

MAPPING SALMON



Anadromous Waters
Prioritization for the
Matanuska-Susitna Basin

PRESENTED BY **ERIN LARSON**

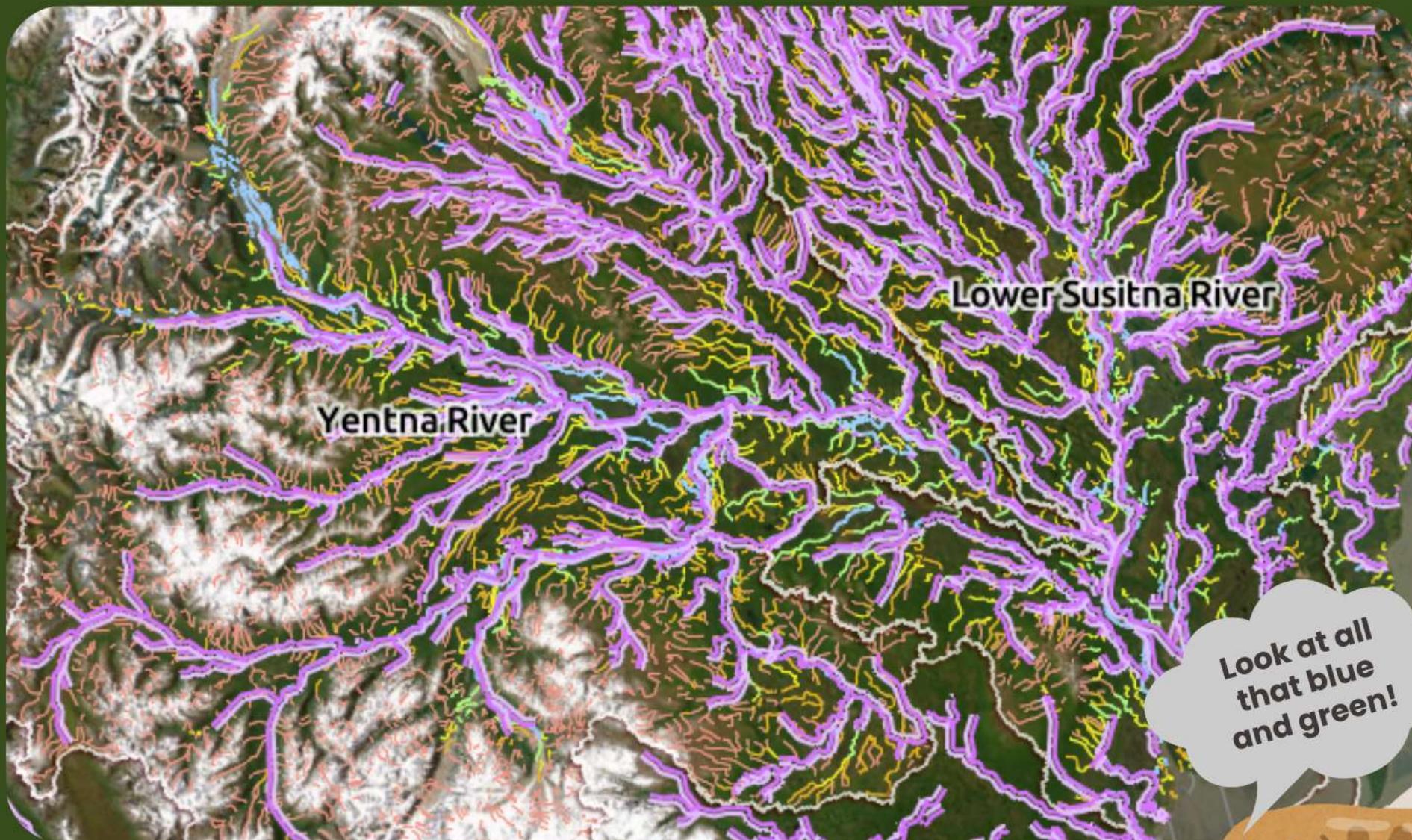
DATE **NOVEMBER 20, 2025**

PROJECT TEAM **ERIN LARSON, DUSTIN MERRIGAN, BECKY SHAFTEL**

**Where am I?
Find me and
conserve
me!**



Innocent Until Proven Anadromous



Anadromous streams



NHD layers

Flowlines with Habitat Score

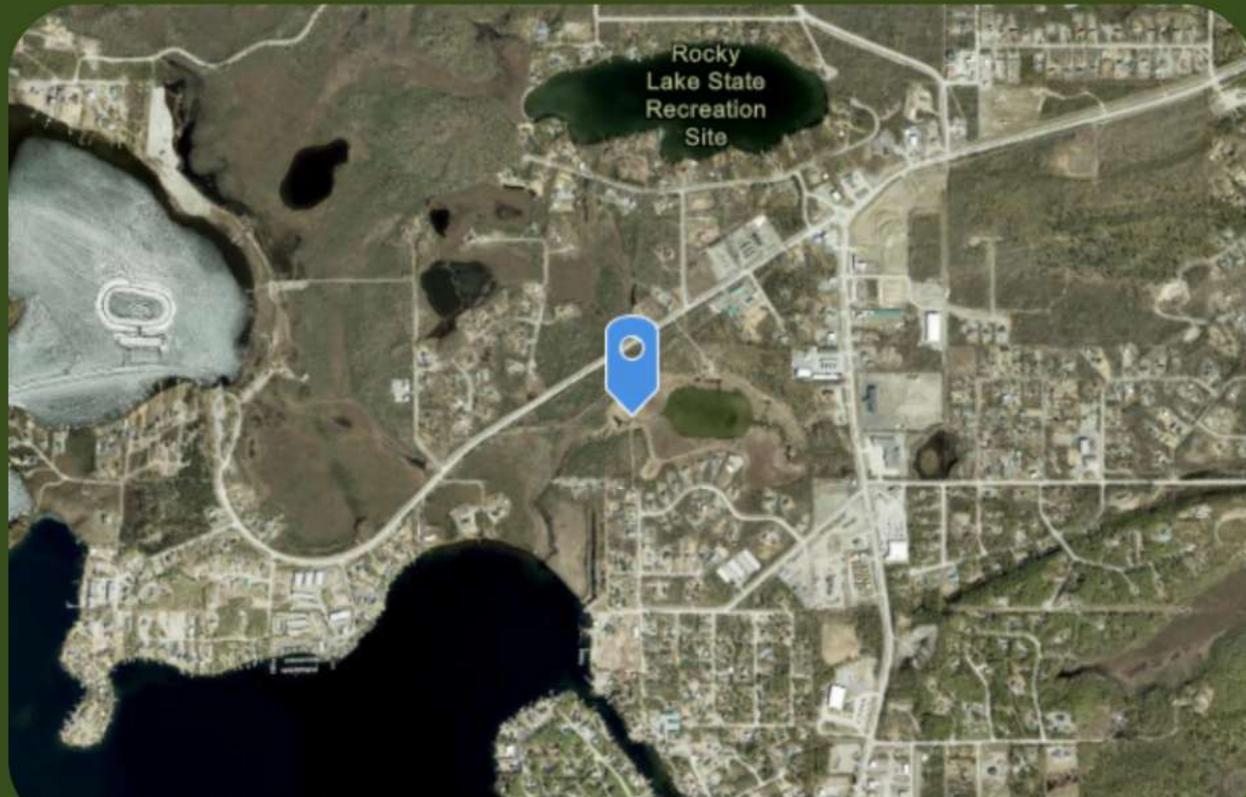
gridcode

- Low (<0.1)
- Med-Low (0.1 - 0.3)
- Med (0.3 - 0.5)
- Med-High (0.5 - 0.8)
- High (0.8 - 1.0)

Look at all
that blue
and green!

