Puyallup-White River LIO Quarterly Meeting

OCTOBER 25, 2023

COORDINATORS:
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Theme: Riparian Activities

Agenda

- **Welcome and Introductions**
- **Riparian DSS Tool** – Sherrie Duncan (Sky Environmental)
- **New Riparian Programs and Future Funding** – Nick Norton (RCO)
- **Riparian Program Development** – Alison Halpern (Conservation Commission)
- **Break (5 minutes)**
- **LIO Member Updates / Round Robin**
- **Updating the ERP**
- **Brainstorm 2024 Meeting Themes**

Puyallup Watershed Riparian Decision Support System

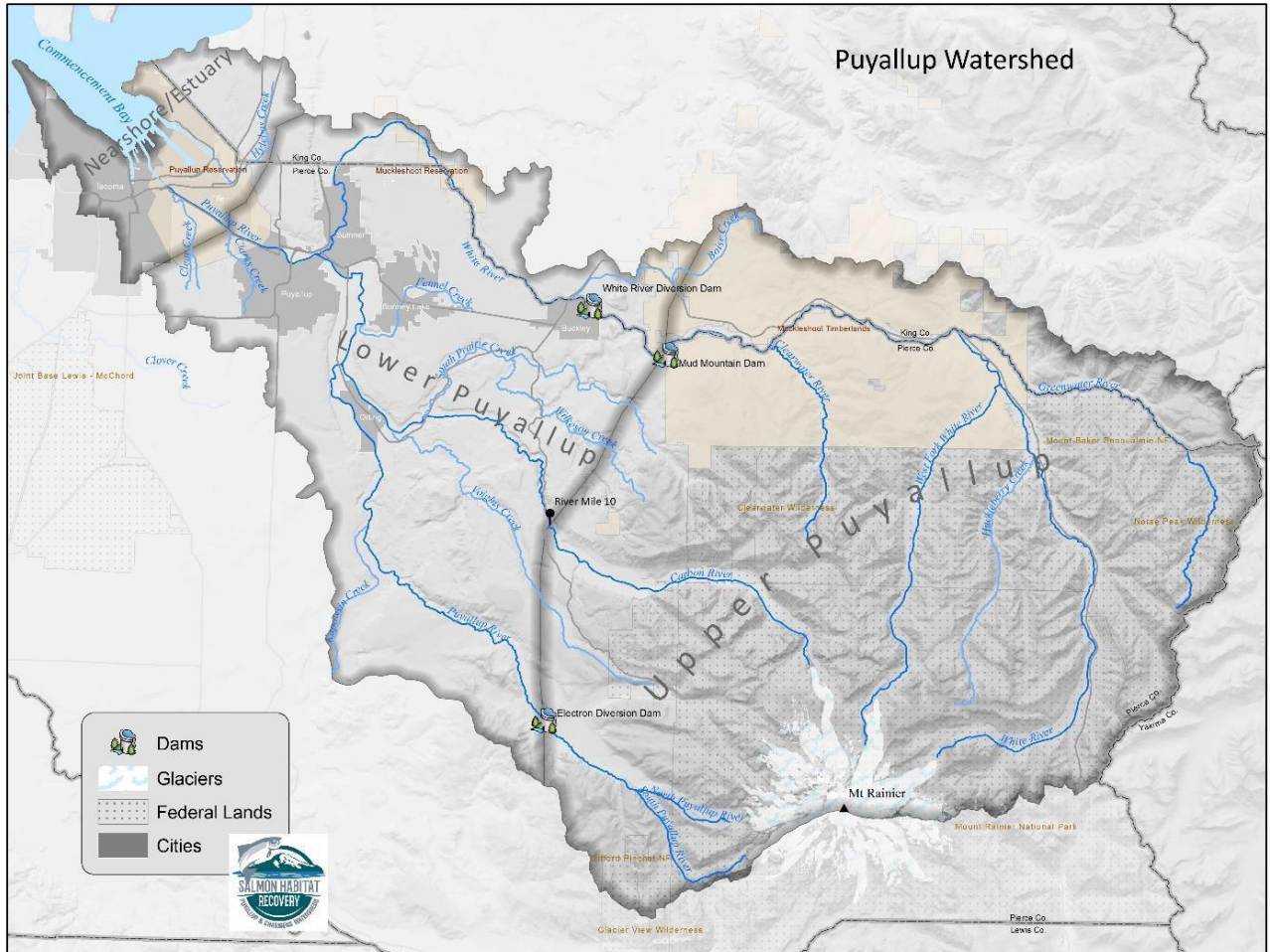
Sky Environmental LLC

Washington Conservation Science Institute LLC

October 25, 2023

Project Driver

Lack of information on riparian quality and land cover change has been identified as a major data gap in Puget Sound, including the Puyallup Watershed.



Grant Funding Acknowledgment

This Riparian Decision Support System (DSS) project is a Puget Sound Partnership Near Term Action (NTA) funded through the federal Environmental Protection Agency National Estuary Program. The project was chosen by the Habitat Strategic Initiative Advisory Team as an NTA (NTA 2018-0636) for the 2018-2022 Puget Sound Partnership Action Agenda.

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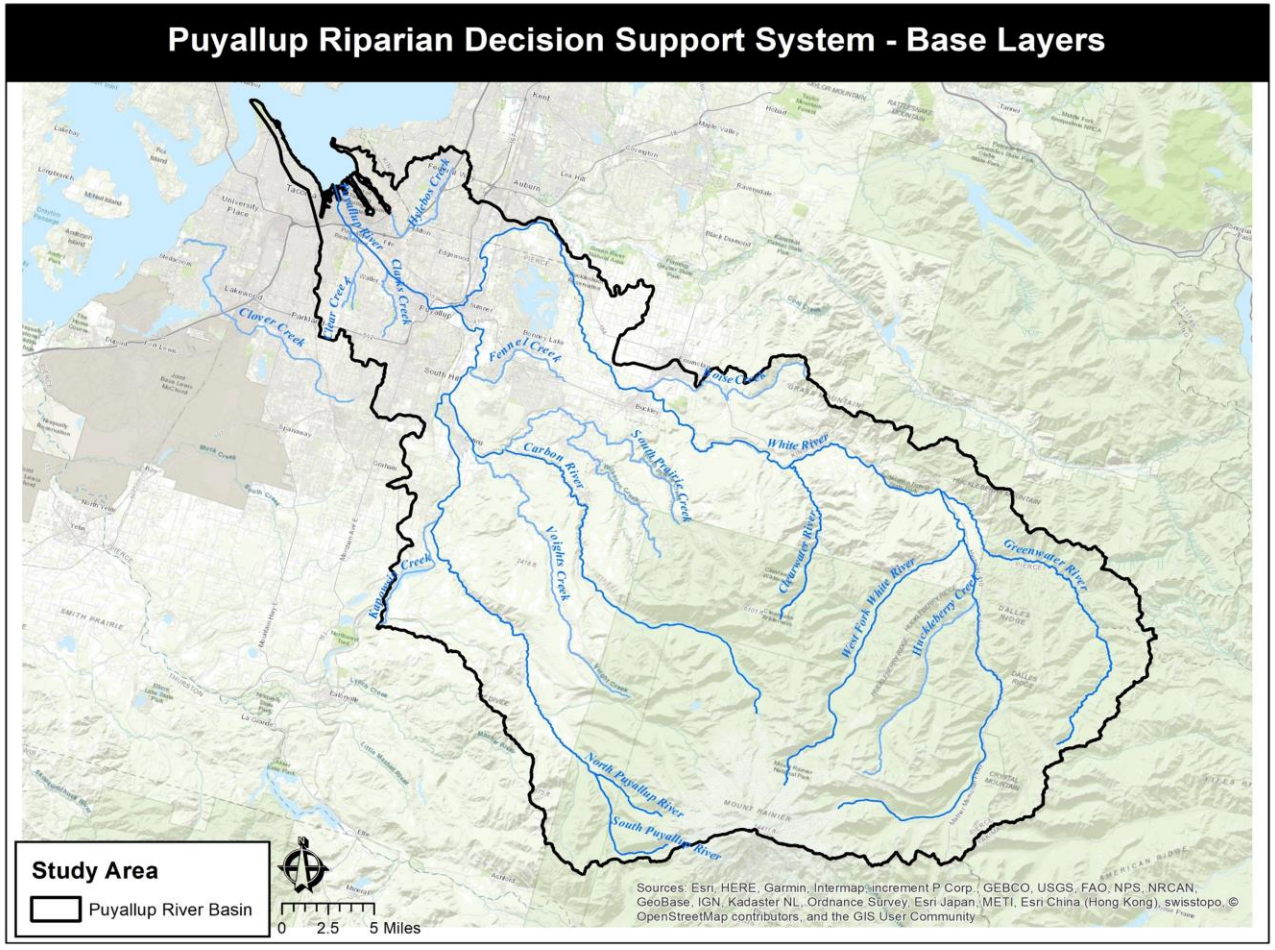
Riparian DSS Goals and Objectives

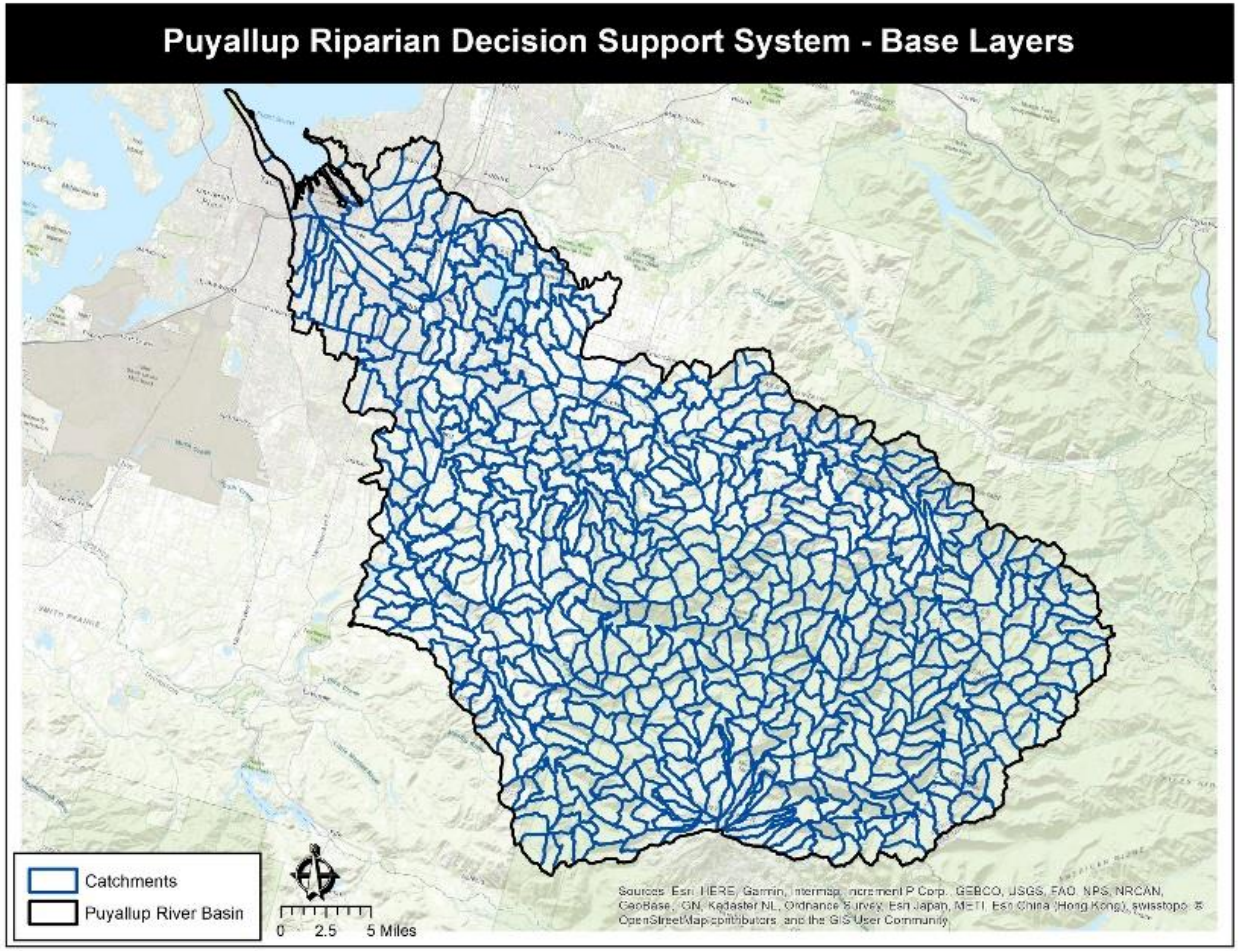
Goals

- Provide a mechanism to prioritize protection and restoration actions that is repeatable, transparent, and adaptable when new data and information becomes available.
- Provide baseline conditions of riparian corridors, floodplains, nearshore habitats and existing land cover.
- Provide a mechanism to track watershed health and land cover change over time.
- Provide a set of spatially explicit tools to help communicate the importance of actions needed to meet the 10-year implementation and 50-year habitat goals outlined in the 2018 Salmon Habitat Protection and Restoration Strategies for the Puyallup Watershed.

Objectives

- Develop an adaptive and repeatable decision support system to help resource managers/planners prioritize restoration, conservation, and monitoring of riparian habitats.
- Establish a baseline for existing riparian conditions to identify areas for protection and restoration, and to track future changes to riparian habitats
- Establish a baseline for existing floodplain conditions to identify areas for protection and restoration, and to track future changes to floodplain habitats.
- Identify “hot spots” of increased water temperature and area of cold water refugia.

