Priest Rapids Fish Forum

Conference Call

Wednesday, 6 May 2026
9:00 a.m. – 11:30 p.m.

FINAL MINUTES

PRFF Members

Michael Lucid, USFWS
Ralph Lampman, Keely Murdoch, YN
Nathan and Clayton Buck, Wanapum
Jason McLellan, Bret Nine, CTCR
Mike Clement, Chris Mott, Grant PUD
Tracy Hillman, Chair
Patrick Verhey, Laura Heironimus, WDFW
Melissa Peterson, Chad Brown, Ecology
Aaron Jackson, Carl Merkle, CTUIR
Steve Lewis, BIA
Pete McHugh, CRITFC

Meeting Attendees

Mike Clement, Grant PUD
Melissa Peterson, Ecology
Chris Mott, Grant PUD
Tygh Schuster, YN
Cory Kamphaus, YN
Jason McLellan, CTCR
Patrick Verhey, WDFW
Gabriella Brill, ODFW
Ralph Lampman, YN
Nate Patterson, YN
Laura Heironimus, WDFW
Joseph LeMoine, Grant PUD
Erin Harris, Grant PUD
Tim Taylor, Grant PUD
Todd Miller, WDFW
Tracy Hillman, Chair

Action Items:

- Tim Taylor will finalize the TMDL WQAP evaluation criteria with Ecology and begin evaluating temperature-related options once the criteria are approved.
- Laura Heironimus will update the White Sturgeon Spontaneous Autopolyploidy Guidance document based on recently published literature.
- Ralph Lampman will refine the juvenile lamprey source spreadsheet to identify fish collected upstream of Rock Island (or Priest Rapids as applicable), including isolating those greater than

130 mm and summarizing seasonal timing, peak migration windows, and any relevant trends in availability.

- Ralph Lampman will share CRITFC's genetic report (or supporting information) with the PRFF once available.
- Grant PUD will discuss internally whether to begin development of a draft juvenile Pacific Lamprey survival study plan based on current information, including sample size assumptions, detection design, and source fish availability.
- Ralph Lampman will confirm the reported number of adult lamprey planned to be tagged at Bonneville Dam and provide clarification if needed.

Decisions:

- The PRFF unanimously approved a one-year extension of the 2016 Statement of Agreement (Priest Rapids Project White Sturgeon Stocking Program for Population Rebuilding, Mitigation, and Enhancement SOA) to authorize White Sturgeon broodstock collection and juvenile releases, pending completion of the updated SOA.

I. Welcome and Introductions

Tracy Hillman welcomed everyone to the meeting and identified all attendees.

II. Agenda Review

The PRFF reviewed and approved the May agenda.

III. Approve April Meeting Notes

The PRFF reviewed and approved the 1 April 2026 meeting minutes.

IV. Review Action Items

The PRFF reviewed the following action items from the April meeting:

- Tim Taylor will finalize the TMDL WQAP evaluation criteria with Ecology and begin evaluating temperature-related options once the criteria are approved. **Ongoing.**
- Laura Heironimus will update the White Sturgeon Spontaneous Autopolyploidy Guidance document based on recently published literature. **Ongoing. Laura said she hopes to have the guidance document completed before the next PRFF meeting.**
- Ralph Lampman will ask Ryan Harnish (PNNL) whether they estimate juvenile lamprey losses due to predation downstream from a dam. If so, how do they estimate losses due to predation downstream from a dam? Would releasing live tagged juveniles below the dam (i.e., paired release) help estimate losses due to predation downstream from the dam? Finally, does Ryan have thoughts on using predation tags inserted into the dead fish to estimate losses due to predation downstream from a dam. **Complete. Ralph reported that he spoke with Ryan about the use of predation tags. Ryan has not used predation tags and questioned whether they would provide useful results if inserted into dead fish. Ryan was not certain the results could be generalized to live fish. Ryan indicated that PNNL is working on developing small predation tags that may be useful in survival studies. Jason McLellan commented that the goal is to**

determine the number (or proportion) of dead fish consumed by predators. Thus, it does have relevance and would possibly help assess losses of juvenile lamprey due to predation in the tailrace. Ralph said Ryan believes live fish tagged with predation tags could be released below the dam in a paired release design but was not sure whether all agents of mortality could be identified. Regarding source fish, Ryan indicated that they relied on several sources, including fish from the Yakima River. PNNL found that eyed juveniles collected from canals in fall/winter and held over to the following year had higher survival compared to run-of-river fish. There was some variability in fish released early in the season suggesting that higher survival could be related to the season rather than source of fish, but this speaks to the benefits of having different fish sources.