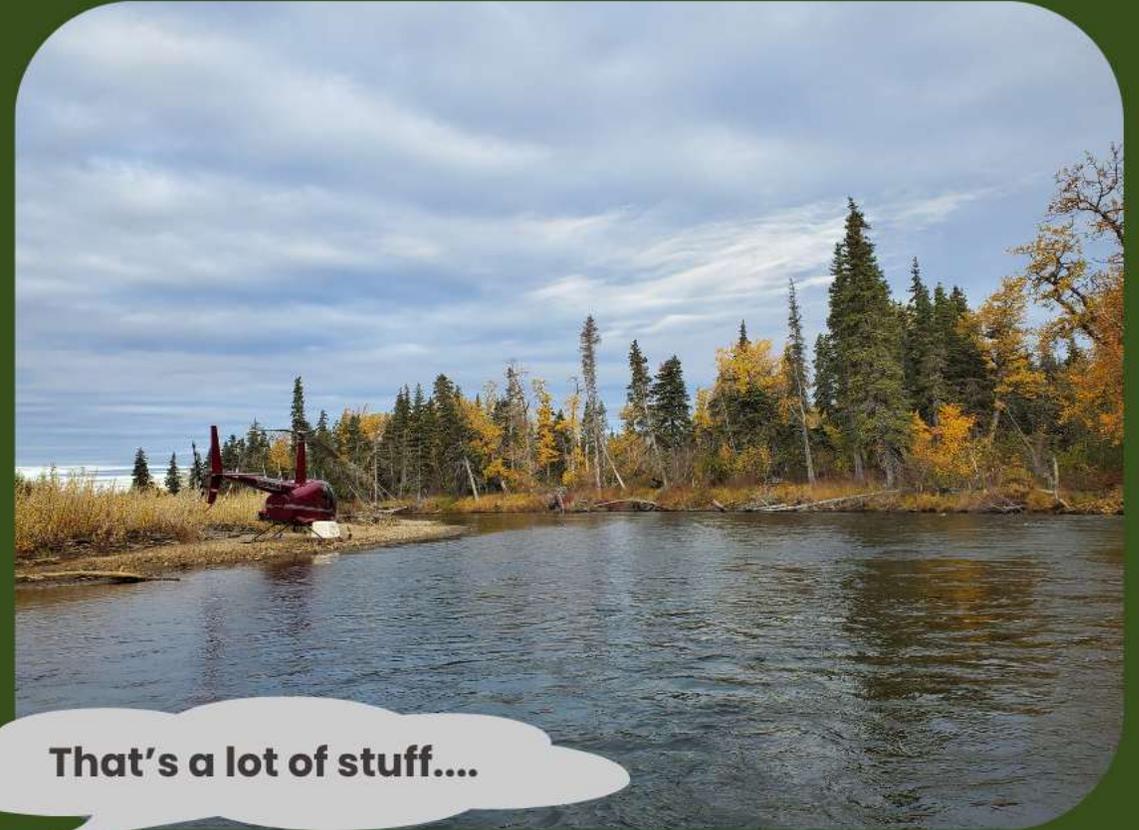


Innocent Until Proven Anadromous



AWC Work is Costly...

Modeling Could Make Us More Efficient



That's a lot of stuff....



Our Approach

All models are wrong,
some are useful!



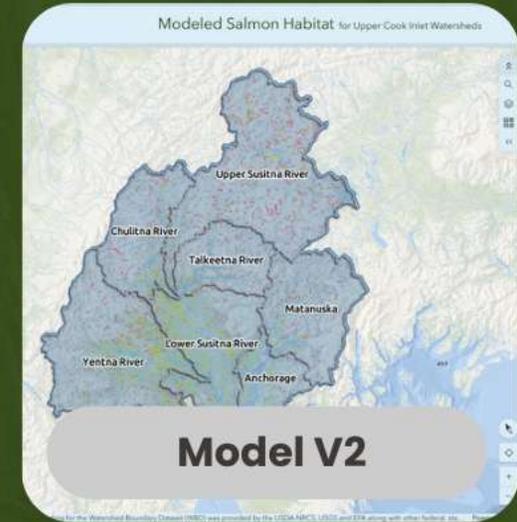
Model V1

Built a Binomial Logit SDM using AWC (2024) as presence/absence layer.



Field Validate

Field sampling at road-accessible and publicly accessible sites in the MatSu following AFFI protocols.



Model V2

Refined the model using an ensemble modeling framework, using the newer version (2025) of the AWC as a presence/absence layer.

Let's talk more if you want more detail!



Model Details

Covariates derived from NHDPlus and DEM.

Anadromous presence/absence based on AWC (2024 and 2025)

Ensemble model run in R, composed of 3 individual models with good performance (based on ROC and TSS):

1. Classification and Regression Tree Analysis
2. Binomial Logit Model
3. Random Forests

Latitude

Proxy for air and water temperature.

Longitude

Proxy for migration distance.

Elevation

Proxy for water temperature and hydrologic regime.

Stream Order

Representative of stream size and proximity to ocean habitat.

Watershed Area

Representative of stream size and proximity to ocean habitat.

Valley Confinement

Measure of habitat diversity (diverse, high quality habitat in unconfined valleys).

Maximum Slope

Representative of fish barriers for spawners and juveniles.

Mean Slope

Representative of overall steepness and challenges for spawners and juveniles to access.

Field Validation

25 Road
Accessed Sites



E-Fishing
Following AFFI



Field ID and
Measurements





AWC Additions

17 out of 25 sites had fish. Salmon (coho or sockeye) found at 4 sites. Resident dollys and rainbows at remaining sites.



Model Accuracy

Sampled a range of probabilities (0.004-0.674) and found salmon at sites from 0.175-0.269. Found other fish across a wider range.

Field Validation Results

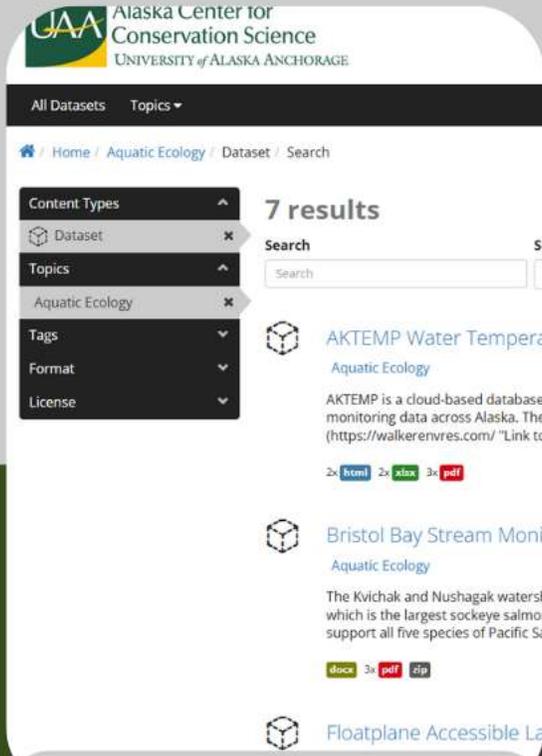
Sites selected across a range of anadromous fish presence probabilities and reasonable representation across the MatSu.

Only sampled sites that were within a 0.5 mile walk from the road, with public access.



ArcGIS Dashboard

Information about land ownership, AWC, nearby trails, model output.



ACCS Data Catalog

Final project report, shapefile of model output, link to ArcGIS dashboard.

Project Products



Feedback welcome!