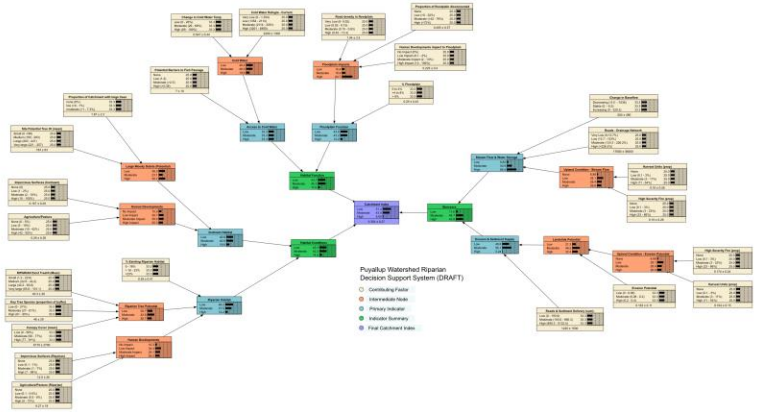




Study Area and Analysis Units

1. Puyallup Watershed
2. Catchments

Bayesian Network Model

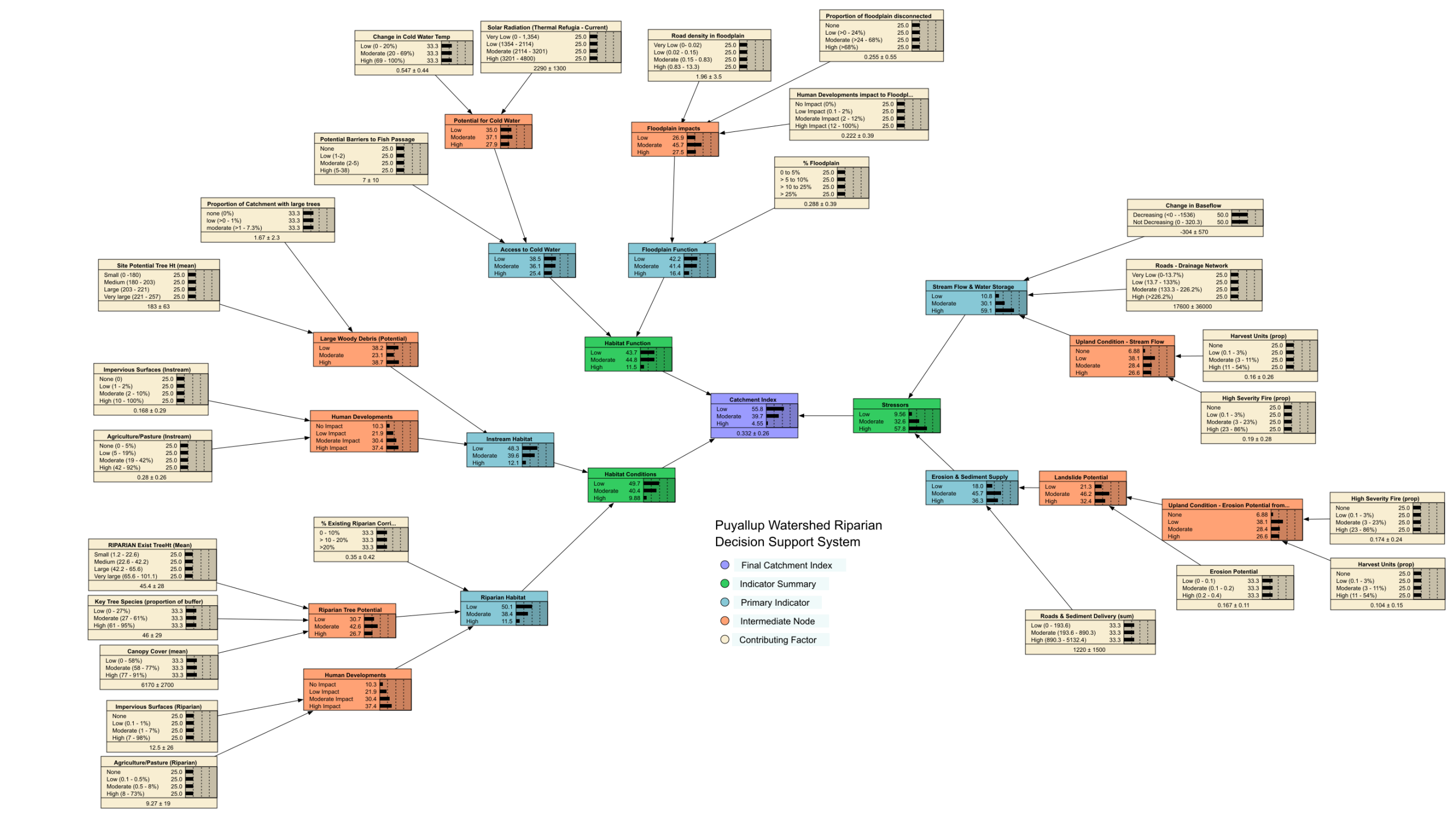


The Bayesian Network Model was selected for use in the Riparian DSS for the following reasons:

- Major influence on riparian processes and quality are displayed.
- Empirical data and expert knowledge are combined.
- The system is repeatable and can be rerun with different management actions or new assumptions.
- The outcomes (e.g., catchment conditions) are based on probabilities of how key variables interact and can be adapted as new science or understanding is developed.
- Results are spatially explicit.

Components of the Bayesian Network Model

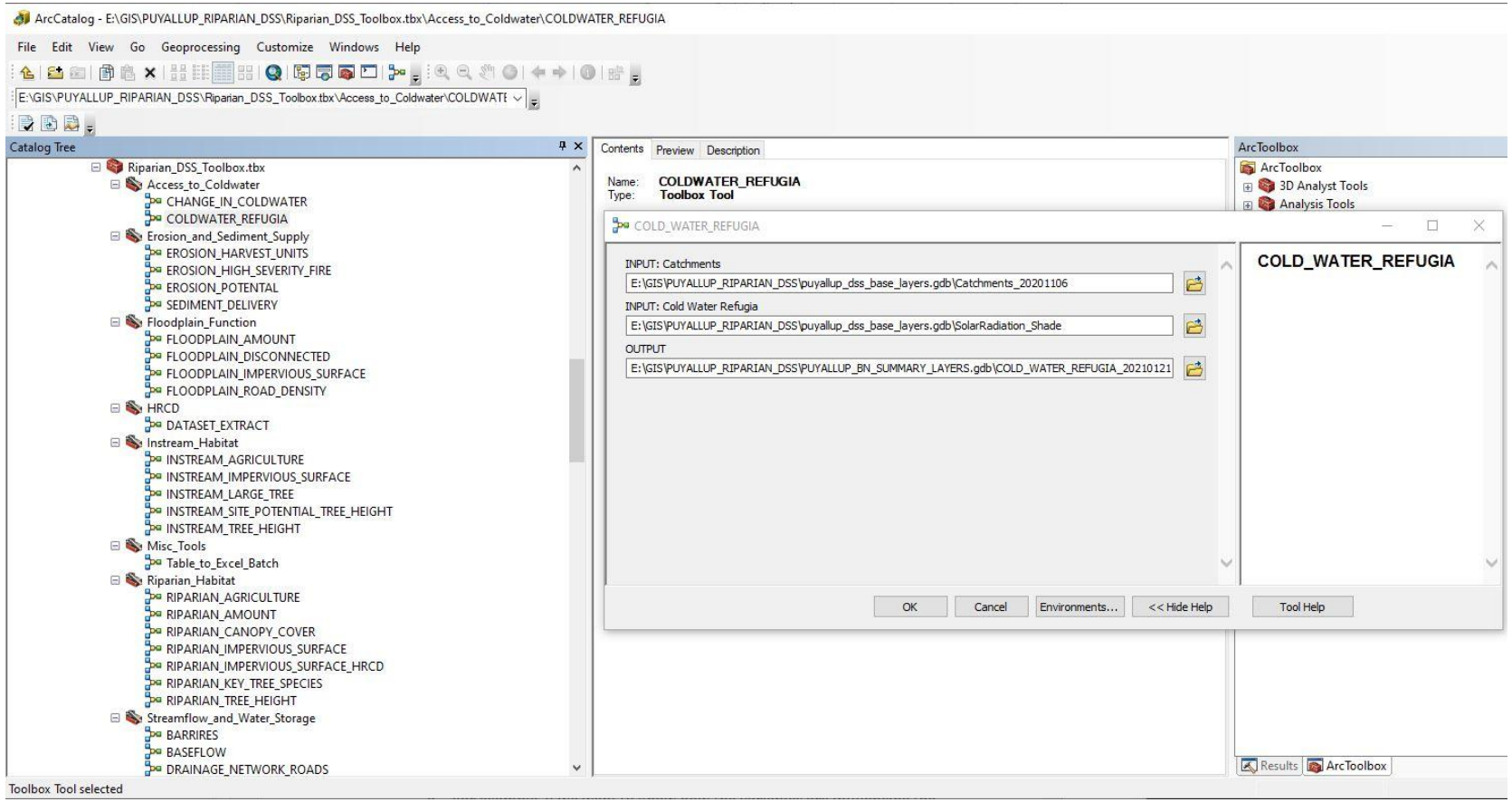
Definition of nodes used in Bayesian Network model	
Node Category	**Description**
Contributing Factor	Foundational variables known to influence the aquatic conditions in the watershed. These are the spatial data that informs the model variables. The values associated with these can be altered through management efforts.
Intermediate Node	Defines and summarizes the relationship between two or more contributing factors based on input probabilities.
Primary Indicator	Defines and summarizes the relationship between intermediate nodes based on input probabilities.
Indicator Summary	Defines and summarizes the relationship between primary indicators based on input probabilities.
Catchment Index (Riparian DSS Model)	Provides a relative index (value) of catchment condition based on the relationship of indicator variables. These values were assigned to the following categories: low; low-moderate; moderate-high; and high.
Catchment Conditions (Catchment Index + Fish Distribution)	Standalone product derived using the Catchment Index (Riparian DSS Model) and distribution of four salmonid species (chinook, coho, steelhead, and bull trout). Provides a ranking of catchment condition based on fish use and presence intended to further inform management emphases (e.g., restoration, protection).


Change in Cold Water Temp
Low (0 - 20%) 33.3
Moderate (20 - 69%) 33.3
High (69 - 100%) 33.3
0.547 ± 0.44
Solar Radiation (Thermal Refugia - Current)
Very Low (0 - 1,354) 25.0
Low (1354 - 2114) 25.0
Moderate (2114 - 3201) 25.0
High (3201 - 4800) 25.0
2290 ± 1300
Road density in floodplain
Very Low (0- 0.02) 25.0
Low (0.02 - 0.15) 25.0
Moderate (0.15 - 0.83) 25.0
High (0.83 - 13.3) 25.0
1.96 ± 3.5
Proportion of floodplain disconnected
None 25.0
Low (>0 - 24%) 25.0
Moderate (>24 - 68%) 25.0
High (>68%) 25.0
0.255 ± 0.55
Potential for Cold Water
Low 35.0
Moderate 37.1
High 27.9
Floodplain impacts
Low 26.9
Moderate 45.7
High 27.5
Human Developments impact to Floodpl...
No Impact (0%) 25.0
Low Impact (0.1 - 2%) 25.0
Moderate Impact (2 - 12%) 25.0
High Impact (12 - 100%) 25.0
0.222 ± 0.39
Potential Barriers to Fish Passage
None 25.0
Low (1-2) 25.0
Moderate (2-5) 25.0
High (5-38) 25.0
7 ± 10
% Floodplain
0 to 5% 25.0
> 5 to 10% 25.0
> 10 to 25% 25.0
> 25% 25.0
0.288 ± 0.39
Proportion of Catchment with large trees
none (0%) 33.3
low (>0 - 1%) 33.3
moderate (>1 - 7.3%) 33.3
1.67 ± 2.3
Change in Baseflow
Decreasing (<0 - -1536) 50.0
Not Decreasing (0 - 320.3) 50.0
-304 ± 570
Access to Cold Water
Low 38.5
Moderate 36.1
High 25.4
Floodplain Function
Low 42.2
Moderate 41.4
High 16.4
Site Potential Tree Ht (mean)
Small (0 -180) 25.0
Medium (180 - 203) 25.0
Large (203 - 221) 25.0
Very large (221 - 257) 25.0
183 ± 63
Roads - Drainage Network
Very Low (0-13.7%) 25.0
Low (13.7 - 133%) 25.0
Moderate (133.3 - 226.2%) 25.0
High (>226.2%) 25.0
17600 ± 36000
Stream Flow & Water Storage
Low 10.8
Moderate 30.1
High 59.1
Large Woody Debris (Potential)
Low 38.2
Moderate 23.1
High 38.7
Habitat Function
Low 43.7
Moderate 44.8
High 11.5
Upland Condition - Stream Flow
None 6.88
Low 38.1
Moderate 28.4
High 26.6
Harvest Units (prop)
None 25.0
Low (0.1 - 3%) 25.0
Moderate (3 - 11%) 25.0
High (11 - 54%) 25.0
0.16 ± 0.26
Impervious Surfaces (Instream)
None (0) 25.0
Low (1 - 2%) 25.0
Moderate (2 - 10%) 25.0
High (10 - 100%) 25.0
0.168 ± 0.29
Catchment Index
Low 55.8
Moderate 39.7
High 4.55
0.332 ± 0.26
Stressors
Low 9.56
Moderate 32.6
High 57.8
High Severity Fire (prop)
None 25.0
Low (0.1 - 3%) 25.0
Moderate (3 - 23%) 25.0
High (23 - 86%) 25.0
0.19 ± 0.28
Human Developments
No Impact 10.3
Low Impact 21.9
Moderate Impact 30.4
High Impact 37.4
Agriculture/Pasture (Instream)
None (0 - 5%) 25.0
Low (5 - 19%) 25.0
Moderate (19 - 42%) 25.0
High (42 - 92%) 25.0
0.28 ± 0.26
Instream Habitat
Low 48.3
Moderate 39.6
High 12.1
Habitat Conditions
Low 49.7
Moderate 40.4
High 9.88
Erosion & Sediment Supply
Low 18.0
Moderate 45.7
High 36.3
Landslide Potential
Low 21.3
Moderate 46.2
High 32.4
Upland Condition - Erosion Potential from...
None 6.88
Low 38.1
Moderate 28.4
High 26.6
High Severity Fire (prop)
None 25.0
Low (0.1 - 3%) 25.0
Moderate (3 - 23%) 25.0
High (23 - 86%) 25.0
0.174 ± 0.24
% Existing Riparian Corri...
0 - 10% 33.3
> 10 - 20% 33.3
>20% 33.3
0.35 ± 0.42
RIPARIAN Exist TreeHt (Mean)
Small (1.2 - 22.6) 25.0
Medium (22.6 - 42.2) 25.0
Large (42.2 - 65.6) 25.0
Very large (65.6 - 101.1) 25.0
45.4 ± 28
Riparian Habitat
Low 50.1
Moderate 38.4
High 11.5
Erosion Potential
Low (0 - 0.1) 33.3
Moderate (0.1 - 0.2) 33.3
High (0.2 - 0.4) 33.3
0.167 ± 0.11
Harvest Units (prop)
None 25.0
Low (0.1 - 3%) 25.0
Moderate (3 - 11%) 25.0
High (11 - 54%) 25.0
0.104 ± 0.15
Key Tree Species (proportion of buffer)
Low (0 - 27%) 33.3
Moderate (27 - 61%) 33.3
High (61 - 95%) 33.3
46 ± 29
Riparian Tree Potential
Low 30.7
Moderate 42.6
High 26.7
Roads & Sediment Delivery (sum)
Low (0 - 193.6) 33.3
Moderate (193.6 - 890.3) 33.3
High (890.3 - 5132.4) 33.3
1220 ± 1500
Canopy Cover (mean)
Low (0 - 58%) 33.3
Moderate (58 - 77%) 33.3
High (77 - 91%) 33.3
6170 ± 2700
Human Developments
No Impact 10.3
Low Impact 21.9
Moderate Impact 30.4
High Impact 37.4
Impervious Surfaces (Riparian)
None 25.0
Low (0.1 - 1%) 25.0
Moderate (1 - 7%) 25.0
High (7 - 98%) 25.0
12.5 ± 26
Agriculture/Pasture (Riparian)
None 25.0
Low (0.1 - 0.5%) 25.0
Moderate (0.5 - 8%) 25.0
High (8 - 73%) 25.0
9.27 ± 19
Puyallup Watershed Riparian Decision Support System
Final Catchment Index
Indicator Summary
Primary Indicator
Intermediate Node
Contributing Factor