- Ralph Lampman will send the updated juvenile lamprey source table to Tracy Hillman for distribution to the PRFF. **Complete. The spreadsheet was sent to the group on 4 May. This will be discussed today (see Section VII).**
- The PRFF will review the sample size analyses for conducting a Pacific Lamprey juvenile survival study and be prepared to discuss study design options, including precision targets and fish sourcing strategies, at the next meeting. **Complete. This will be discussed today (see Section VII).**
- Members will review the draft Aquatic Invasive Species Control and Prevention Plan Annual Report and send their comments to Nate Dietrich by 1 April 2026. **Complete.**

V. Water Quality

Water Temperature TMDL WQAP Proposed Improvement Options – Tim Taylor indicated that there are no new updates to share with the PRFF. Melissa Peterson shared that Ecology is currently developing a technical memo to address questions from Douglas PUD regarding EPA's 2019 temperature TMDL for the Columbia and Snake rivers[1], with a focus on clarifying how Tables 6-6 through 6-10 should be interpreted. The draft technical memo will be shared with the PUD for review and comment. Following that review, Ecology plans to hold individual meetings with each PUD to discuss project specific considerations, followed by a joint meeting with all three PUDs (Grant, Chelan, and Douglas PUDs). Once finalized, the technical memo will be attached to the TMDL implementation plan, which will initiate an additional public comment period.

Other Water Quality Items – No additional water quality items were discussed.

VI. White Sturgeon

White Sturgeon Releases – Tygh Schuster reported that juvenile White Sturgeons were released successfully on 20 April 2026. A small number of fish died between tagging and release, with 5 fish lost from the Priest Rapids tank and 2 from the Wanapum tank. As a result, they released a total of 1,506 juvenile sturgeon into the project area (571 fish into Priest Rapids reservoir and 935 into Wanapum reservoir). All releases were completed on the same day and were considered successful.

White Sturgeon 2016 Statement of Agreement (SOA) – Tracy Hillman noted that the PRFF needs to discuss whether they want to extend the 2016 White Sturgeon Stocking Statement of Agreement (Priest Rapids Project White Sturgeon Stocking Program for Population Rebuilding, Mitigation, and Enhancement SOA) another year. He said the PRFF has reviewed and extended the SOA one additional

[1] U.S. Environmental Protection Agency. 2021. Columbia and Lower Snake Rivers Temperature Total Maximum Daily Load. U.S EPA, Region 10, Seattle, WA.

year each year since 2000. After reviewing the 2016 SOA with the group, Tracy asked whether the group would like to extend the SOA one additional year. All parties present agreed to extend the SOA one more year. This extension covers broodstock collection in 2026 and juvenile releases in 2027.

Referring to the December 2025 meeting notes, Tracy reminded the group that they started the process of updating the 2016 SOA. He noted that the group began the process of defining what is meant by "adult" (i.e., the size of a sturgeon at which it is considered an adult) and identifying an appropriate adult abundance target for the project area. This included a discussion on density (e.g., fish per km or fish per surface area; Ralph Lampman recommended both). The group also discussed using the LGL/Chelan PUD/CTCR model for the Priest Rapids project area. Here is a link to the model: https://analytics.lglsidney.com/chelan-sturgeon/. During the December meeting, the group identified the following next steps:

- Laura will compile adult White Sturgeon abundance and biomass data from Bonneville Reservoir. WDFW defines an adult sturgeon as >167 cm FL.
- Jason will compile adult White Sturgeon abundance and biomass data from the Rocky Reach project area.
    - For both Bonneville and Rocky Reach reservoirs, abundance and biomass will be reported as number per area (density) and weight per area (biomass).
- Jason and Laura will research effective population size (N_e) for White Sturgeon. They will evaluate whether N_e can be estimated for the project area.
- Paul will provide separate growth figures for each brood year in each of the Priest Rapids and Wanapum reservoirs. The figures will show the lengths by age, the fit of the von Bertalanffy growth curve to the data, precision of the model (e.g., PI or CI), the parameter estimates (i.e., L_∞, K, and t_0), and sample size.
- Paul will evaluate the effects of juvenile sampling gear on growth data and consider ways to incorporate data from adult sampling gear.
- Paul will generate figures showing the relationship between length classes (X-axis) and mean annual growth rates (mean cm/yr on Y-axis) for sturgeon in the project area.
    - Laura will provide Paul with an example figure.
- The Subgroup will familiarize themselves with the White Sturgeon life-cycle model.
- The Subgroup will consider different slot limits for harvest.

Tracy noted that addressing these items was tabled until the annual White Sturgeon report was complete. Now that the annual report is complete and has been submitted to FERC, the group can begin addressing these action items. Mike Clement said he will reach out to Paul Grutter and have him begin working on the items assigned to Paul. Laura noted that she provided abundance and biomass data for sturgeon in Bonneville pool. Jason noted that he provided a paper on effective population size. Both Jason and Laura will work on effective population size in the project area. Tracy said the PRFF will discuss this work during the June meeting and determine whether they want to reconvene the White Sturgeon Subgroup.

White Sturgeon Broodstock Collection – Joe LeMoine reported that White Sturgeon broodstock collection is scheduled to begin the following Monday (11 May) and will continue Monday through Friday for two weeks (end on 22 May). Collection activities will occur downstream of McNary Dam using

two boats, with crews working to achieve the target 6x6 broodstock matrix. Captured broodstock will be transported to the Yakama Nation Sturgeon Hatchery for spawning.

White Sturgeon Movement and Habitat Use in John Day Reservoir Presentation – Gabriella Brill (ODFW) presented results from a long-term telemetry study examining adult White Sturgeon movements and habitat use in the John Day reservoir and McNary Dam tailrace (see Attachment 1). Her research, which builds on a multi-year thesis project, uses acoustic telemetry to better understand adult behavior, habitat selection, and potential factors contributing to observed recruitment failure in the reservoir. Her findings show that adult White Sturgeons are primarily sedentary, spending most of their time in holding behaviors, but also exhibit seasonal and individual variability in movement patterns. The John Day reservoir habitat was used more extensively by both males and females than previously understood, including during warmer periods, suggesting site fidelity and behavioral flexibility. Fine-scale telemetry in the McNary Dam tailrace confirmed that both males and females occupy this assumed spawning habitat during spawning periods, with overlapping core use areas concentrated in the upstream tailrace. While spatial overlap suggests spawning potential, the absence of observed young-of-year limits confirmation of spawning events. Ongoing and future analyses will integrate temperature, flow, and other environmental variables to better evaluate spawning, foraging, and thermal refuge behavior.

Jason McLellan asked whether the same fish were included in the fine-scale McNary tailrace analysis across both study years. Gabriella responded that all 23 fish included in the 2023 fine-scale study were also detected and included in the 2024 data set. Jason also asked whether the reproductive condition of the tagged fish was known and whether observed movements could be directly linked to spawning activity. Gabriella explained that reproductive condition was assessed at tagging, but because White Sturgeon do not spawn annually and no young-of-year have been observed, movements were interpreted cautiously and not definitively classified as spawning behavior.

Laura Heironimus commented on the potential value of exploring whether male movements may be responding to female movements or interactions. Gabriella noted that sex-specific interactions are of interest and may be explored further using fine-scale telemetry and future modeling approaches.

Ralph Lampman asked whether substrate differences within the tailrace could help explain habitat use or movement patterns. Gabriella responded that substrate data have been collected but are still under review, and incorporating substrate information is a future goal to help interpret observed behaviors. Ralph also asked whether water temperatures reached stressful levels during the study period. Gabriella confirmed that high-temperature years occurred during the study and noted that temperature is a key variable being incorporated into both reservoir-scale and fine-scale movement analyses.