ArcGIS Dashboard

Active Layers

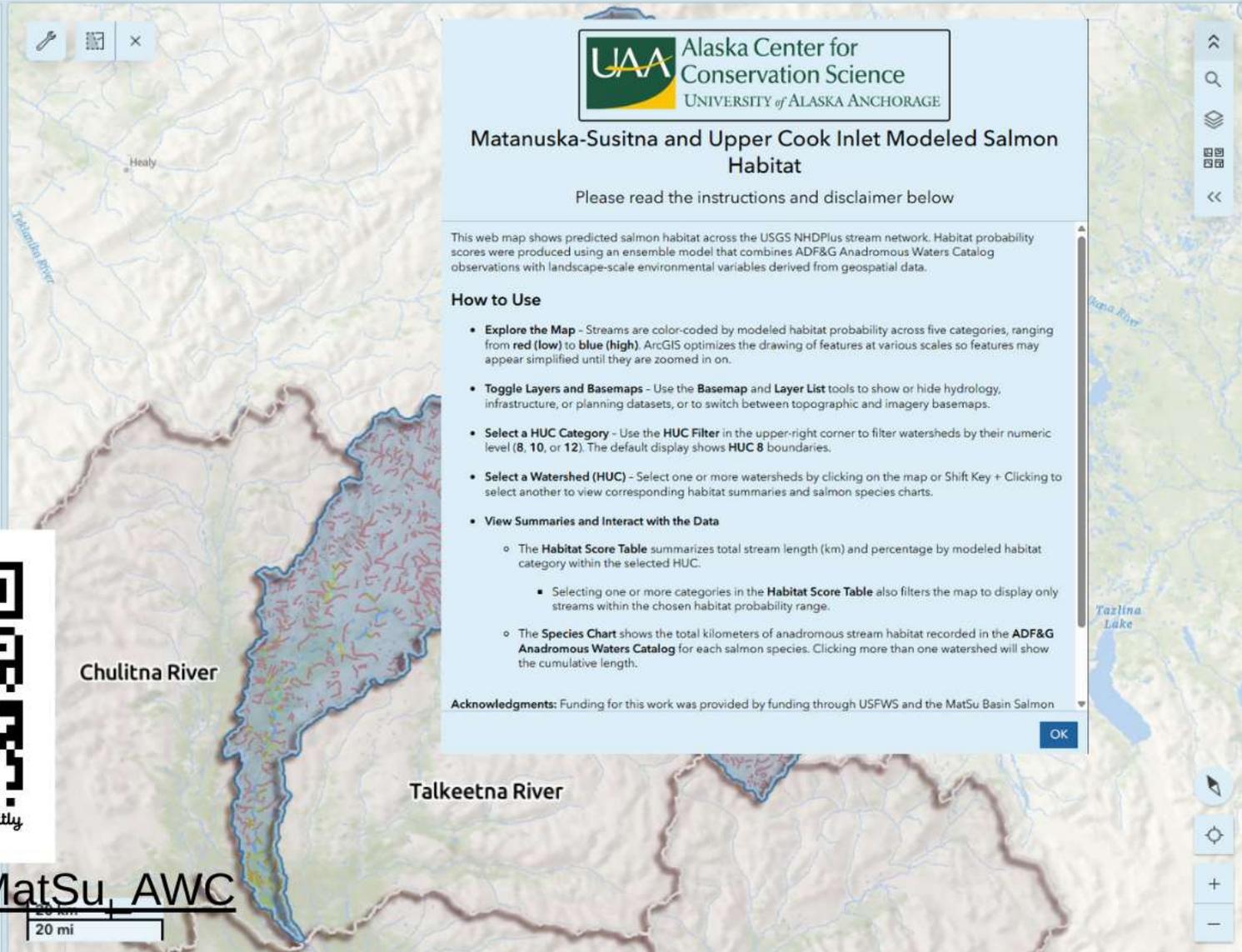
NHD layers

HUCs

Flowlines with Habitat Score

gridcode

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- High (0.8 - 1.0)
- No Data



Matanuska-Susitna and Upper Cook Inlet Modeled Salmon Habitat

Please read the instructions and disclaimer below

This web map shows predicted salmon habitat across the USGS NHDPlus stream network. Habitat probability scores were produced using an ensemble model that combines ADF&G Anadromous Waters Catalog observations with landscape-scale environmental variables derived from geospatial data.

How to Use

- **Explore the Map** - Streams are color-coded by modeled habitat probability across five categories, ranging from **red (low)** to **blue (high)**. ArcGIS optimizes the drawing of features at various scales so features may appear simplified until they are zoomed in on.
- **Toggle Layers and Basemaps** - Use the **Basemap** and **Layer List** tools to show or hide hydrology, infrastructure, or planning datasets, or to switch between topographic and imagery basemaps.
- **Select a HUC Category** - Use the **HUC Filter** in the upper-right corner to filter watersheds by their numeric level (8, 10, or 12). The default display shows **HUC 8** boundaries.
- **Select a Watershed (HUC)** - Select one or more watersheds by clicking on the map or Shift Key + Clicking to select another to view corresponding habitat summaries and salmon species charts.
- **View Summaries and Interact with the Data**
 - The **Habitat Score Table** summarizes total stream length (km) and percentage by modeled habitat category within the selected HUC.
 - Selecting one or more categories in the **Habitat Score Table** also filters the map to display only streams within the chosen habitat probability range.
 - The **Species Chart** shows the total kilometers of anadromous stream habitat recorded in the **ADF&G Anadromous Waters Catalog** for each salmon species. Clicking more than one watershed will show the cumulative length.

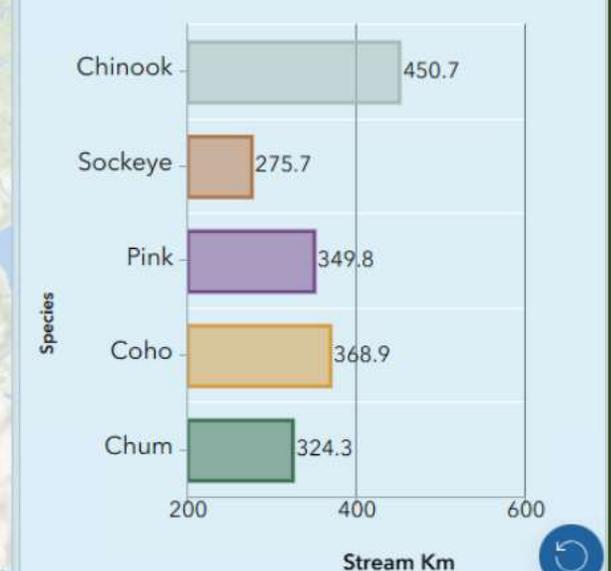
Acknowledgments: Funding for this work was provided by funding through USFWS and the MatSu Basin Salmon

OK

Modeled Habitat Score for Selected HUC

Habitat Score	Length km	Length %	Name
No Data	323.5	2.2	Upper Susitna River
Low (< 0.1)	12,708.9	87.5	Upper Susitna River
Med-Low (0.1 - 0.3)	724.8	5.0	Upper Susitna River
Medium (0.3 - 0.5)	266.4	1.8	Upper Susitna River
Med-High (0.5 - 0.8)	219.8	1.5	Upper Susitna River
High (> 0.8)	285.9	2.0	Upper Susitna River