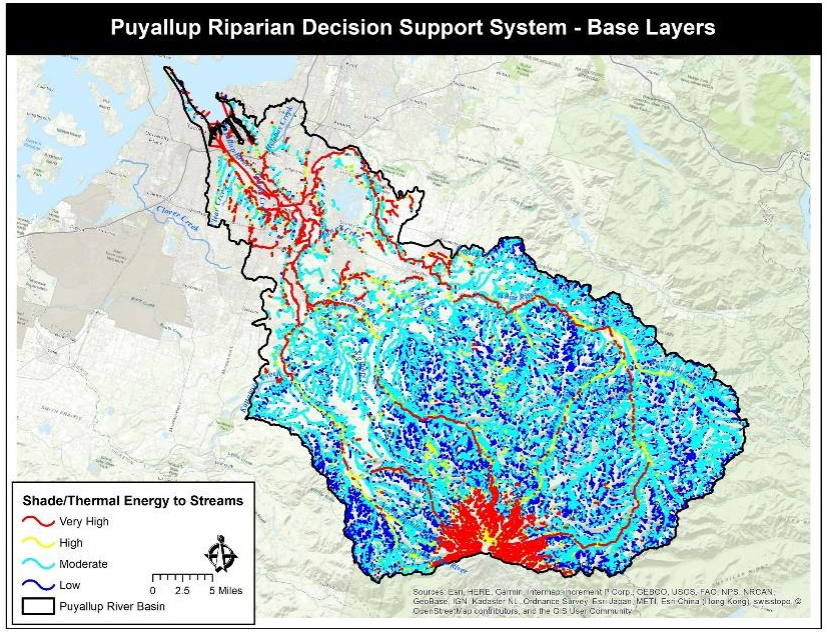
Data Sources for Puyallup Watershed Riparian DSS

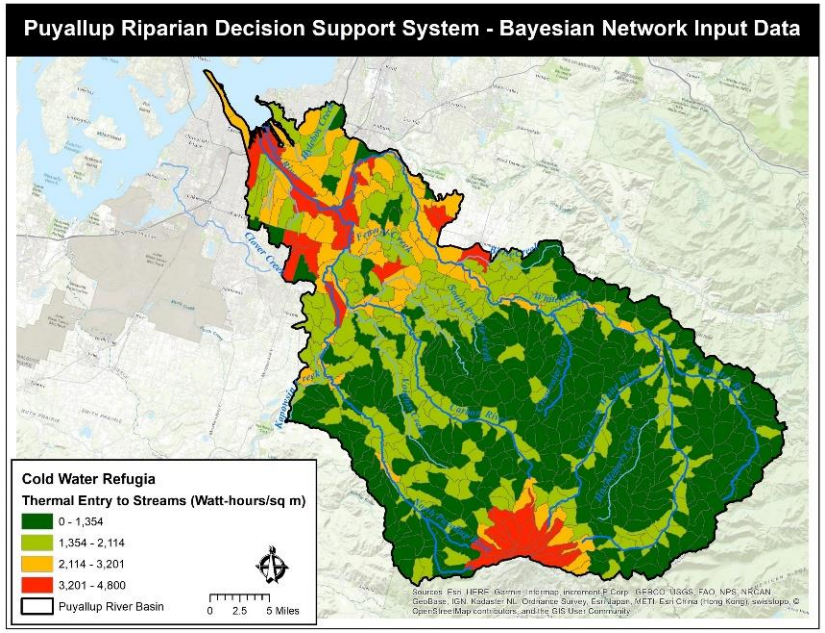
Category	Description	Layer Name	Data Type	Source	Date (Year)
Boundary	Catchments (~HUC16)	Catchments_20201106	Polygon	WCSI, Pierce County, USFS	2020
Boundary	Study Area/Subbasin	Puyallup_HUC8	Polygon	USGS/NHD	???
Fire	High Severity Fires from 2006 to 2020	High_severity_fire_2006_2020	Raster	MTBS	2020
Fish	Fish / Salmonid Distribution	Puyallup_SWIFD	Polyline	WDFW	2021
Fish	Potential Barriers to Fish Passage (<68% passable)	WDFWFishPassageSite67	Point	WDFW	2021
Forestry	Harvest Units (Clearcuts) from 2006 to 2017	HRCD_2006_2017_Forestry_Puyallup	Polygon	WDFW/HRCD	2021
Hydrology	Change in Baseflow	NPLCC_Stream_Flow	Polyline	NPLCC	2010
Hydrology / LiDAR	Stream Delivered Erosion Potential	GEPdel_puyl2	Raster	NetMap	2012, 2020
Hydrology	Floodplains Disconnected	Floodplain_Disconnected_20210317	Polygon	FFtF, WCSI	2021
Hydrology / LiDAR	Floodplains	Floodplains_20210305	Polygon	NetMap, FFtF	2012, 2021
Hydrology	Riparian Corridor (Floodplain with 200 ft Buffer)	Riparian_Corridor_20210305	Polygon	NetMap, FFtF	2021
Hydrology/LiDAR	Rivers and Streams	Reach_puyl2	Polyline	NetMap	2012, 2020
Hydrology	Stream Temperature	NorWest_PredictedStreamTemp_Puyallup	Polyline	NorWest	2016
Hydrology	Thermal Refugia	SolarRadiation_Shade	Raster	NetMap, LEMMA	2017, 2020
Infrastructure	Roads, Drainage Network	roadDrain_puly2	Polyline	NetMap, WDNR	2020
Infrastructure	Roads	Puyallup_DNR_active_roads	Polyline	WDNR	2020
Infrastructure	Road Density (mi/Sq. mi) in Floodplain	Floodplain_Road_Density	Raster	WDNR, FFtF, WCSI	2021
Infrastructure	Roads, Sediment Delivery Potential	READIoutSim_Puyl2	Polyline	NetMap, WDNR	2020
Landcover	Agriculture, Pasture	NLCD_Agriculture	Raster	NLCD	2016
Landcover	Impervious Surfaces	NLCD_Impervious_Surface	Raster	NLCD	2016
Vegetation	Tree Canopy Closure	Puyallup_cancov_2017	Raster	LEMMA	2017
Vegetation/LiDAR	Highest Hit, Tree Overstory Height	Tree_Height	Raster	WDNR, MRNP	2012
Vegetation	Key Tree Species, Dominate Forest Type	Fortybpa_dom	Raster	LEMMA	2017
Vegetation	Site Potential Tree Height, Plant Association Group	Wapag081912_new	Raster	Fox, USFS	2021

Riparian DSS Toolbox

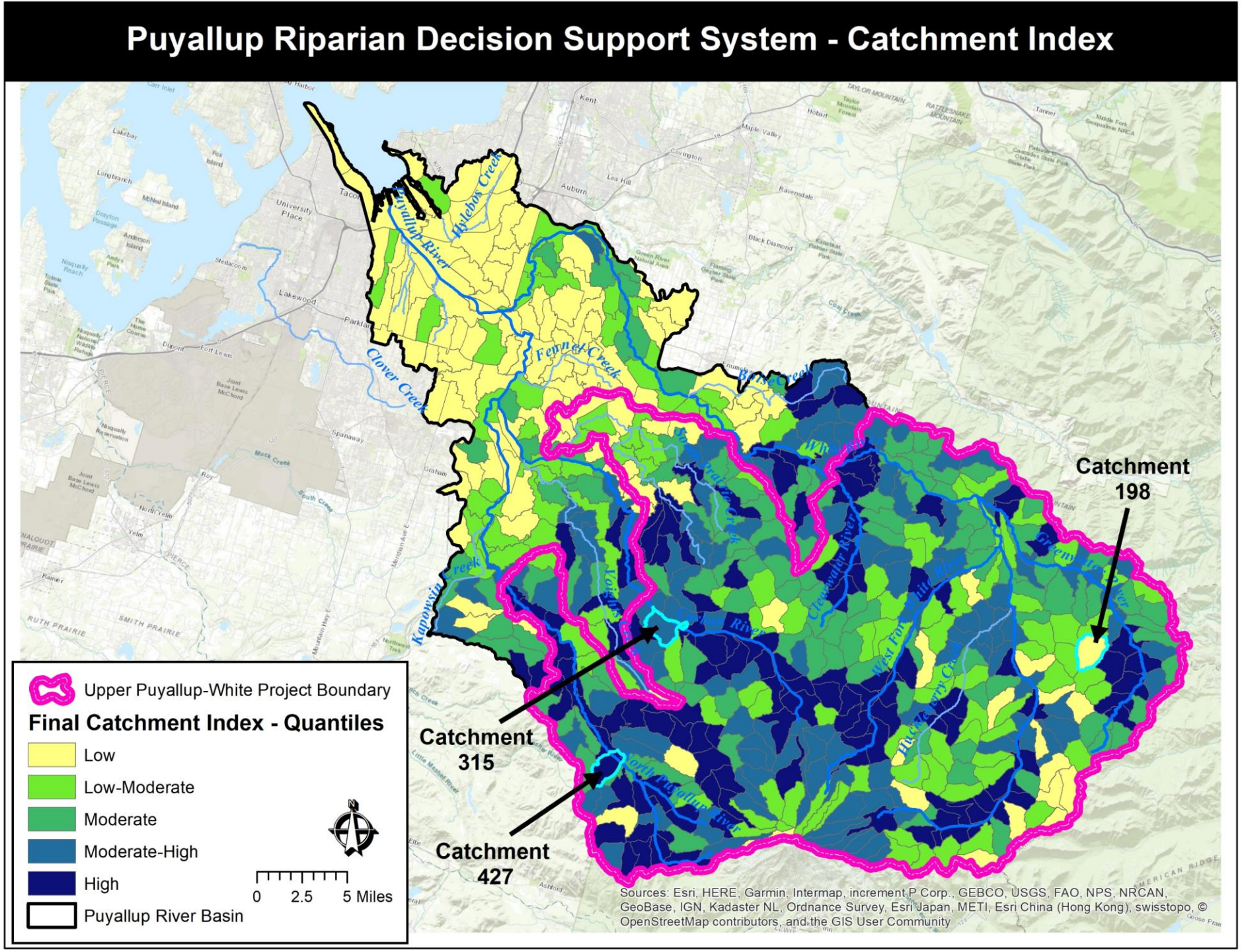


Example Contributing Factor Solar Radiation (Thermal Refugia)





Riparian DSS Outcome Catchment Index



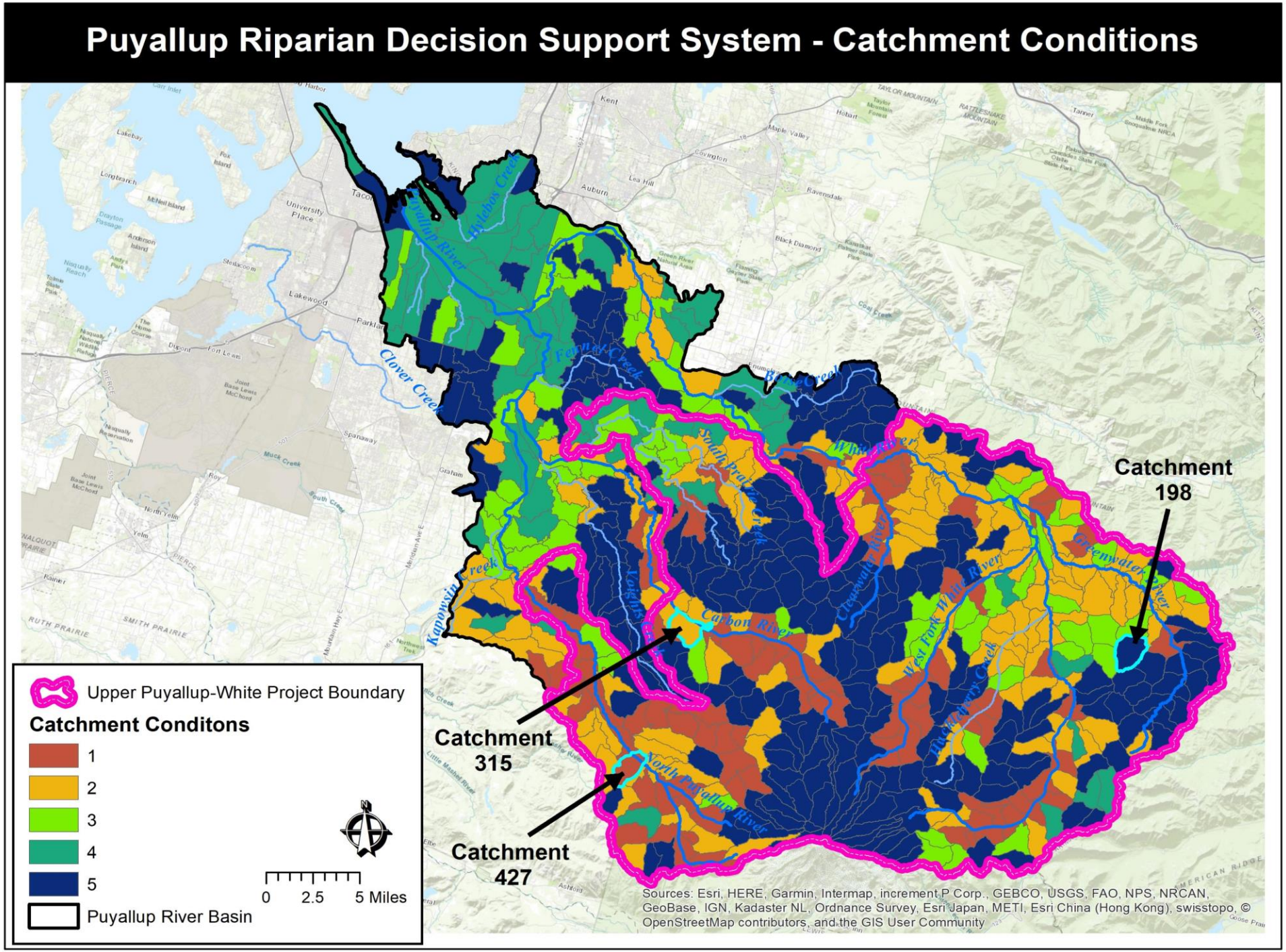
Catchment Conditions

Definition of catchment conditions and primary management emphasis.		
Catchment Condition	Description	Management Emphasis
Catchment Condition 1	Catchments are considered to be in High condition; habitat/potential habitat for 1-4 selected fish species*.	Primary emphasis is to protect existing conditions; restoration as needed.
Catchment Condition 2	Catchments are in Moderate-High condition; habitat/potential habitat for 1-4 selected fish species.	Primary emphasis is to restore to a High condition; these catchments would likely take fewer resources to get to a high condition.
Catchment Condition 3	Catchments are in a Moderate-Low condition; habitat/potential habitat for 1-4 selected fish species.	Primary emphasis it to restore; Likely take considerable resources to get to a Moderate-High to High condition due to Moderate-Low existing condition.
Catchment Condition 4	Catchments are in a Low condition; habitat/potential habitat for 1-4 selected fish species.	Primary emphasis it to restore; Likely take considerable resources to get to a Moderate-High to High condition due to Low existing condition.
Catchment Condition 5	Catchment conditions vary from Low to High; No habitat/potential habitat for selected fish species.	Emphasis may vary from restore to protect; focused on upland conditions that contributes to stream and riparian condition.