The PRFF thanked Gabriella for the presentation and noted the value of her work to the PRFF.

Other White Sturgeon Items – No additional White Sturgeon items were discussed.

VII. Pacific Lamprey

Juvenile Pacific Lamprey Survival Studies – Tracy Hillman reminded members that during the last PRFF meeting, based on information provided by Dave Robichaud, they discussed precision (standard error or SE) of a survival estimate and the number of fish needed to conduct a valid survival study. He also reminded members that they previously supported survival studies conducted at the scale of the dams and the use of the Virtual Release/Dead-Fish Correction (ViRDCt) model. The action items from the last meeting were to seek feedback from PNNL on the use of predation tags, which Ralph addressed under review of Action Items, review the presentation Dave Robichaud gave on estimating sample sizes for a ViRDCT-based juvenile lamprey survival study, and for Ralph to update the juvenile lamprey source

spreadsheets. Ralph updated the spreadsheets and they were distributed to the PRFF on Monday, 4 May. Tracy asked Ralph to describe the information contained in the updated spreadsheets.

Ralph Lampman first walked through the Daily Lamprey Collection and Condition Data spreadsheet, which summarizes data from the Fish Passage Center (FPC) monitoring sites (Brandon Chockley [FPC] provided the data). He indicated that these sites are the mainstem facilities involved in monitoring juvenile lamprey. Ralph clarified the life-stage labels used in the spreadsheet: AP = larval lamprey (ammocoetes) and MP = juvenile lamprey (macrophthalmia). The spreadsheet includes raw sample data beginning in 2011, condition data such as length, weight, and injuries, and graphs that aggregate counts across monitoring sites. Ralph noted that juvenile lamprey counts were relatively high in recent years, approaching 15,000 juveniles last year (combined counts at Bonneville, McNary, Little Goose, and Lower Granite dams). Although trends vary by site and are not synchronized, the overall pattern suggests an upward trend compared with the low point around 2015. Ralph indicated that Lower Granite stands out as having a very large increase in larval numbers beginning around 2020. Ralph distinguished between sample numbers (fish handled by staff) and estimated collected numbers (extrapolated totals based on sampling rates).

Ralph also discussed the fish condition data in the spreadsheet. Fish condition monitoring includes the number of fish sampled for length and weight, monitoring site counts by year, and descriptive statistics (mean, minimum, and maximum size information). He noted that mean juvenile lengths are generally around 135-145 mm, with most near 140 mm. Unlike juveniles, lengths of lamprey larvae are more variable (the smallest around 44 mm); some larvae can be larger than juveniles. Ralph pointed out that juvenile lengths appear to show a declining trend, while juvenile weights appear relatively stable. Larval size appears to depend on sampling location. For example, larvae seem somewhat smaller at Bonneville Dam and are larger at John Day Dam. Ralph said a possible reason why juveniles are not always larger than larvae is because during transformation the fish stop feeding and may lose weight. Ralph also noted that there are no data for Rock Island Dam after 2021 as Rock Island is no longer a data collection site under Fish Passage Center's Smolt Monitoring Program.

Ralph then walked through the Juvenile Lamprey Source Information and Number Summary spreadsheet. This spreadsheet focuses on sources of juvenile lamprey for a survival study. As before, sources are ordered by how far upstream they are from specific dams. The spreadsheet includes a juvenile table from 2022 through the most recent year and totals for all source locations combined, mainstem collection only, and fish upstream from Rock Island Dam, Rocky Reach Dam, and Wells Dam. Ralph said that when all sources are combined, recent years show totals in the 5,000-10,000 range. If we look at mainstem locations, totals are lower but up to about 5,000 fish. Ralph noted that the lower Methow site is a major source of fish with a total of over 2,500 juveniles last year. The number of fish captured at this site is one of the reasons why total numbers have increased recently. Because of the observed pattern of larvae and juvenile captures, Ralph believes larvae may provide an early indicator of future juvenile output.