Anadromous Stream Km By Species



https://bit.ly/MatSu_AWC

ArcGIS Dashboard

Active Layers

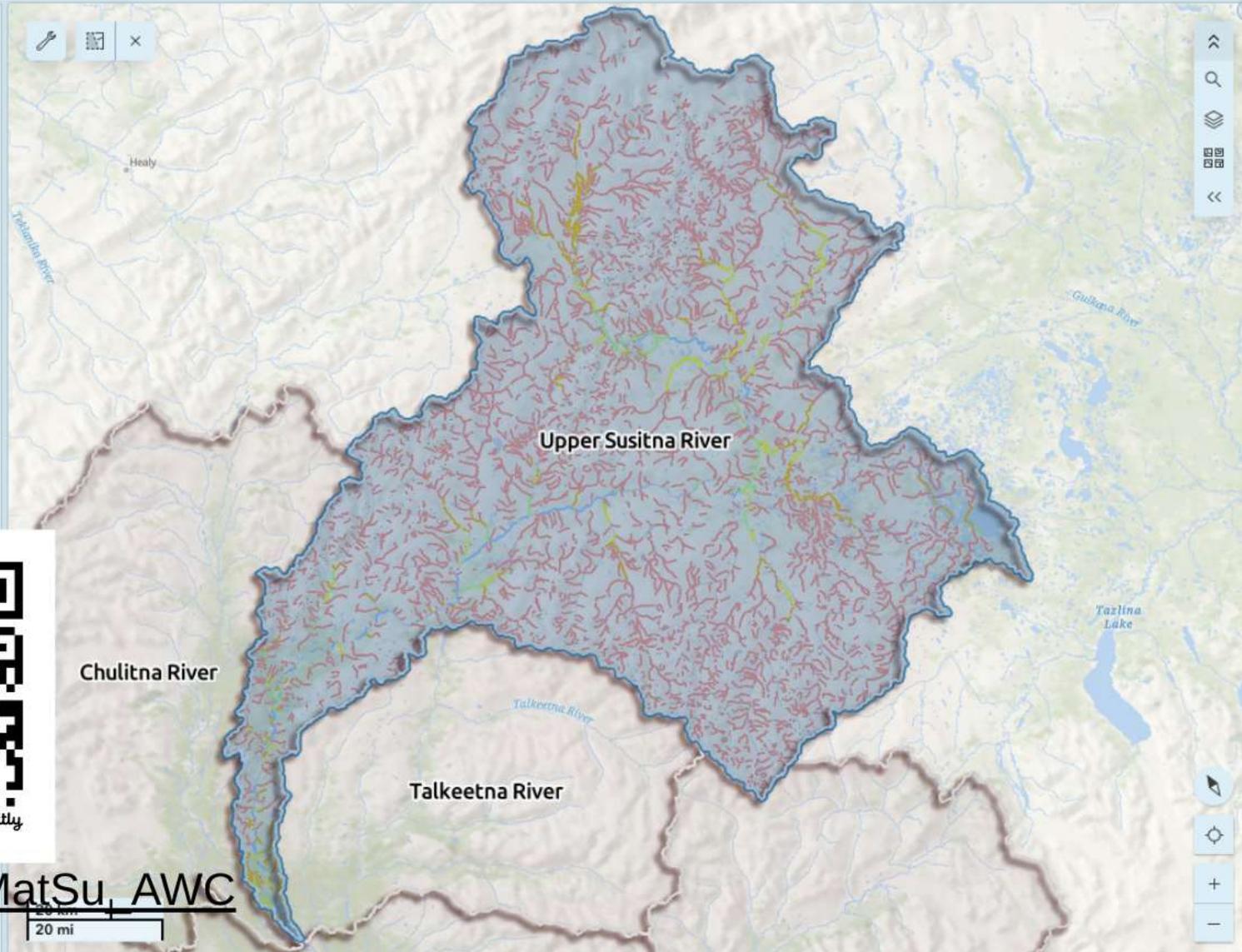
NHD layers

HUCs

Flowlines with Habitat Score

gridcode

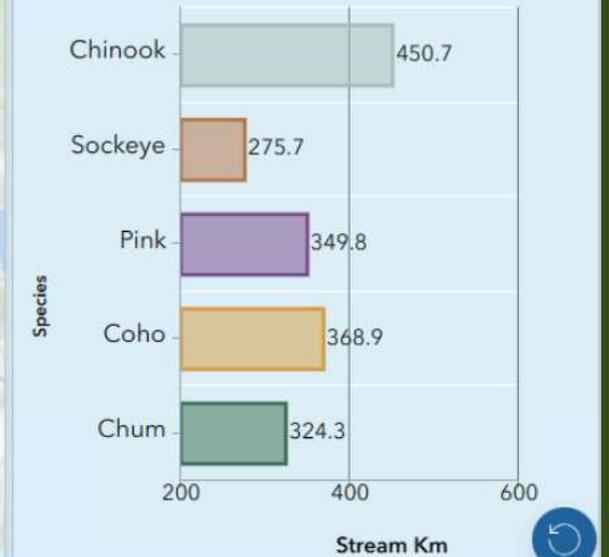
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Active Layers

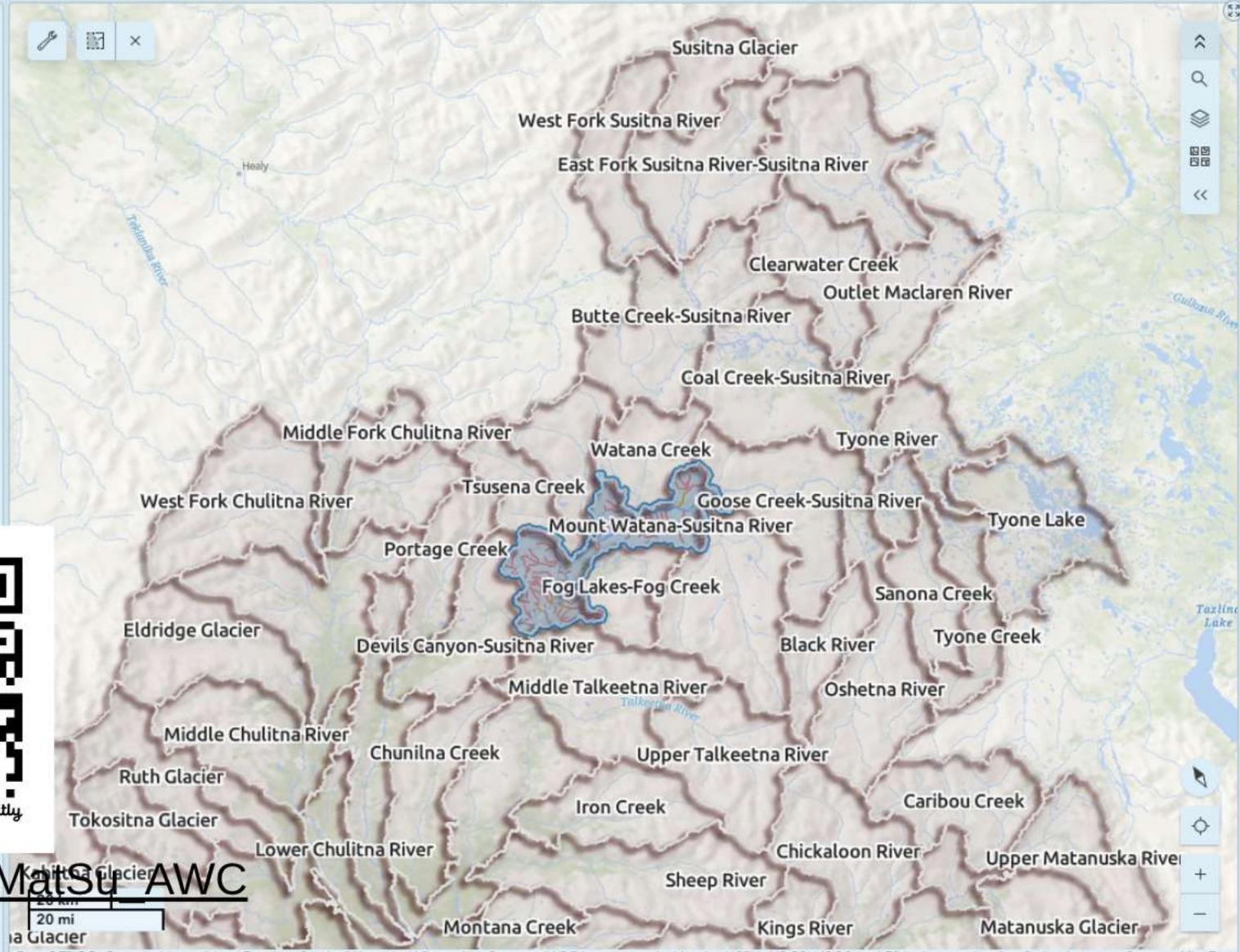
NHD layers

HUCs

Flowlines with Habitat Score

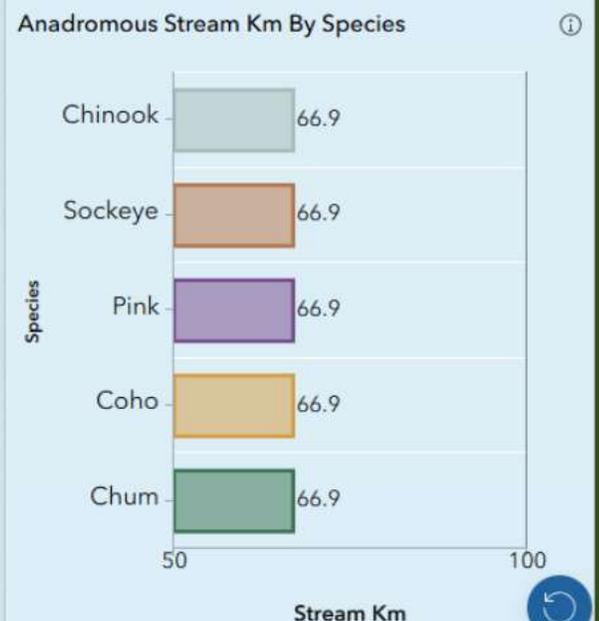
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- Med-High (0.5 - 0.8)
- High (0.8 - 1.0)
- No Data