*Chinook, Coho, Steelhead, and Bull Trout

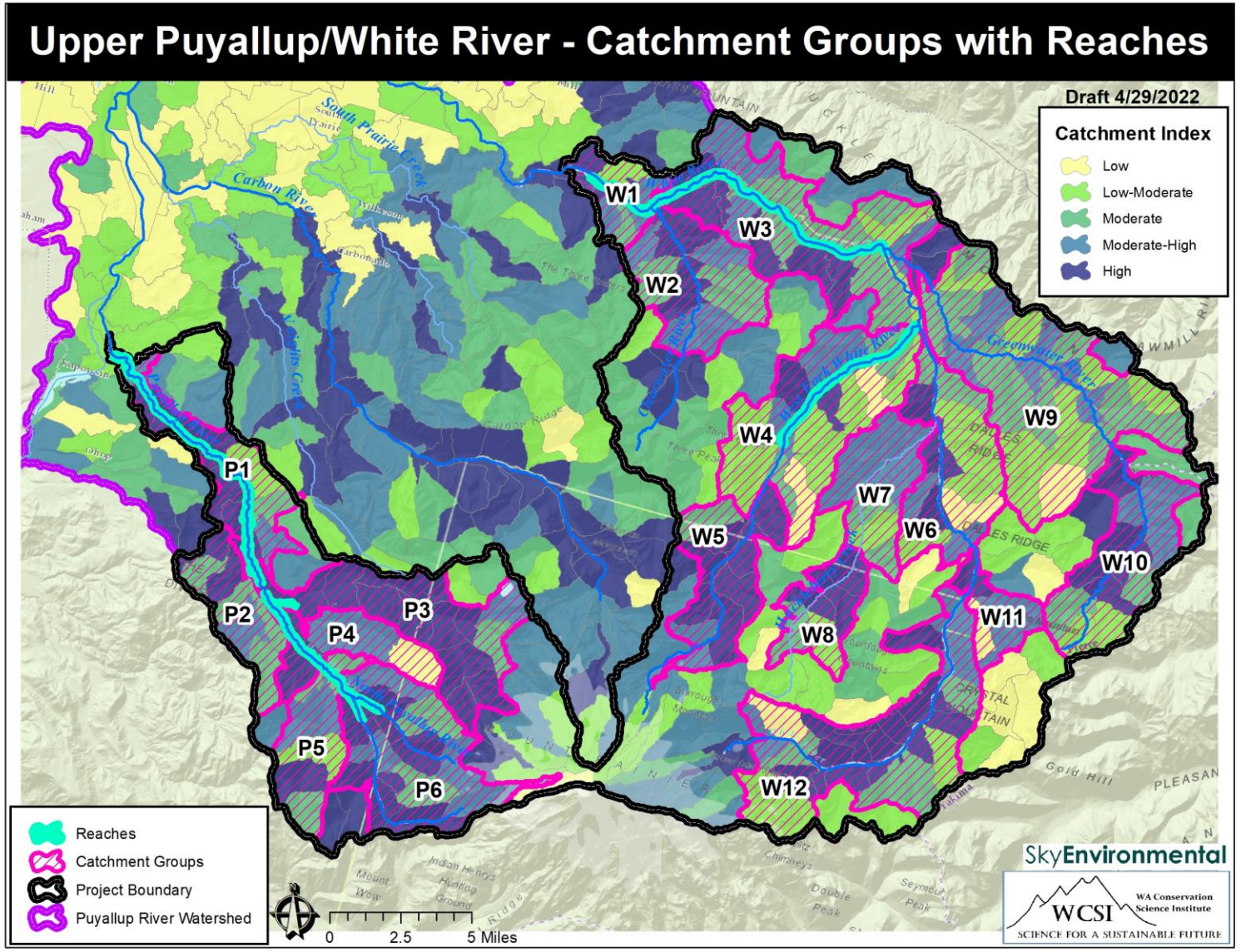
Catchment 198
Condition 5

Emphasis may vary from restore to protect; focused on upland conditions that contributes to stream and riparian condition.

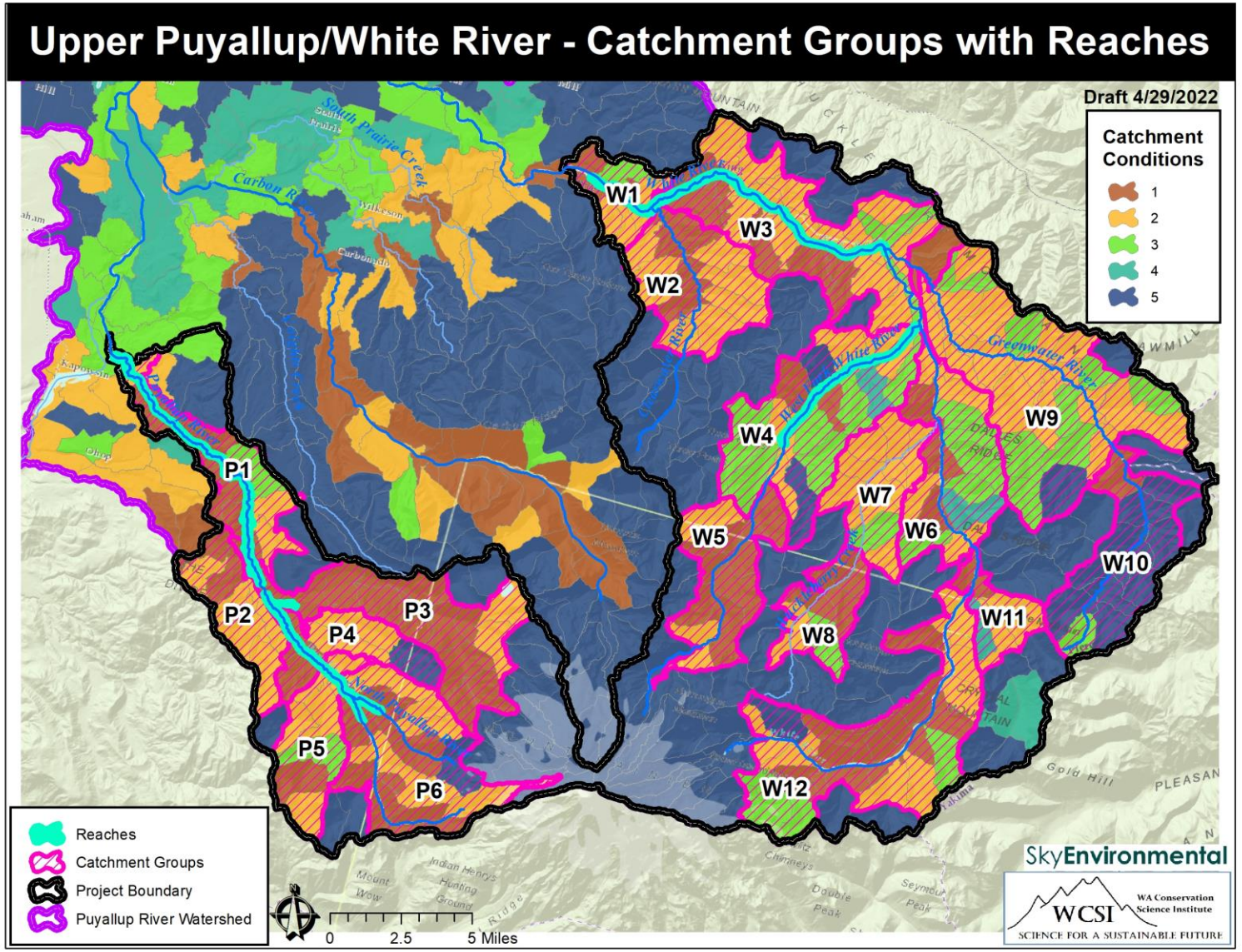


Riparian DSS Outcome

Catchment Index



Catchment Conditions

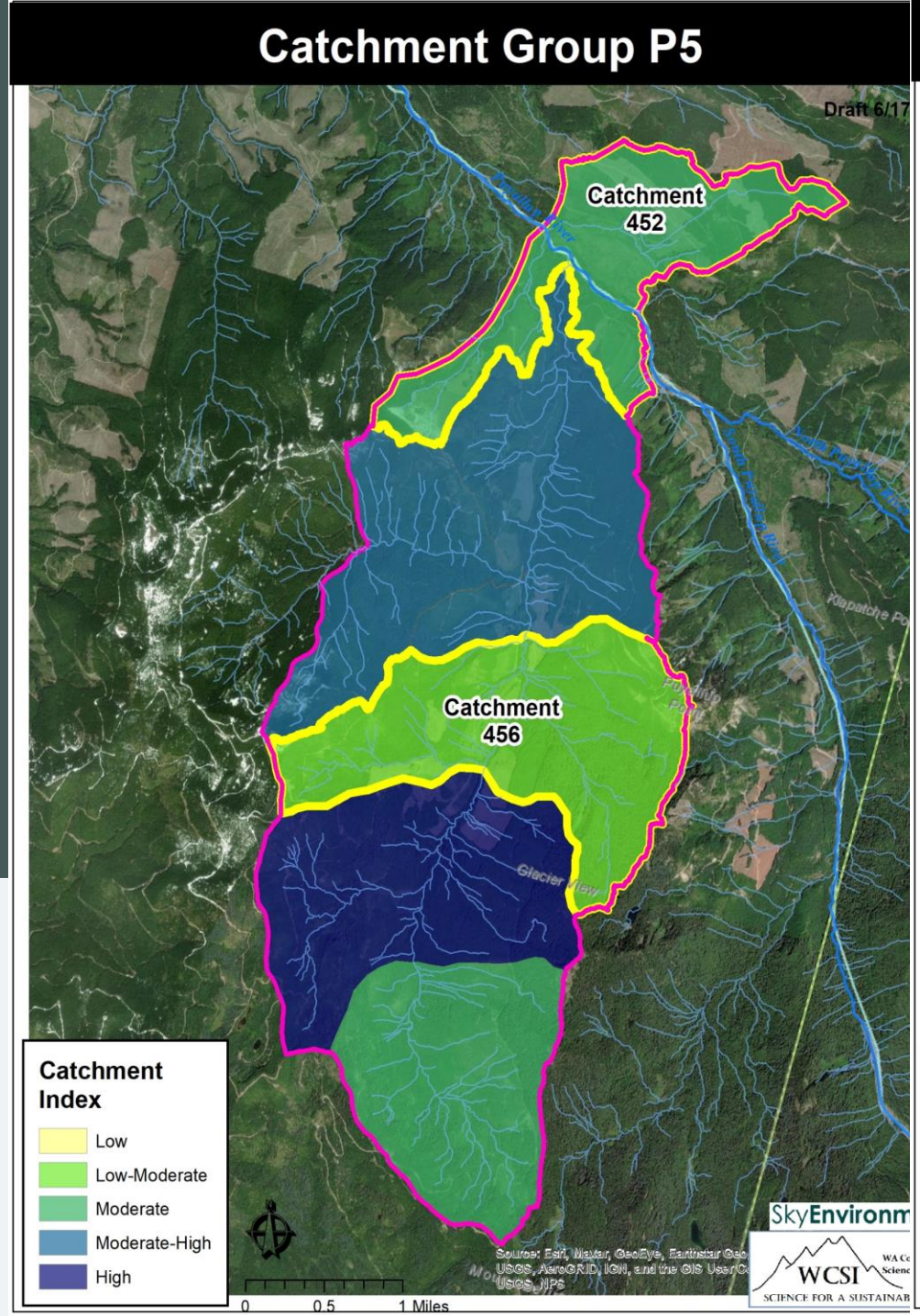


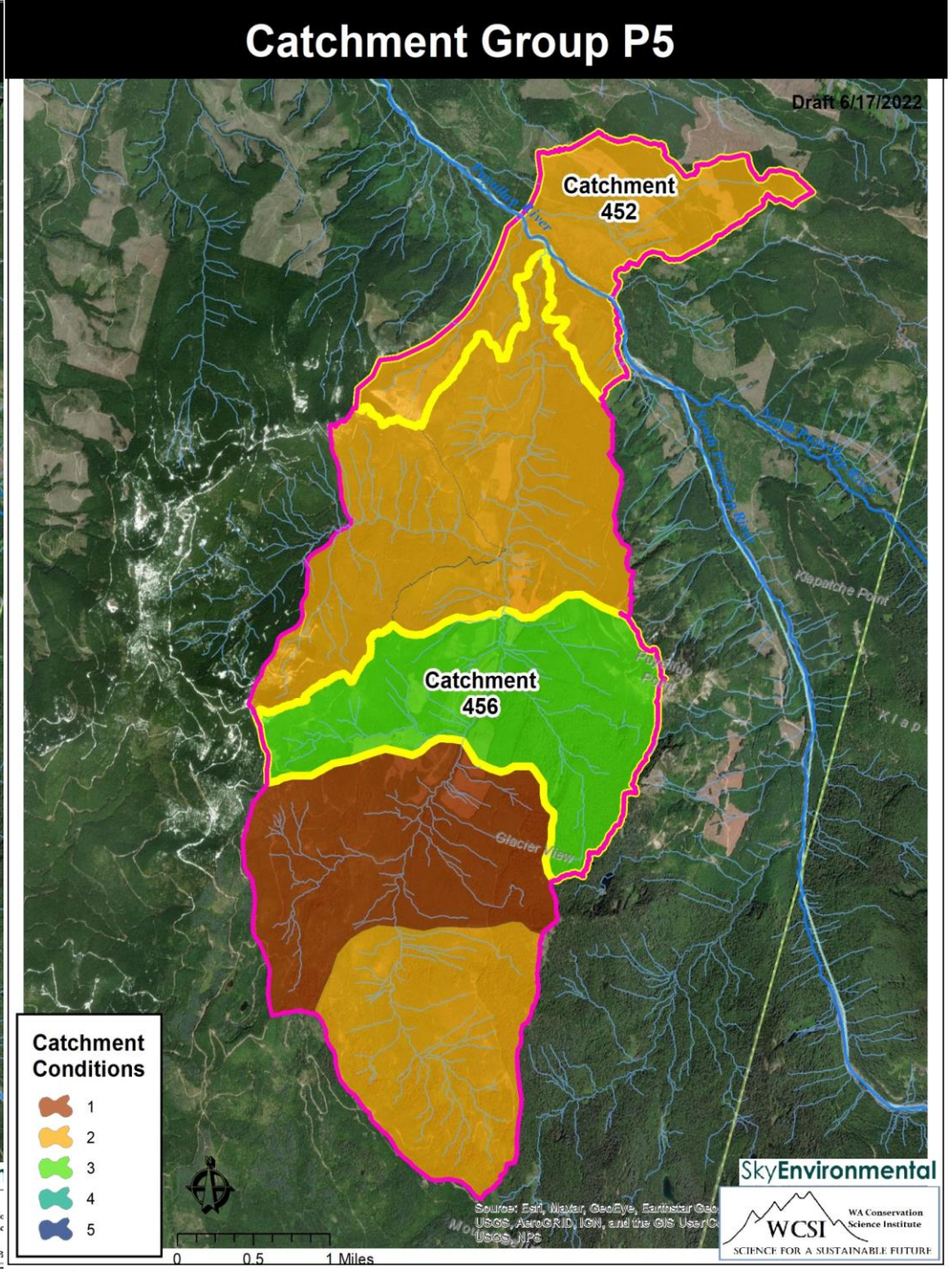
*Chinook, Coho, Steelhead, and Bull Trout