Ralph emphasized that these datasets are important for identifying viable source fish, particularly upstream of Priest Rapids, which is a key focus for tagged fish in a future survival study. Mike Clement suggested some additional refinements to the source spreadsheet to better support study planning, including identifying fish greater than 130 mm, summarizing seasonal timing and peak migration windows, and narrowing datasets to locations most relevant to Grant PUD's project area. Seasonality was noted as variable but generally concentrated in spring (March–May), with possible secondary movement during summer depending on flow conditions. Mike questioned whether increasing trends in juvenile abundance upstream might be linked to translocation efforts. Ralph confirmed that recent increases are largely attributed to translocation programs. He said he will share CRITFC's genetic results

that indicate the vast majority (80-90%) of lamprey collected at the lower Methow trap are from translocated adults.

Tracy Hillman noted that many of the Pacific Lamprey subgroup's earlier "must have" elements such as sample size estimation, potential source fish identification, and general study design considerations are largely in place. Based on feedback from members, he recommended that Grant PUD begin assembling a draft study plan to organize assumptions, identify data gaps, and provide a framework for iterative refinement. This would include incorporating modeled sample size scenarios (e.g., ~2,300 fish under conservative assumptions), considering detection system layout, and outlining potential fish sources. Mike, however, expressed caution about moving too quickly, citing key uncertainties that remain. These uncertainties include limited confidence in juvenile fish availability upstream and concerns about the reliability of ATS's Eel/Lamprey Acoustic Tags (ELAT), which could pose a significant risk to study feasibility if activation rates remain low. While acknowledging that internal discussions could begin, Mike indicated that these uncertainties may constrain near-term progress. Tracy responded that a draft study plan is not a commitment to implementation in the near-term, but rather a tool to clarify needs and guide next steps, noting that an actual study is likely still one to two years out.

Tracy noted that progress is being made and that continued refinement of source fish data and internal discussions at Grant PUD will help determine next steps. Additional considerations include exploring alternative fish collection methods (e.g., trapping in canal systems), tracking seasonality more precisely, and evaluating emerging tools and technologies. Overall, the PRFF is transitioning from information gathering toward preliminary study planning, while acknowledging remaining uncertainties.

Ralph asked whether Grant PUD conducts early season testing (like Chelan PUD's salmon test releases) to support study readiness. Mike explained that Grant has already conducted extensive bypass testing over multiple years and uses those results to guide operations rather than performing new annual test releases.

Grant PUD Adult Trapping Efforts in 2026 – Mike Clement outlined Grant PUD's planned adult Pacific Lamprey trapping activities for the 2026 season, which are structured around existing mitigation requirements (2018 Grant PUD Adult Lamprey No Net Impact SOA) and inter-utility agreements. Grant PUD plans to conduct four weeks of trapping to fulfill its own mitigation obligations, with an additional four weeks of trapping conducted on behalf of Douglas PUD in support of their study needs under a memorandum of understanding.

Mike emphasized that Grant PUD's mitigation is effort-based, meaning the number of fish collected is dependent on what can be captured during the scheduled trapping period rather than a fixed target number of fish. In contrast, Douglas PUD's effort is tied to a specific study objective, with an approximate goal of collecting around 500 adult lampreys to support a telemetry study. The trapping season is expected to begin in mid-July, consistent with typical operational timing.

Mike asked about adult lamprey tagging activities in the lower Columbia River. Ralph Lampman indicated that a relatively low number of adult lamprey (about 75 fish) may be tagged at Bonneville Dam by the Warm Springs Tribe in 2026. Based on past experience and low detection rates, Mike indicated that Grant PUD may choose not to activate or maintain its HDX detection equipment if tagging numbers remain minimal, as doing so may provide insufficient detections to justify the effort. The group acknowledged this limitation and confirmed that no additional downstream tagging efforts were currently planned beyond Bonneville Dam.

Other Pacific Lamprey Items – Ralph Lampman provided several general updates. He highlighted that BPA funding for projects that benefit lamprey is currently open for proposals through late June, with approximately $329,000 available for projects within the Columbia Basin. In contrast, the Nation Fish

Habitat Partnership funding may be delayed due to administrative issues, and there is a possibility that previously selected projects will be offered funding later instead of opening a new solicitation cycle. Ralph also shared updates on upcoming coordination and information-sharing opportunities. The Information Exchange is expected to be held as a virtual meeting later in the year, with organizers seeking input on topic areas of interest. Additionally, a recently developed "StoryMap" created through the PLCI program was highlighted as a useful resource showcasing cultural context, conservation challenges, and regional lamprey efforts.