Modeled Habitat Score for Selected HUC

Habitat Score	Length km	Length %	Name
No Data	8.3	1.5	Mount Watana-Susitna...
Low (< 0.1)	453.7	80.2	Mount Watana-Susitna...
Med-Low (0.1 - 0.3)	19.2	3.4	Mount Watana-Susitna...
Medium (0.3 - 0.5)	1.5	0.3	Mount Watana-Susitna...
Med-High (0.5 - 0.8)	1.0	0.2	Mount Watana-Susitna...
High (> 0.8)	81.8	14.5	Mount Watana-Susitna...



https://bit.ly/MatSu_AWC

ArcGIS Dashboard

Active Layers

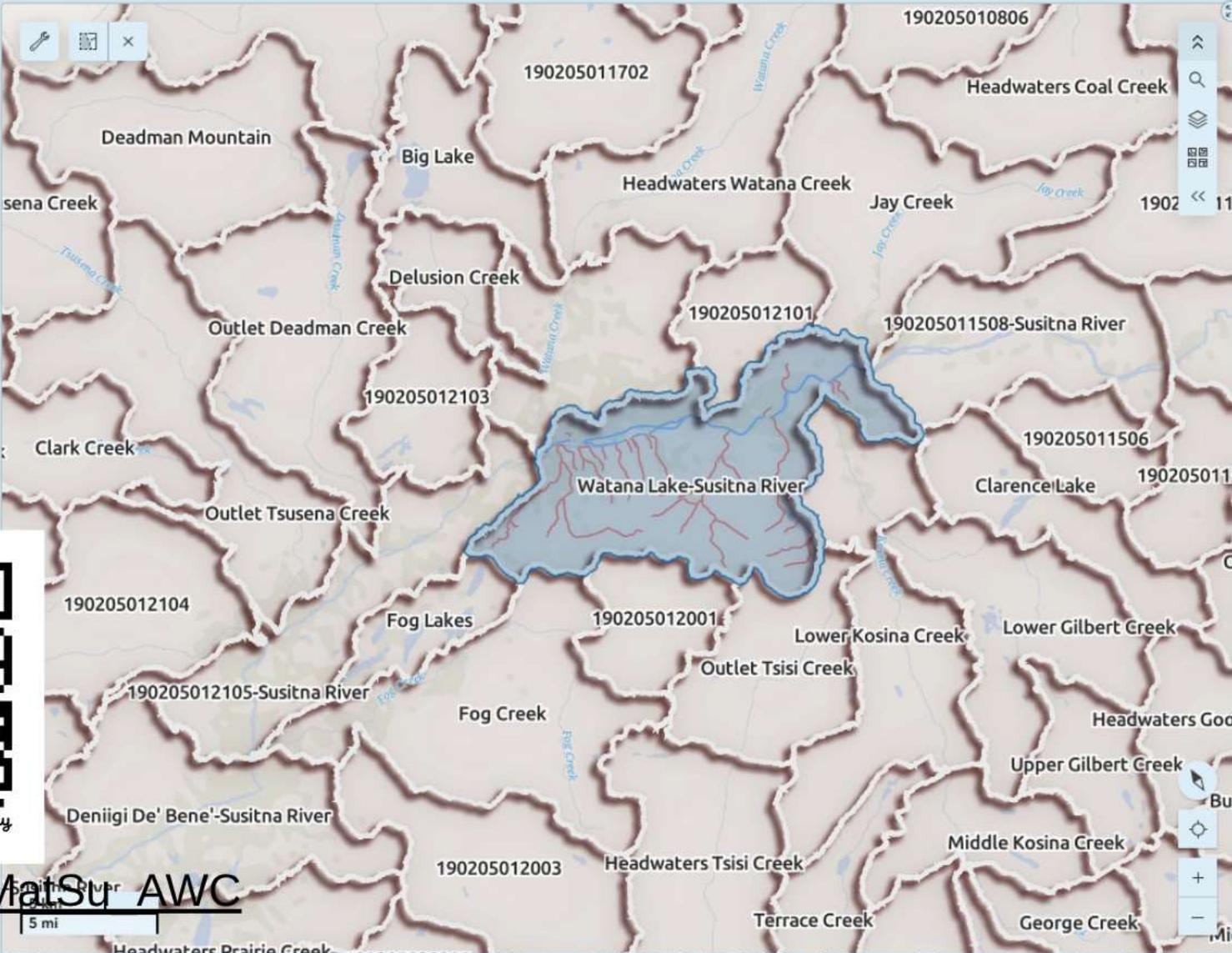
NHD layers

HUCs

Flowlines with Habitat Score

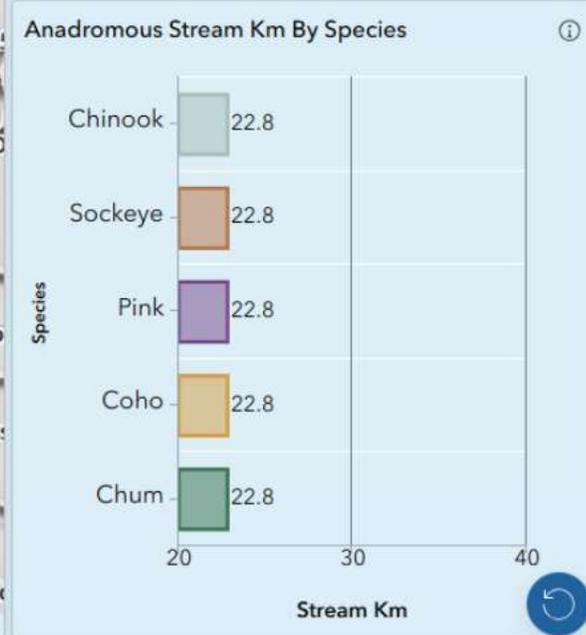
gridcode

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- Med-High (0.5 - 0.8)
- High (0.8 - 1.0)
- No Data



Modeled Habitat Score for Selected HUC

Habitat Score	Length km	Length %	Name
No Data	1.7	1.3	Watana Lake-Susitna R...
Low (< 0.1)	96.2	75.1	Watana Lake-Susitna R...
Med-Low (0.1 - 0.3)	0.5	0.4	Watana Lake-Susitna R...
Med-High (0.5 - 0.8)	0.9	0.7	Watana Lake-Susitna R...
High (> 0.8)	28.8	22.5	Watana Lake-Susitna R...