Group P5

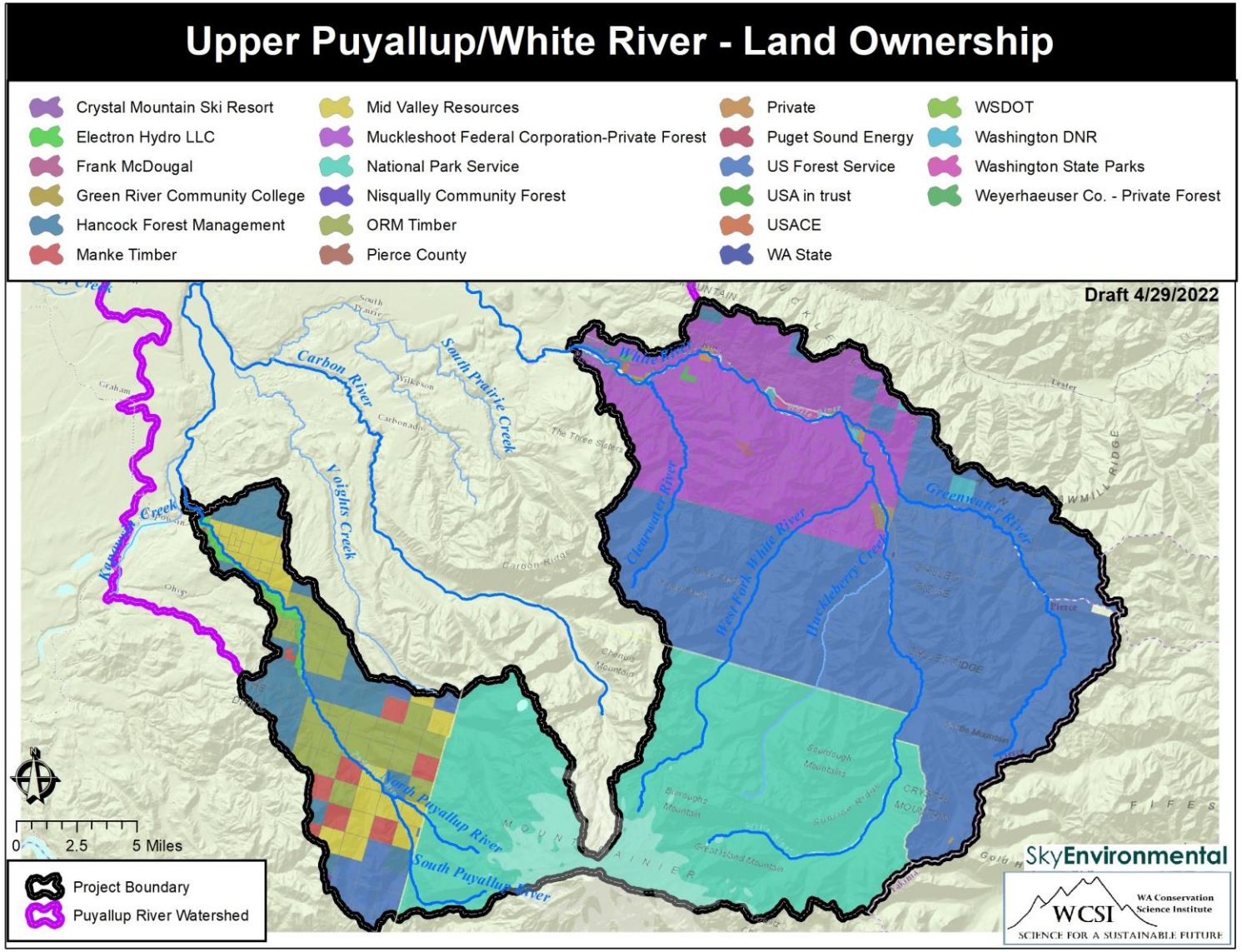
Catchment 452

Catchment Index and Conditions





Catchment Ownership

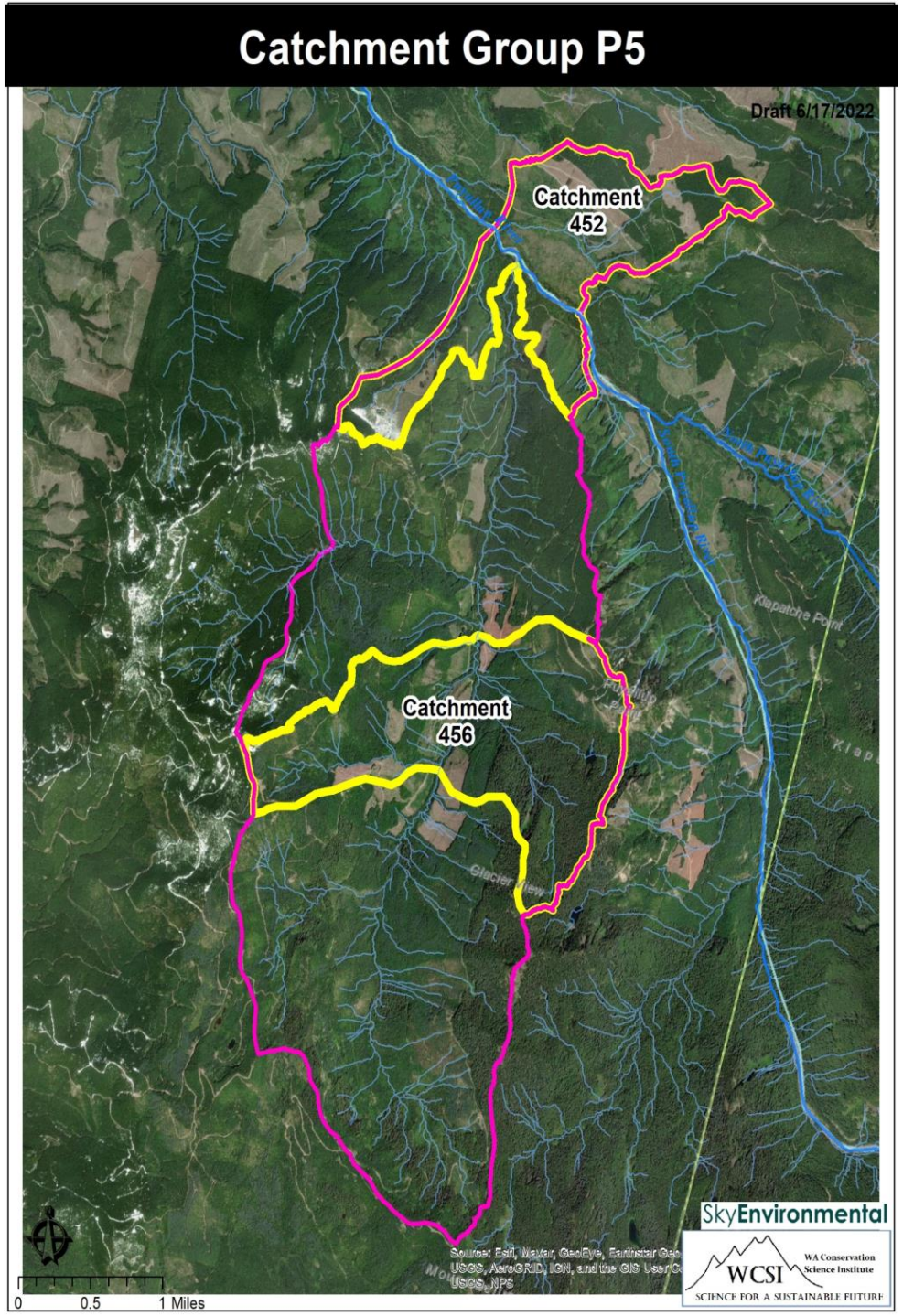


*Chinook, Coho, Steelhead, and Bull Trout

Group P5

Catchment 452

Summary



Ownership

Mid Valley Resources, Hancock Forest Management, ORM Timber (new owner TTG)

Streams

Puyallup River and unnamed tributaries

Fish species

Fall Chinook, coho, winter steelhead

Sensitivity Analysis

Select *Sensitivity to Findings*

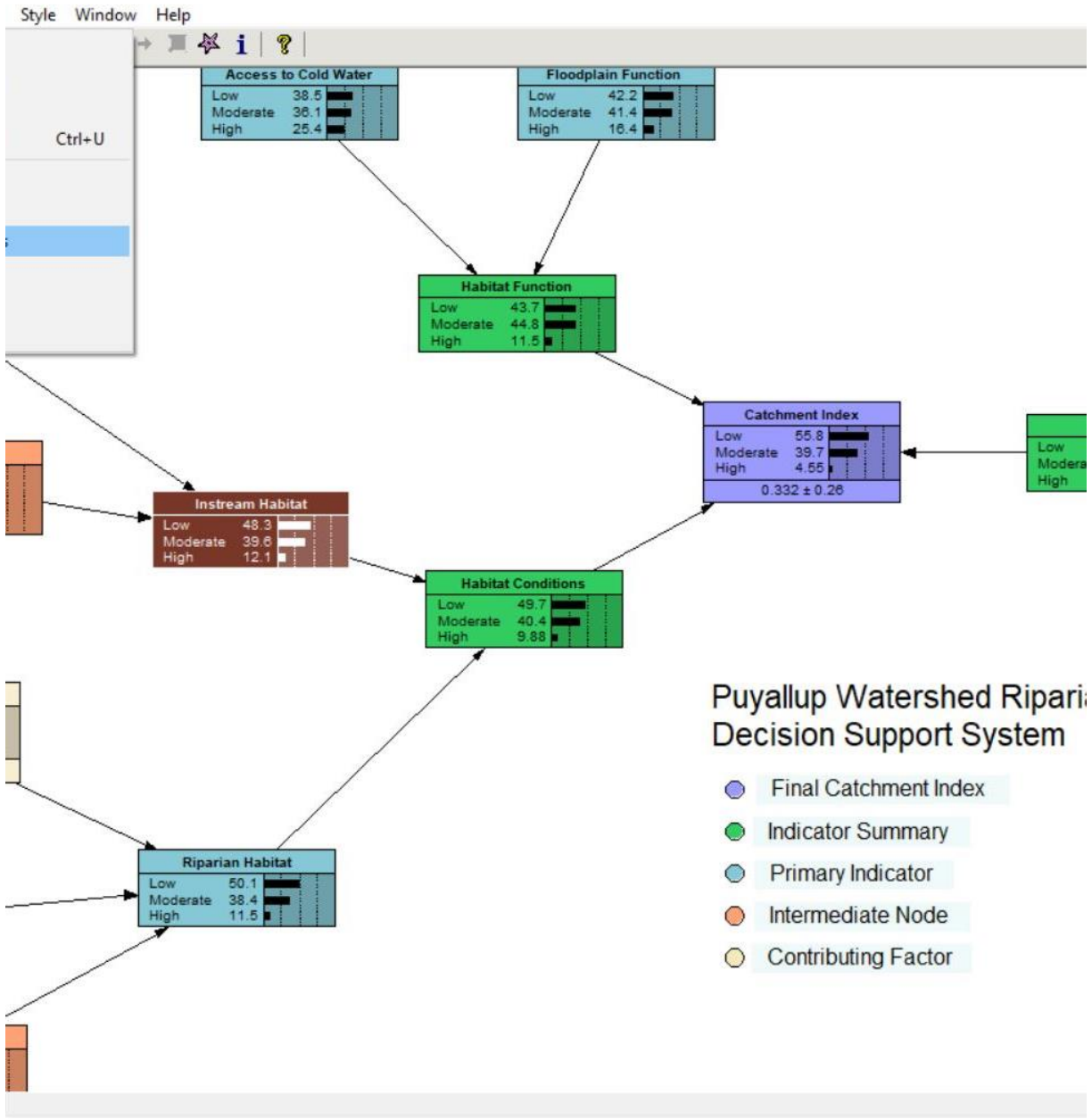
To see how the variables are influencing the Catchment Index, select that node to see a list of the variables that feed into the final model result.

To see how variables are influencing Instream Habitat, select that node and get a shorter list of variables.

