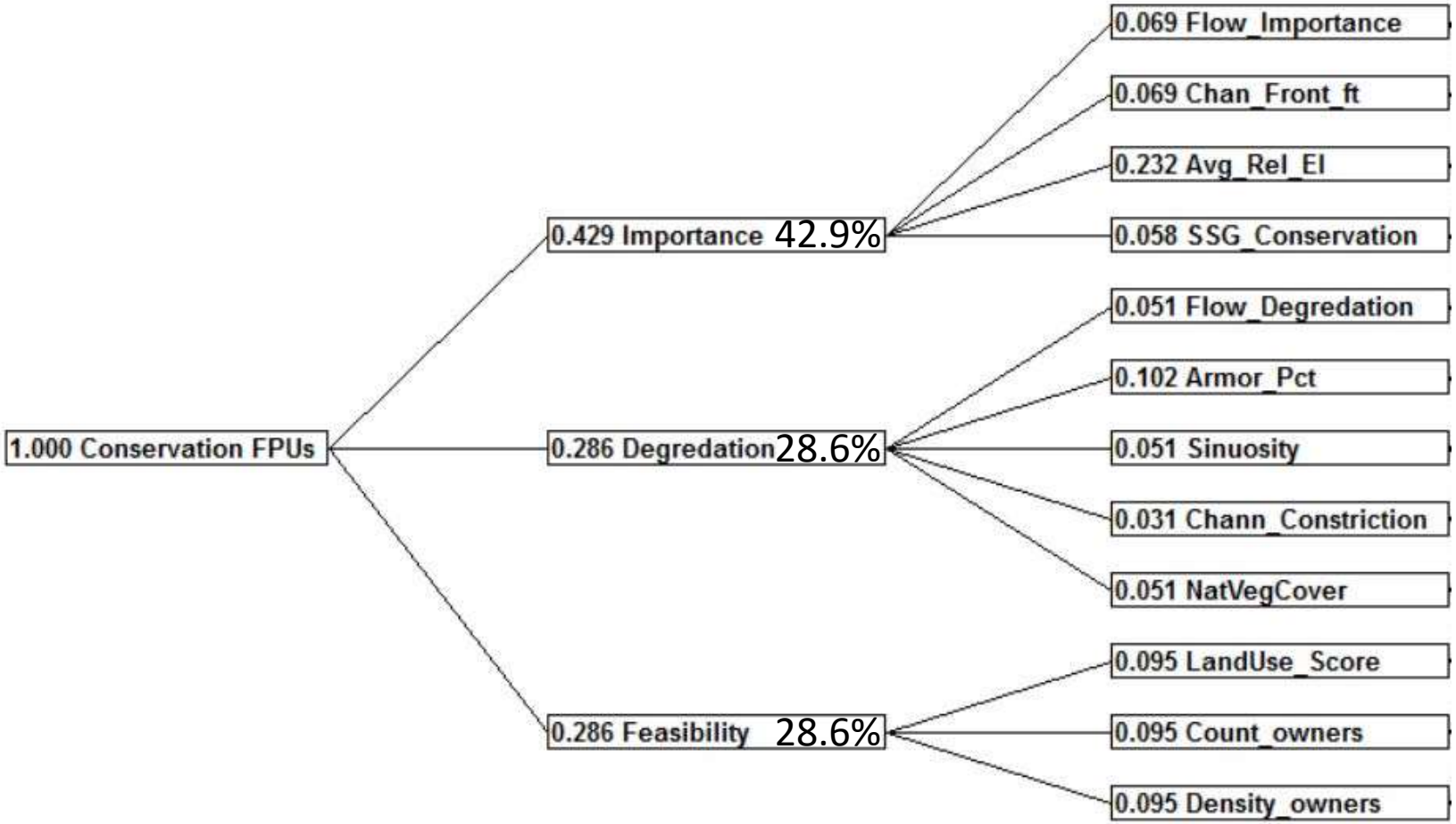
Metric	Weight
Relative Elevation	32.4%
Number Owners	13.3%
Density of Owners	13.3%
Land Use	13.3%
Flow Importance	9.7%
Channel Frontage	9.7%
Sub-Basin Strategy Group	8.1%

Restoration FPU Score



Metric	Weight
Relative Elevation	23.2%
Armoring %	10.2%
Number Owners	9.5%
Density of Owners	9.5%
Land Use	9.5%
Flow Importance	6.9%
Channel Frontage	6.9%
Sub-Basin Strategy Group	5.8%
Flow Degradation	5.1%
Natural Veg Cover	5.1%
Sinuosity	5.1%
Constriction	3.1%

Conservation FPU Score



Metric	Weight
Relative Elevation	23.2%
Armoring %	10.2%
Number Owners	9.5%
Density of Owners	9.5%
Land Use	9.5%
Flow Importance	6.9%
Channel Frontage	6.9%
Sub-Basin Strategy Group	5.8%
Flow Degradation	5.1%
Natural Veg Cover	5.1%
Sinuosity	5.1%
Constriction	3.1%