https://bit.ly/MatSu_AWC

ArcGIS Dashboard

Active Layers

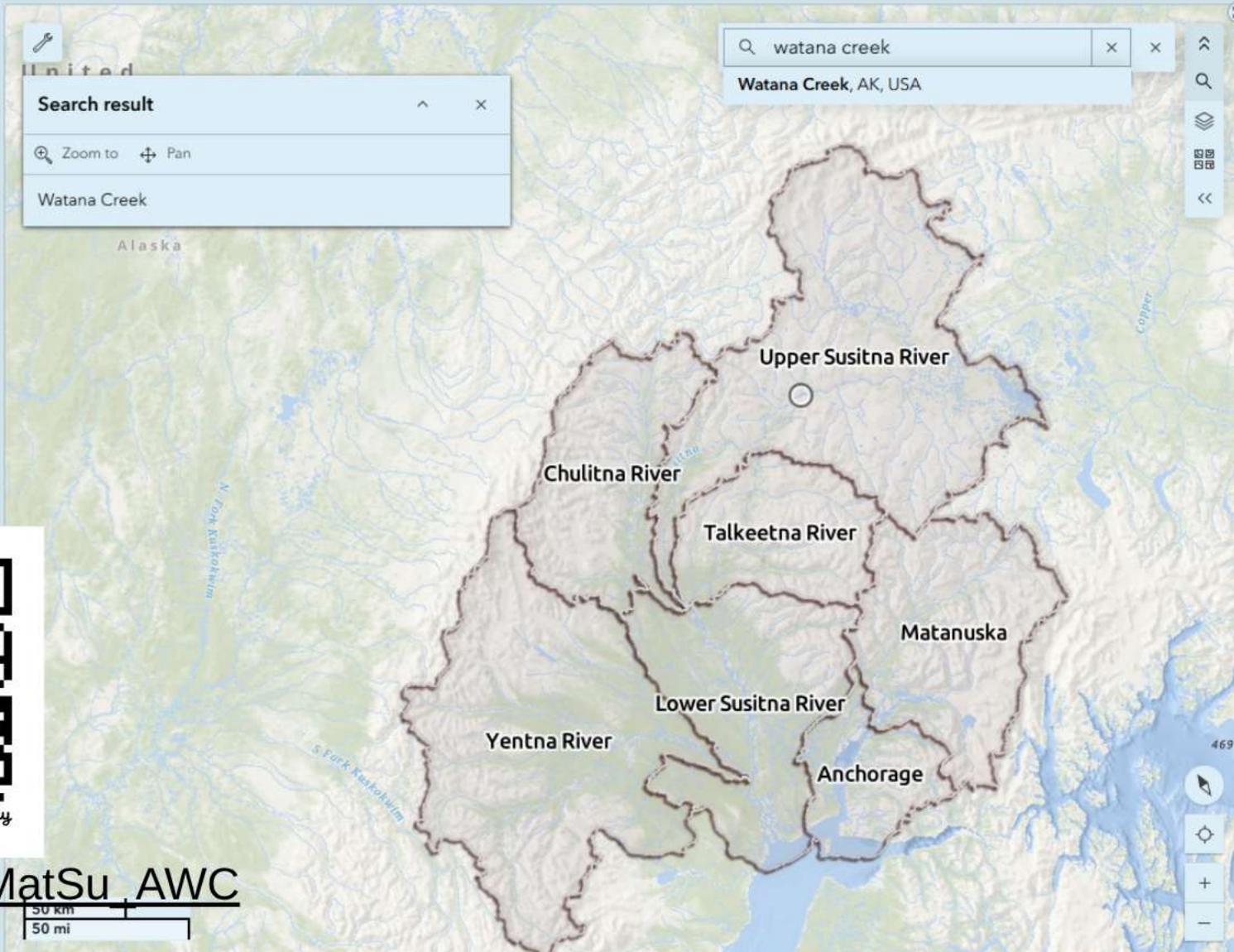
NHD layers

HUCs

Flowlines with Habitat Score

gridcode

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-  Med-Low (0.1 - 0.3)
-  Med (0.3 - 0.5)
-  Med-High (0.5 - 0.8)
-  High (0.8 - 1.0)
-  No Data



Modeled Habitat Score for Selected HUC

Selection required on one or more elements

Anadromous Stream Km By Species

Selection required on one or more elements



bitly

https://bit.ly/MatSu_AWC

ArcGIS Dashboard

Modeled Salmon Habitat for Upper Cook Inlet Watersheds

HUC Filter - Select 8, 10 or 12 digit

Active Layers

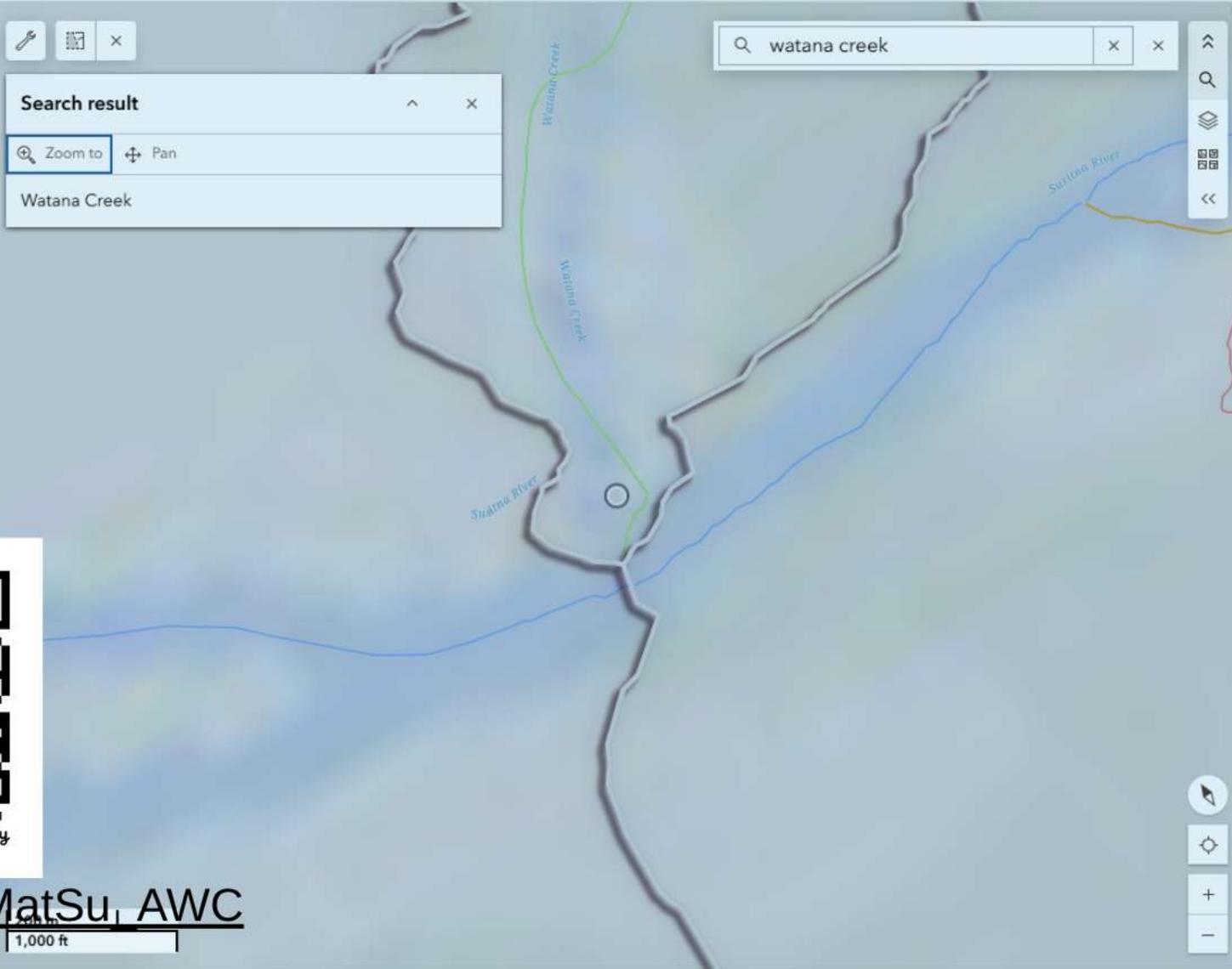
NHD layers

HUCs

Flowlines with Habitat Score

gridcode

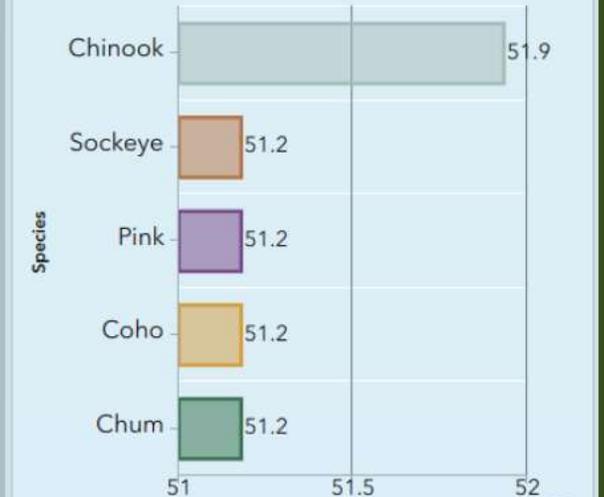
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- Med (0.3 - 0.5)
- Med-High (0.5 - 0.8)
- High (0.8 - 1.0)
- No Data



Modeled Habitat Score for Selected HUC

Habitat Score	Length km	Length %	Name
No Data	1.7	1.3	Watana Lake-Susitna R...
No Data	1.4	1.5	Outlet Watana Creek
No Data	1.3	1.6	190205012105-Susitn...
Low (< 0.1)	96.2	75.1	Watana Lake-Susitna R...
Low (< 0.1)	81.3	84.1	Outlet Watana Creek
Low (< 0.1)	50.9	61.1	190205012105-Susitn...
Med-Low (0.1 - 0.3)	0.5	0.4	Watana Lake-Susitna R...
Med-Low (0.1 - 0.3)	1.9	1.9	Outlet Watana Creek
Med-Low (0.1 - 0.3)	0.6	0.7	190205012105-Susitn...
Medium (0.3 - 0.5)	7.0	7.2	Outlet Watana Creek
Medium (0.3 - 0.5)	0.0	0.1	190205012105-Susitn...