Sample outcome:

Sensitivity of 'Instream Habitat' to a finding at another node:

Node	Mutual Info	Percent	Variance of Beliefs
Instream Habitat	1.40522	100	0.3671392
Large Woody Debris (Pote	0.35844	25.5	0.0722606
Habitat Conditions	0.31909	22.7	0.0472560
Site Potential Tree Ht (	0.23104	16.4	0.0460491
Human Developments	0.19494	13.9	0.0190016
Impervious Surfaces (Ins	0.08211	5.84	0.0069353
Catchment Index	0.05768	4.1	0.0072206
Agriculture/Pasture (Ins	0.05701	4.06	0.0035801
Proportion of Catchment	0.01902	1.35	0.0036050



Group P5

Catchment 452

Current Beliefs

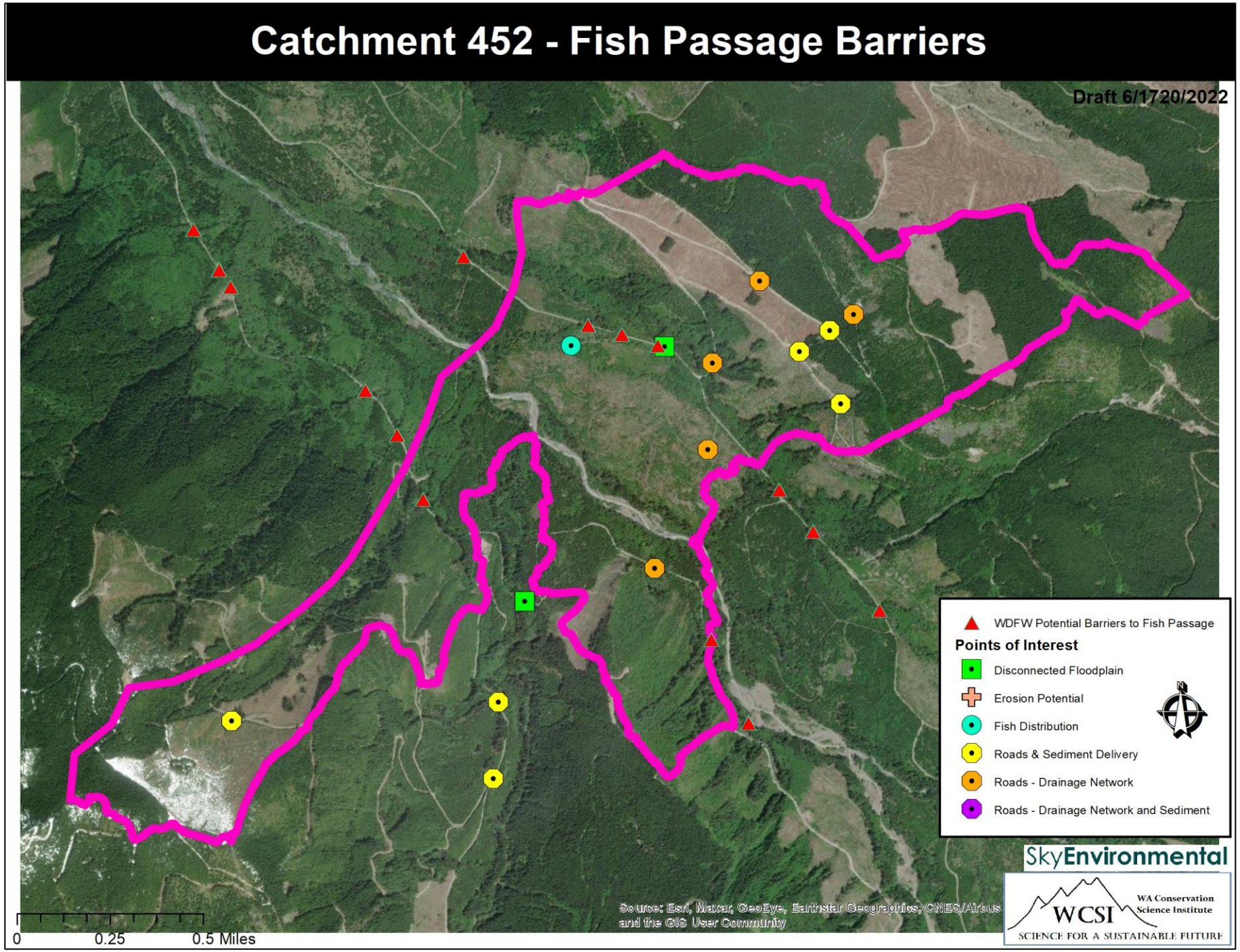
Node Title	Category (Value of States)				POTENTIAL ISSUES?
2.1.a Potential Barriers to Fish Passage	0	0	0	1	Y
2.2.a.2 Proportion of floodplain disconnected	0	1	0	0	M
4.1.c Upland Condition - Stream Flow	0	0	0.6	0.4	M
4.1.c.1 Harvest Units (prop)	0	0	0	1	Y
4.2.a.1 Upland Condition - Erosion Potential from Fire or Harvest Only	0	0	0.6	0.4	Y
4.2.a.1.2. Harvest Units (prop)	0	0	0	1	Y
3.1.a.2 Site Potential Tree Ht (mean)	0	1	0	0	Y
3.2.b.1 Riparian Exist TreeHt (Mean)	0	1	0	0	Y
2.2.b % Floodplain	0	1	0	0	Y
2.2.a.1 Road density in floodplain	0	0	1	0	M
4.1.b Roads - Drainage Network	0	0	0	1	Y
1 Catchment Index	0.4654	0.48076	0.053838		Y
2 Habitat Function	0.17155	0.67552	0.15293		M
2.2 Floodplain Function	0.18	0.76	0.06		M
3 Habitat Conditions	0.40816	0.51687	0.074968		M
3.1 Instream Habitat	0.65825	0.3275	0.01425		Y
3.1.a Large Woody Debris (Potential)	0.85	0.15	0		Y
3.2.a % Existing Riparian Corridor	0	1	0		M
3.2.b.2 Key Tree Species (proportion of buffer)	0	1	0		Y
3.2.b.3 Canopy Cover (mean)	0	1	0		Y
4 Stressors	0.021855	0.17933	0.79882		Y
4.1 Stream Flow & Water Storage	0.03	0.18	0.79		Y
4.2 Erosion & Sediment Supply	0.028	0.331	0.641		Y
4.2.a Landslide Potential	0.14	0.76	0.1		Y
4.2.b Roads & Sediment Delivery (sum)	0	0	1		Y
3.1.a.1 Proportion of Catchment with large trees	1	0	0		Y