Anadromous Stream Km By Species



https://bit.ly/MatSu_AWC

ArcGIS Dashboard

Active Layers

Anadromous streams

NHD layers

HUCs

Flowlines with Habitat Score

gridcode

- Low (<0.1)
- Med-Low (0.1 - 0.3)
- Med (0.3 - 0.5)
- Med-High (0.5 - 0.8)
- High (0.8 - 1.0)
- No Data

Infrastructure and Ownership

Roads

Roads_AKDOT

PublicSafety_E911Roads

Trails



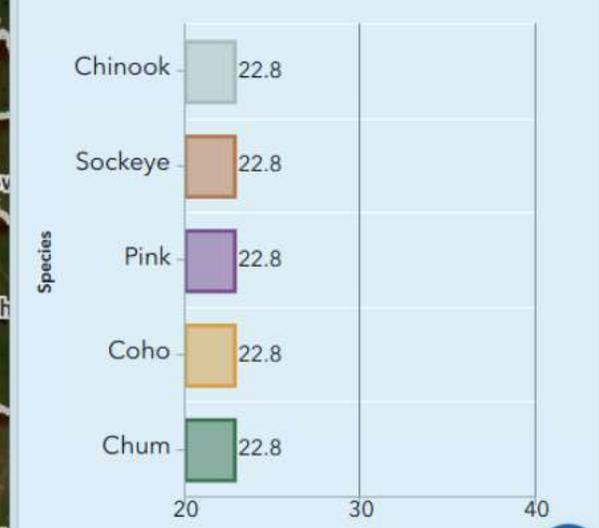
Basemaps

- Imagery
- Imagery Hybrid
- Streets
- Topographic
- Navigation
- Streets (Night)

Modeled Habitat Score for Selected HUC

Habitat Score	Length km	Length %	Name
No Data	1.7	1.3	Watana Lake-Susitna R...
Low (< 0.1)	96.2	75.1	Watana Lake-Susitna R...
Med-Low (0.1 - 0.3)	0.5	0.4	Watana Lake-Susitna R...
Med-High (0.5 - 0.8)	0.9	0.7	Watana Lake-Susitna R...
High (> 0.8)	28.8	22.5	Watana Lake-Susitna R...

Anadromous Stream Km By Species



ArcGIS Dashboard

Active Layers

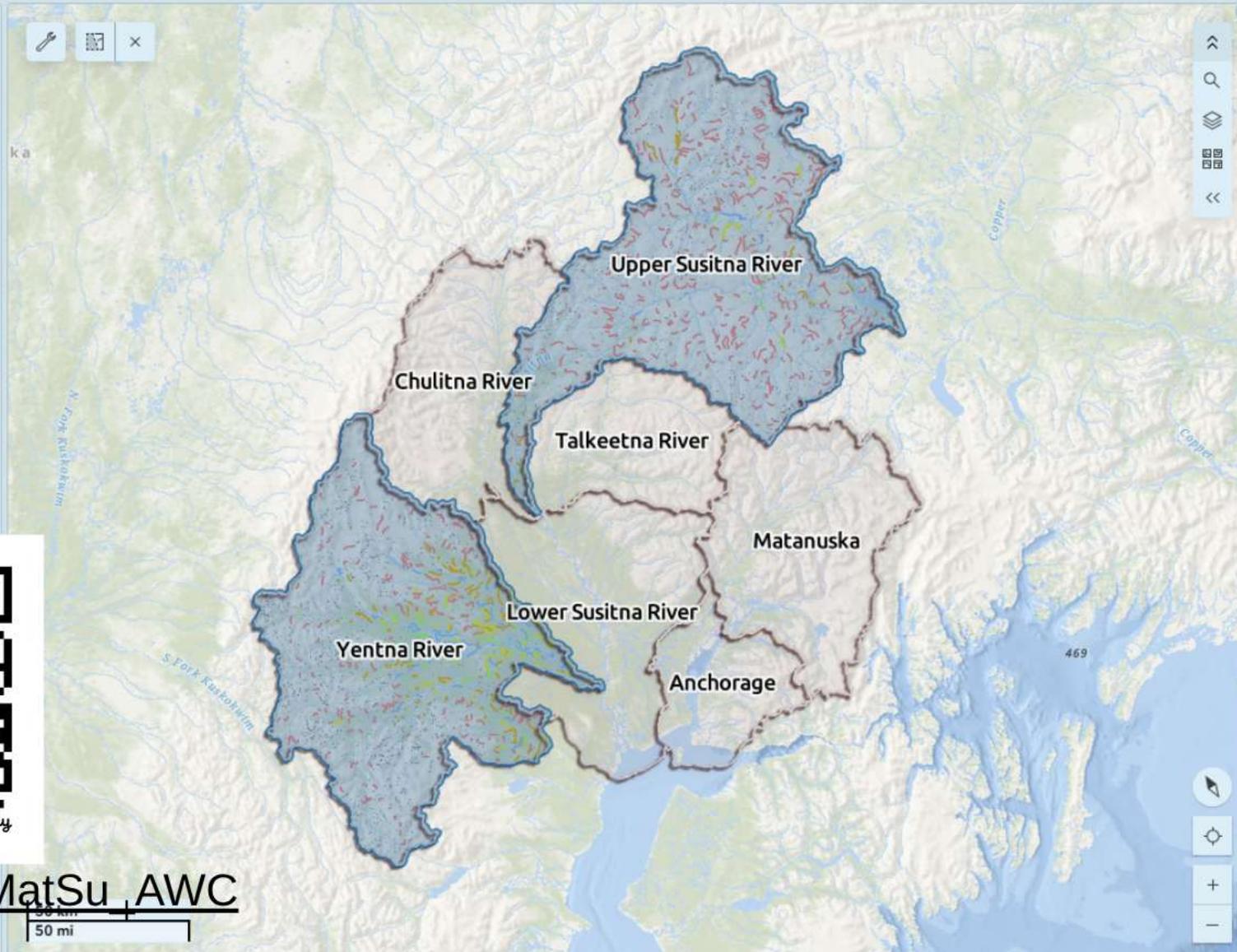
NHD layers

HUCs

Flowlines with Habitat Score

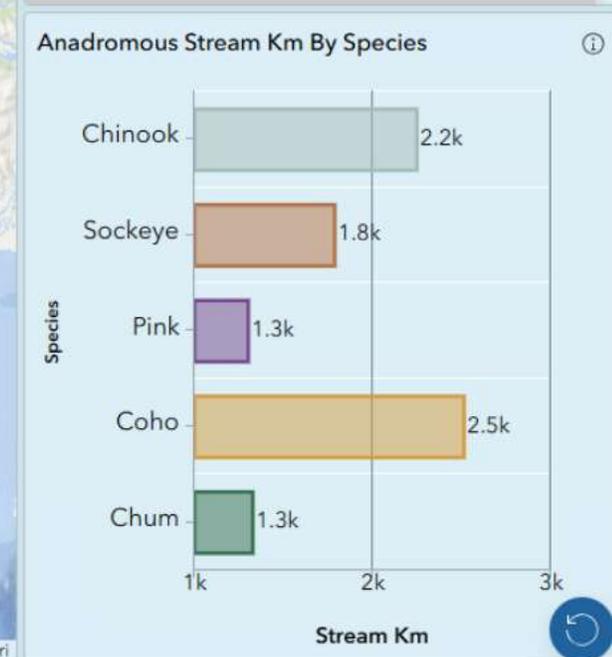
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- Med (0.3 - 0.5)
- Med-High (0.5 - 0.8)
- High (0.8 - 1.0)
- No Data