Group P5

Catchment 452

Habitat Function

Potential Barriers to Fish Passage



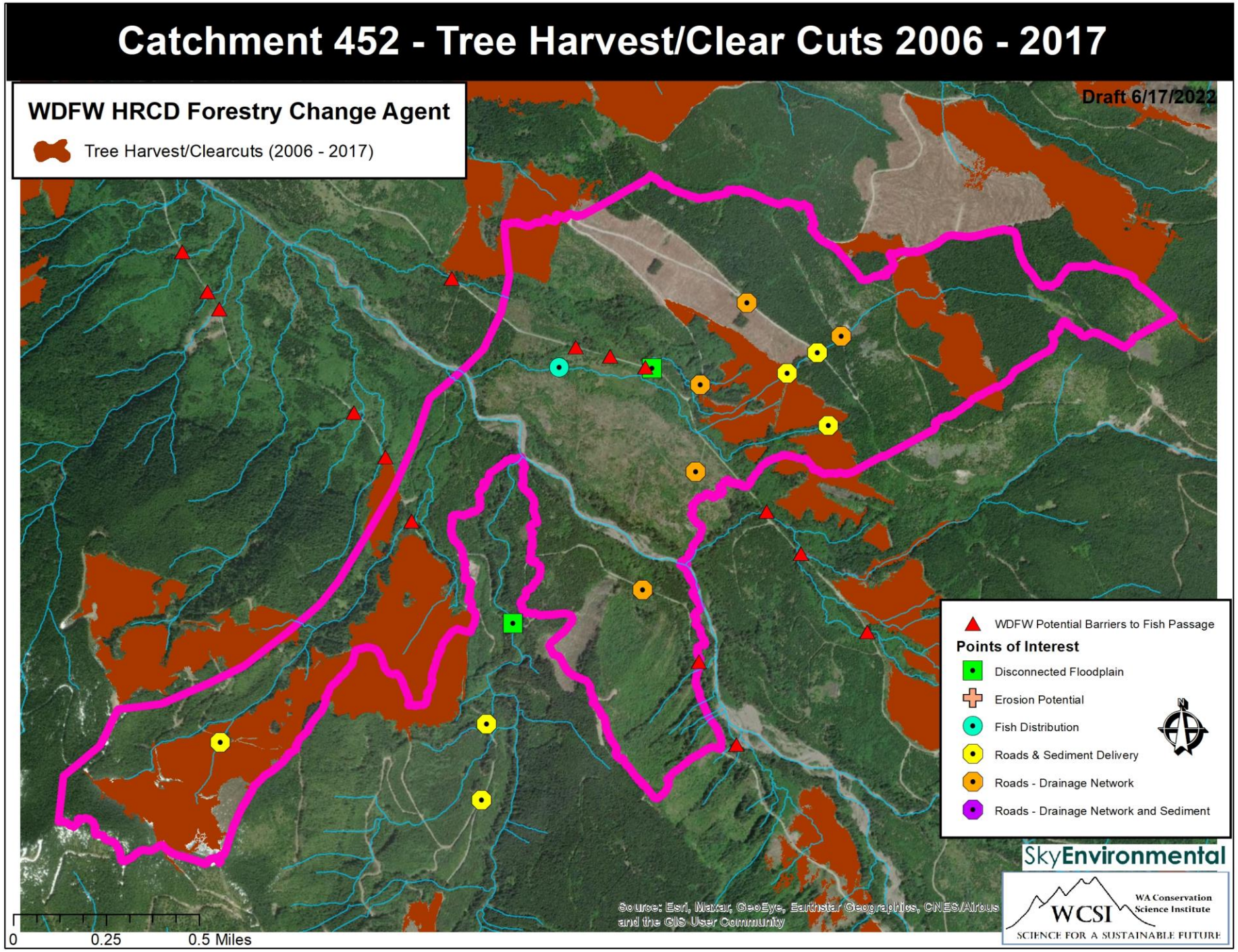
Group P5

Catchment 452

Stressors

Streamflow

Landslide

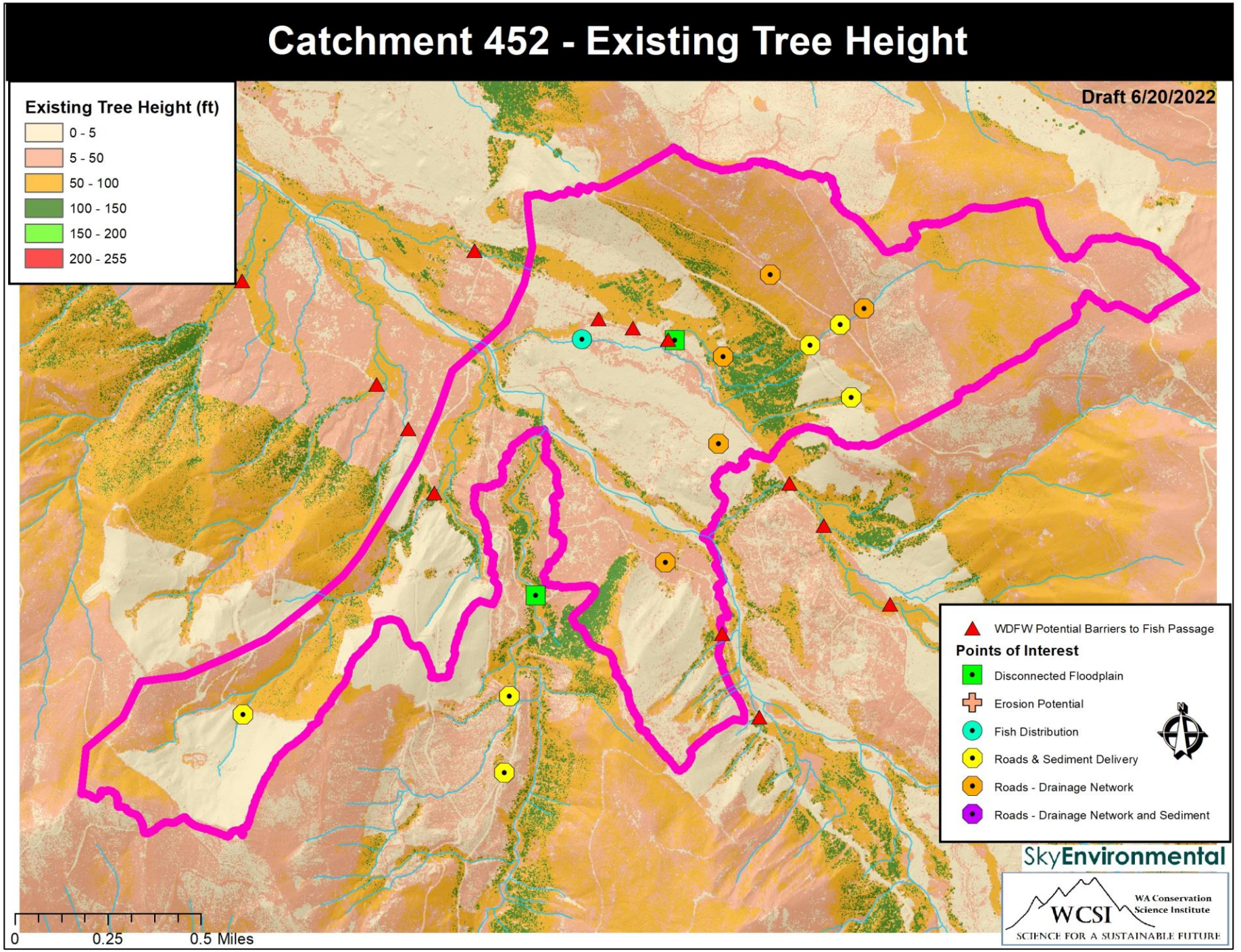


Group P5

Catchment 452

Habitat Conditions

Riparian Habitat

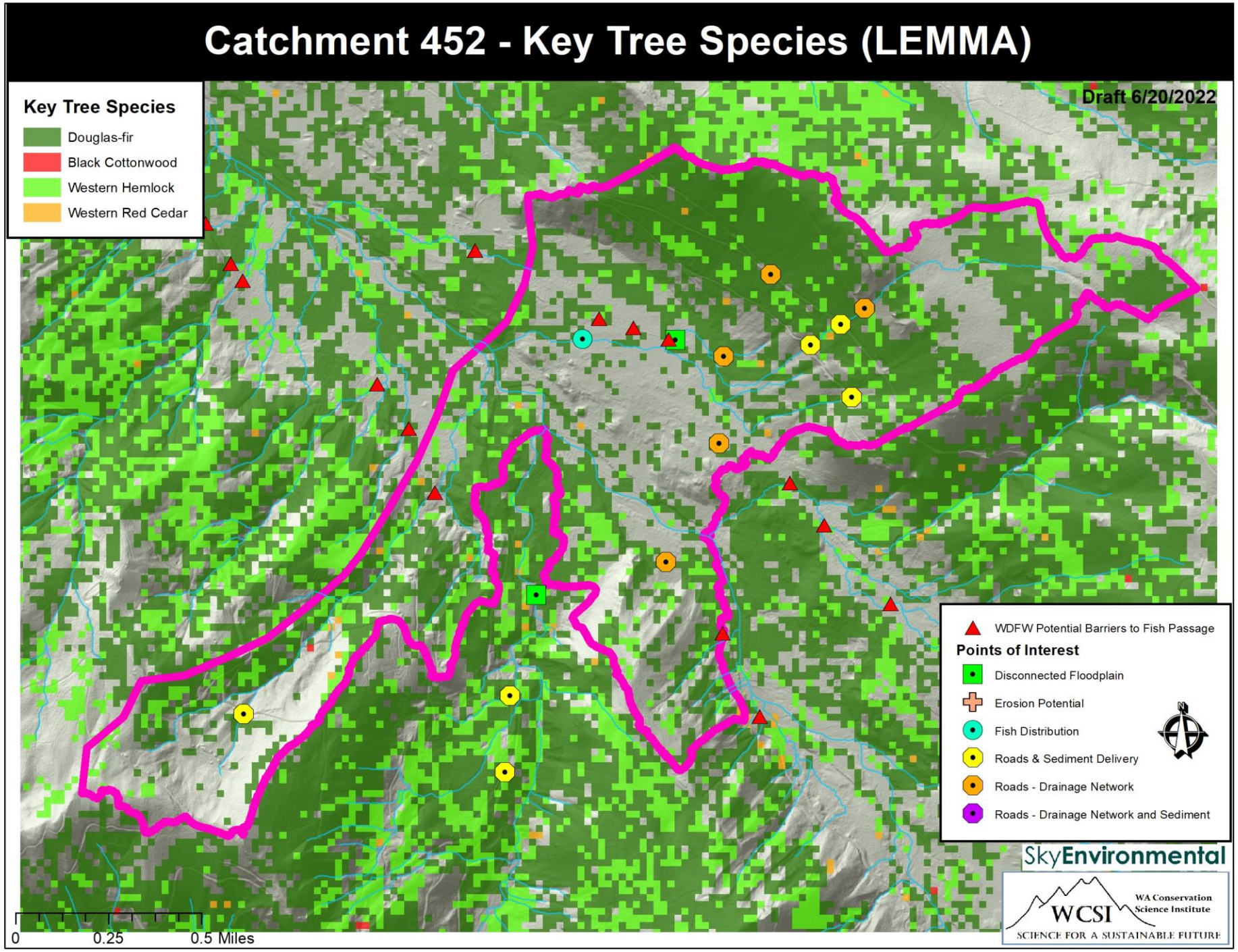


Group P5

Catchment 452

Habitat Conditions

Riparian Habitat

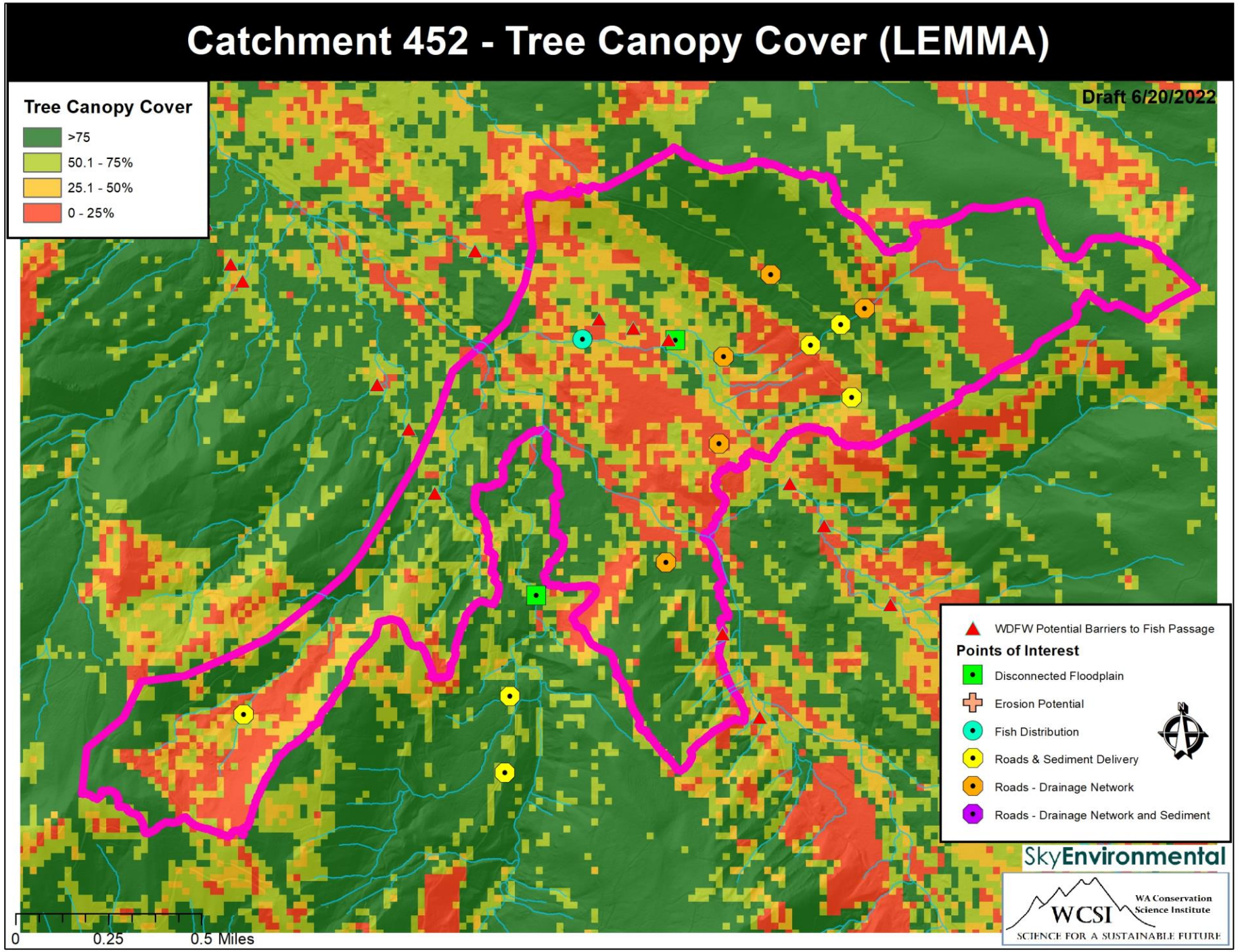


Group P5

Catchment 452

Habitat Conditions

Riparian Habitat

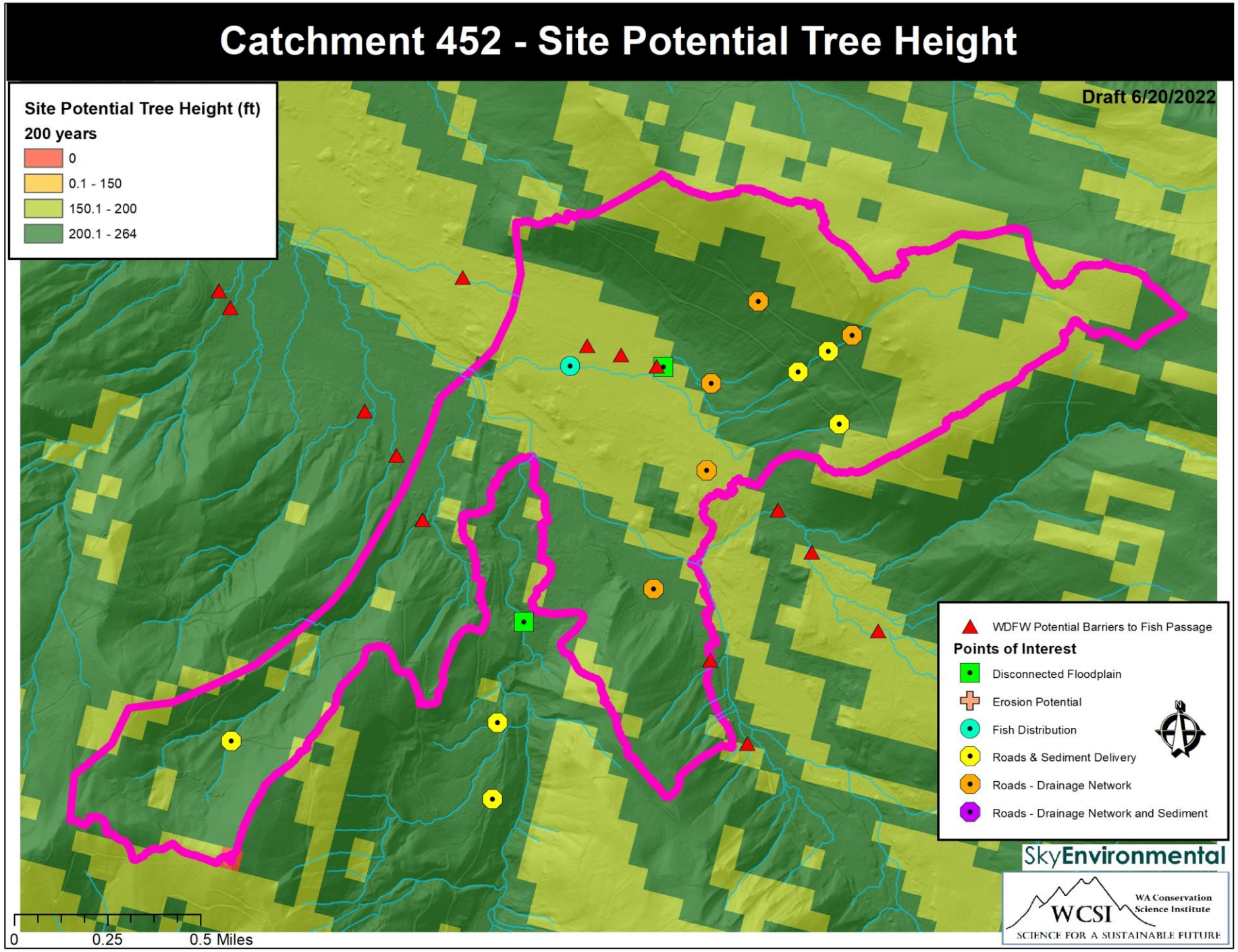


Group P5

Catchment 452

Habitat Conditions

Riparian Habitat

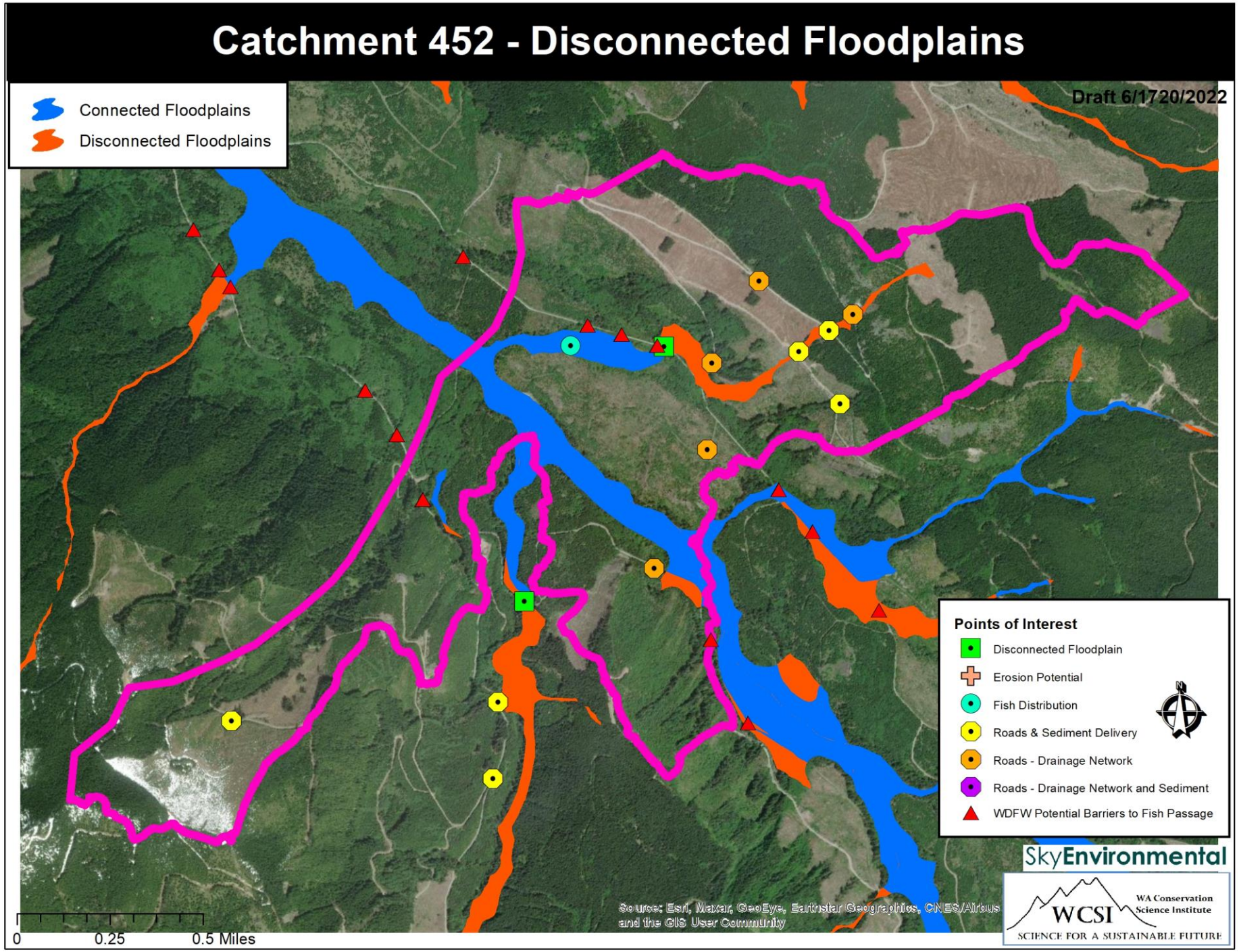


Group P5

Catchment 452

Habitat Function

Floodplain Function

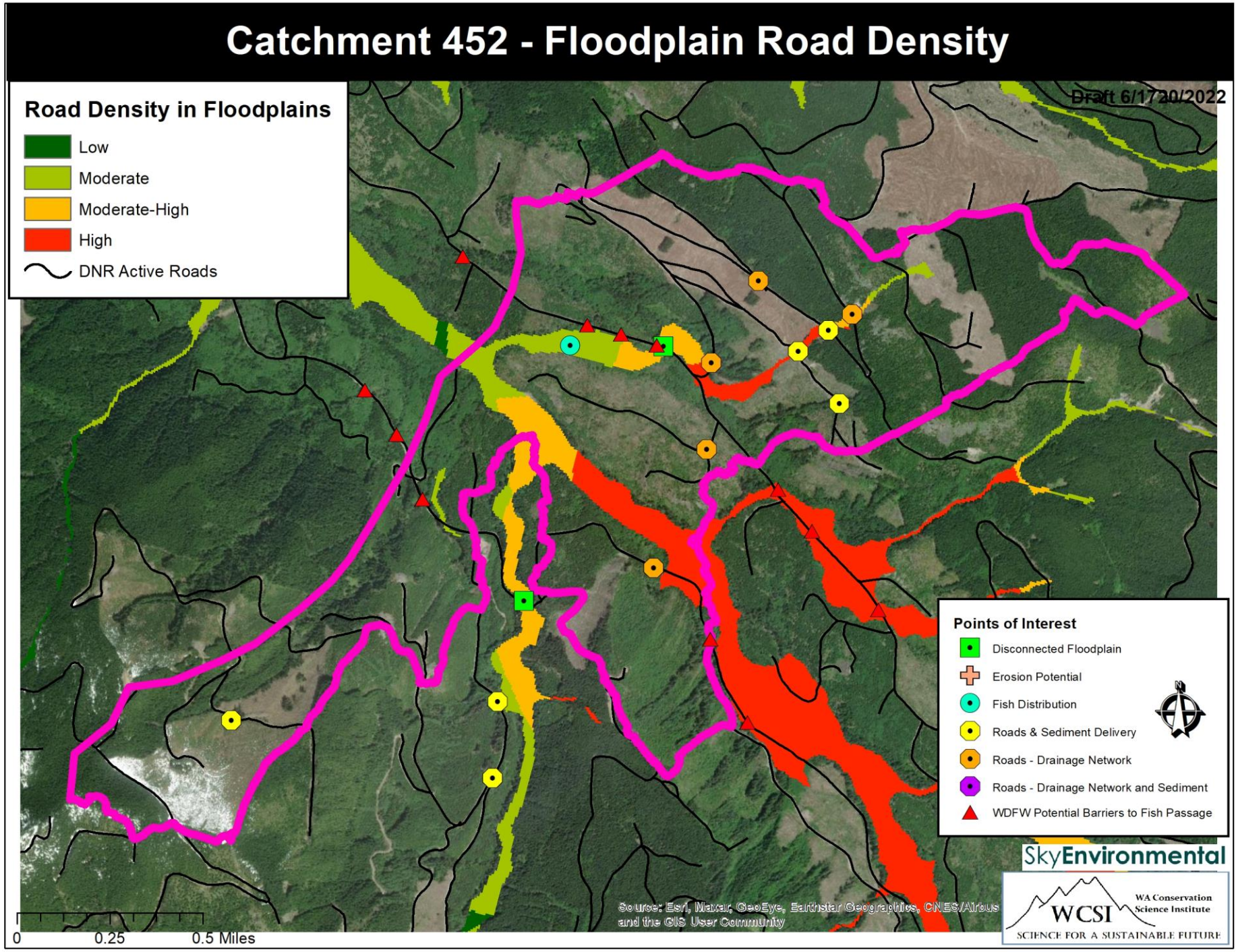


Group P5

Catchment 452

Habitat Function

Floodplain Function

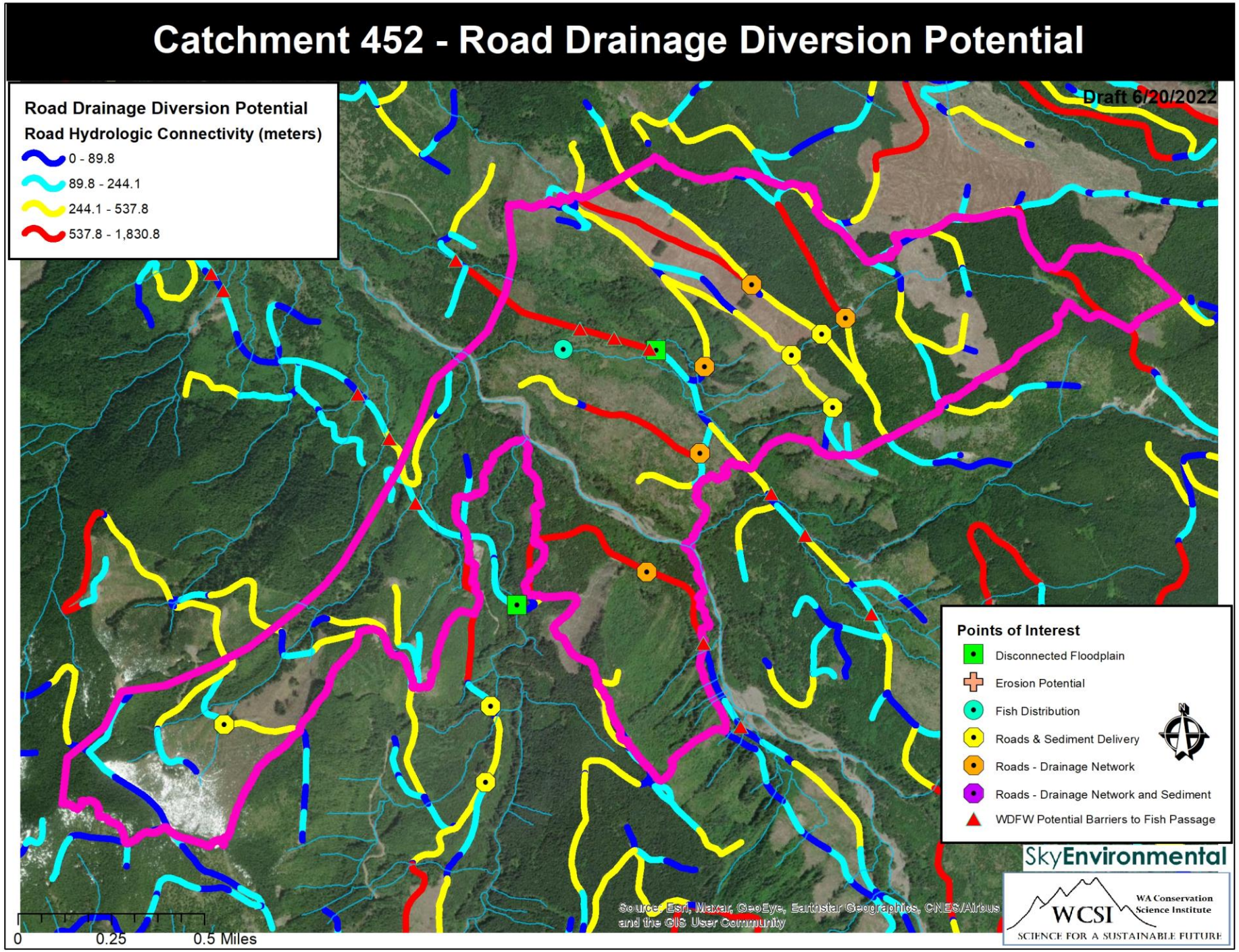


Group P5

Catchment 452

Stressors

Streamflow and Water Storage

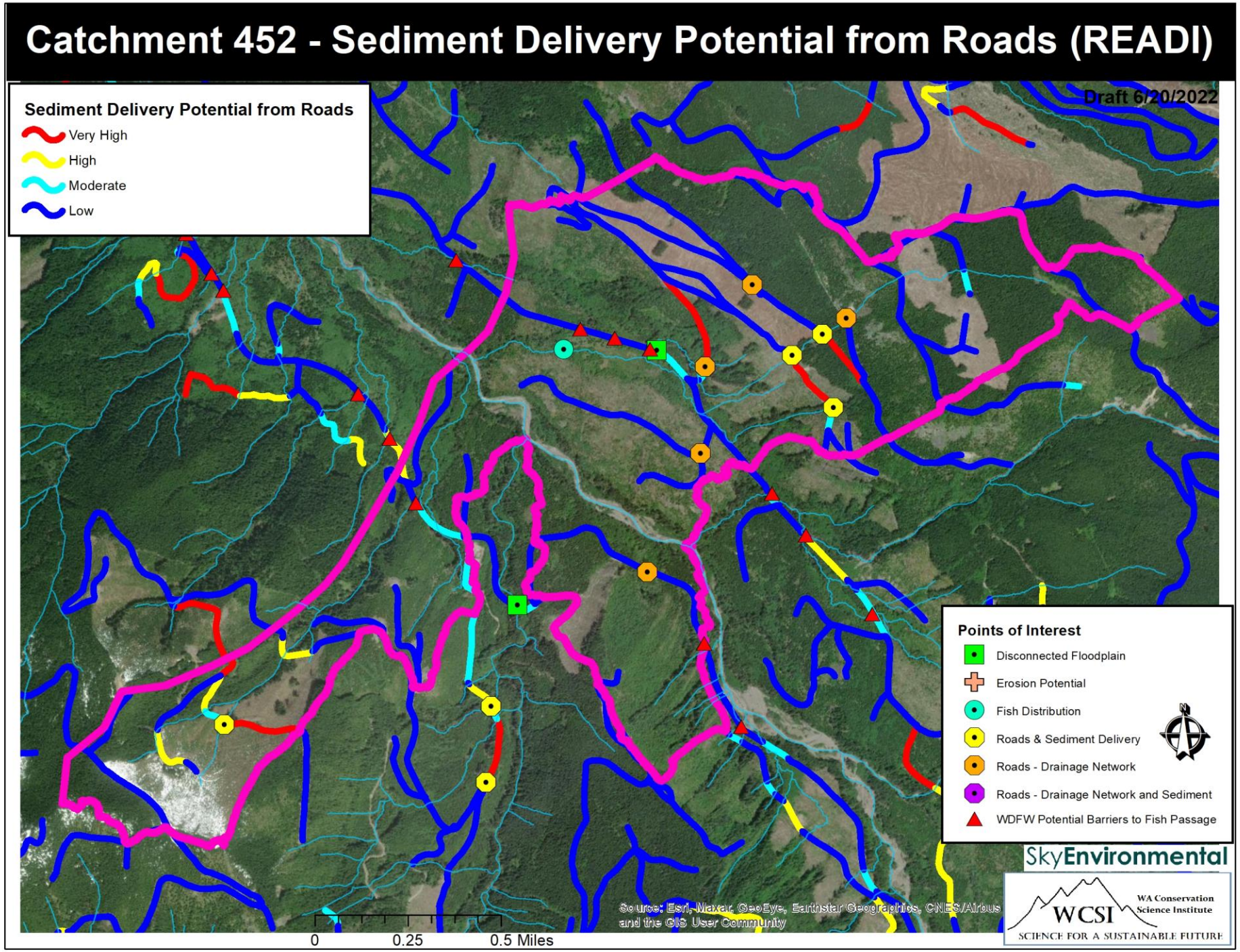


Group P5

Catchment 452

Stressors

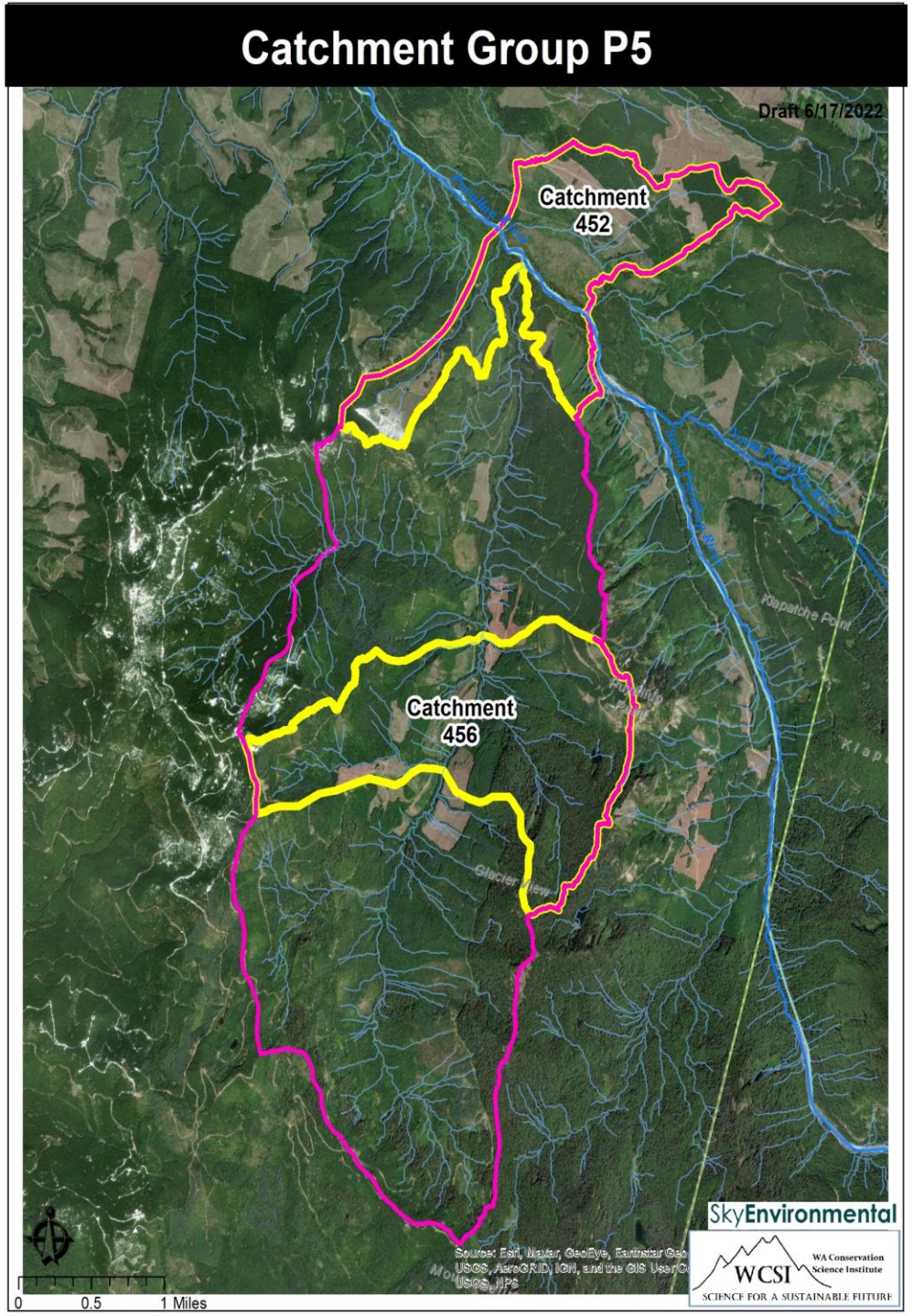
Erosion and Sediment Supply



Group P5

Catchment 452

Actions



Summary

- Four potential fish passage barriers.
- Lack of riparian vegetation including lack of species diversity and large trees.
- Erosion and sediment delivery issues due to roads and harvest practices.
- Disconnected floodplain on tributaries.

Potential Actions

- Remove or fix fish passage barriers and roads.
- Reconnect floodplain.
- Address harvest management practices.
- Conduct vegetation treatments.
- Identify acquisition opportunities.
- Consider for conceptual design as fixing floodplain and removing fish passage barriers may increase fish distribution.

Group P5 Actions

Summary

- Four private landowners with Mid Valley Resources being largest private landowner, including Deer Creek and all areas along the Puyallup River.