Modeled Habitat Score for Selected HUC

Habitat Score	Length km	Length %	Name
No Data	678.0	2.9	Yentna River
Low (< 0.1)	12,708.9	87.5	Upper Susitna River
Low (< 0.1)	16,004.1	69.0	Yentna River
Med-Low (0.1 - 0.3)	724.8	5.0	Upper Susitna River
Med-Low (0.1 - 0.3)	2,391.7	10.3	Yentna River
Medium (0.3 - 0.5)	266.4	1.8	Upper Susitna River
Medium (0.3 - 0.5)	1,219.5	5.2	Yentna River
Med-High (0.5 - 0.8)	219.8	1.5	Upper Susitna River
Med-High (0.5 - 0.8)	1,166.1	5.0	Yentna River
High (> 0.8)	285.9	2.0	Upper Susitna River
High (> 0.8)	1,758.3	7.6	Yentna River



https://bit.ly/MatSu_AWC

ArcGIS Dashboard

Active Layers

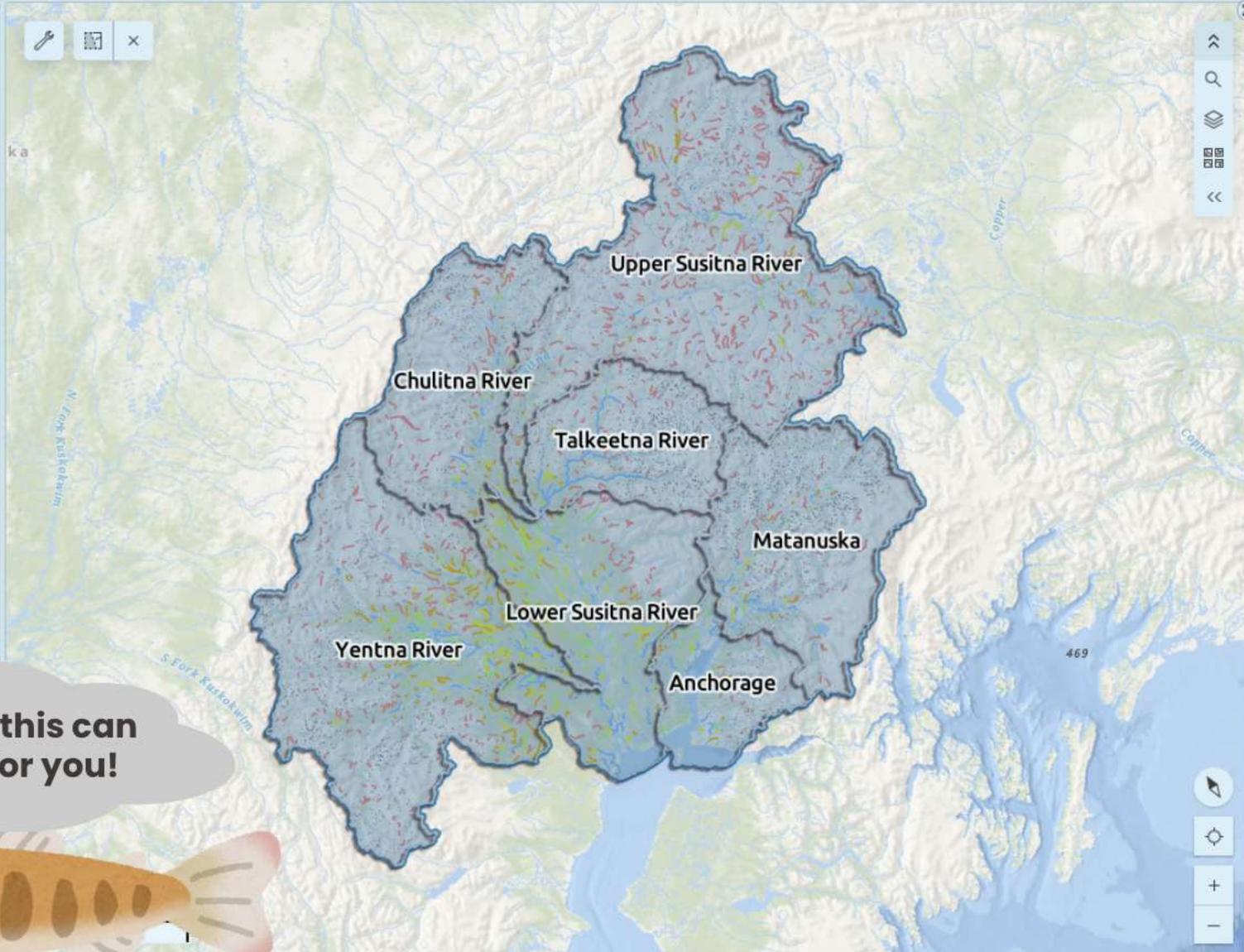
NHD layers

HUCs

Flowlines with Habitat Score

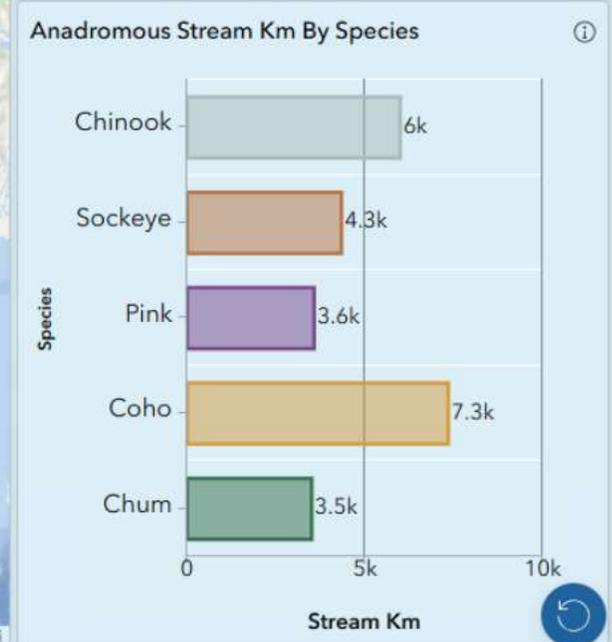
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- High (0.8 - 1.0)
- No Data



Modeled Habitat Score for Selected HUC

Habitat Score	Length km	Length %	Name
No Data	95.3	3.1	Anchorage
No Data	731.8	4.8	Matanuska
No Data	323.5	2.2	Upper Susitna River
No Data	280.7	3.2	Chulitna River
No Data	514.0	4.9	Talkeetna River
No Data	678.0	2.9	Yentna River
No Data	444.1	3.8	Lower Susitna River
Low (< 0.1)	1,764.8	56.6	Anchorage
Low (< 0.1)	13,262.7	86.7	Matanuska
Low (< 0.1)	12,708.9	87.5	Upper Susitna River
Low (< 0.1)	6,923.8	79.5	Chulitna River



Tell us how this can be useful for you!



Caveats



Field Testing

Field testing was limited to road accessed areas. Modeling might have turned out differently with inclusion of more remote sites.



NHD Plus

NHDPlus does not always reflect the reality on the ground... particularly for lower order streams underrepresented in the AWC.



AWC

AWC is an imperfect conservation tool. Different hydrography from NHD Plus makes it challenging to work with both data layers.

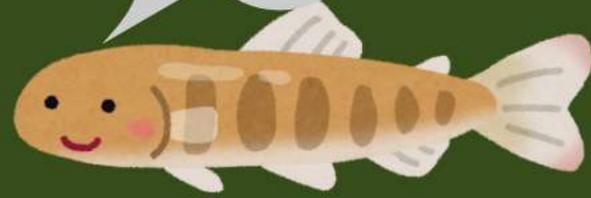
No project is perfect...
But let's make efforts efficient & interoperable for conservation goals!



Questions? Feedback?

Thank you to Dan Bogan, Spencer Johnson, Ben Americus & Cody Henrikson for help with fieldwork and to MSBSHP for funding!

You all rock!
Thanks for
helping me!



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