- US Forest Service owns almost all of one catchment.
- Several potential fish passage barriers grouped together.
- Disconnected floodplain on tributaries.
- Lack of riparian vegetation including lack of species diversity and large trees.
- Drainage, erosion and sediment delivery issues due to roads and harvest practices.

Potential Actions

- Remove or fix fish passage barriers and roads.
- Reconnect floodplain.
- Address harvest management practices.
- Conduct vegetation treatments.
- Identify acquisition opportunities.

Thank you

For more information on salmon recovery efforts in the Puyallup Watershed and access to the Riparian DSS report and materials, please see the Puyallup and Chambers Watersheds Salmon Recovery Pierce County Lead Entity website.

Main page: https://www.piercecountywa.gov/2873/Salmon-Recovery---Lead-Entity

Resource Library: https://www.piercecountywa.gov/DocumentCenter/Index/4953

Round Robin Announcements!

Break – Please Return at 11:20

Updating the Ecosystem Recovery Plan (ERP)

Goal: Focus LIO efforts, coordination, and convening in 2024 and address any needed edits (especially to project contacts) to help track activities into the future.

Prompt: **Are there activities in the ERP list that rise to the top to focus on in 2024?**

For breakouts, please select into one of the following groups:

1. Salmon
2. Farms and Agriculture
3. Stormwater and Water Quality

2024 Meeting Topic Brainstorm

Frequency and timing of future meetings – Proposed Timeline

- March 13 @ 10:00-12:00
- May 22 @ 10:00-12:00
- Summer (Site Visit) - in-person meeting focused on visiting a restoration project or active project in the LIO
- July 10 @ 10:00-12:00
- Nov 13 @ 10:00-12:00

Closing – Thank you!

- Next Meeting will be in early 2024!
- Please send any relevant news/events/grants to Andres to add to the LIO Email Updates!