Ralph identified upcoming Regional Management Unit (RMU) meetings. He said the Upper Columbia RMU meeting was held in April and included presentations and discussion summaries distributed to participants. These materials include updates from tribal partners and work related to artificial propagation efforts. Ralph encouraged participants to review the materials.

VIII. Administration

In-Person Meeting – Tracy Hillman reported that the Aquatic Settlement Work Group (ASWG) is planning an in-person meeting on Tuesday, 4 August 2026. As discussed during the last meeting, the PRFF agreed to meet with the RRFF and ASWG on the same day at Wells Dam. Because 4 August falls on a Tuesday, and the PRFF meets on Wednesday, Tracy asked whether members would be okay to meet on Tuesday rather than Wednesday in August. Members present agreed to meet on Tuesday, 4 August at Wells Dam. The meeting will coincide with the adult lamprey passage studies conducted at Wells Dam. Tracy will provide more information as we get closer to the meeting date.

IX. Adjourn

With no additional business to discuss, Tracy Hillman adjourned the meeting at 11:30 pm.

X. Next Meeting

The next meeting of the PRFF will be on Wednesday, 3 June 2026.

Attachment 1

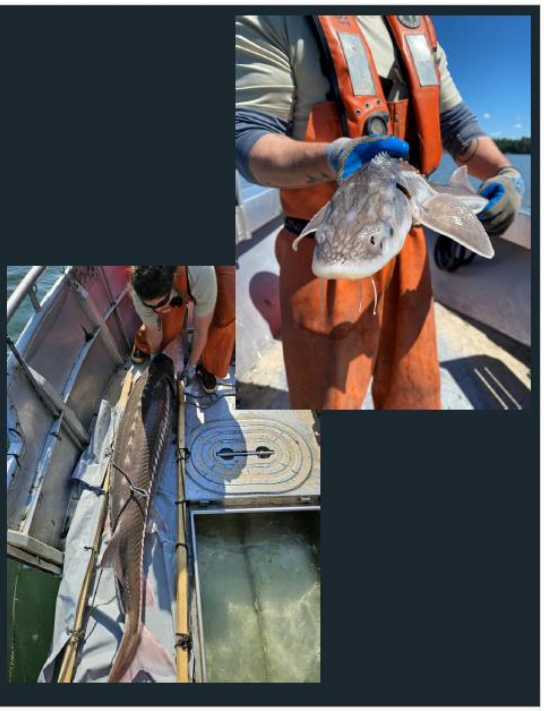
Presentation by Gabriella Brill on White Sturgeon Movement and Habitat Use in John Day Reservoir

Why this study?

- Largest of lower Columbia River reservoirs
- A large amount of sexually mature individuals
- Adult mortalities during periods of increased water temperatures
- Observed recruitment failure

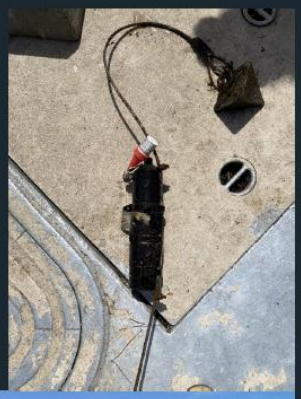
Range Movement and Behavior

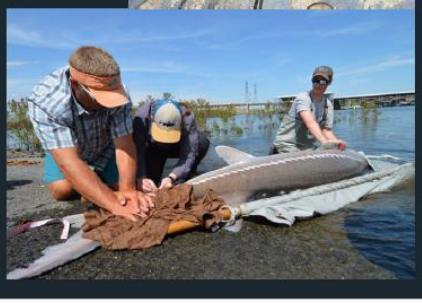
- Knowledge gaps in behaviors and specific habitat use
- Define behaviors and habitat use by adult white sturgeon in the John Day Reservoir
- Determine if phenotypic and temporal variables influence occupation time in behavioral states and habitat use
- Identify differences between movements of males and females



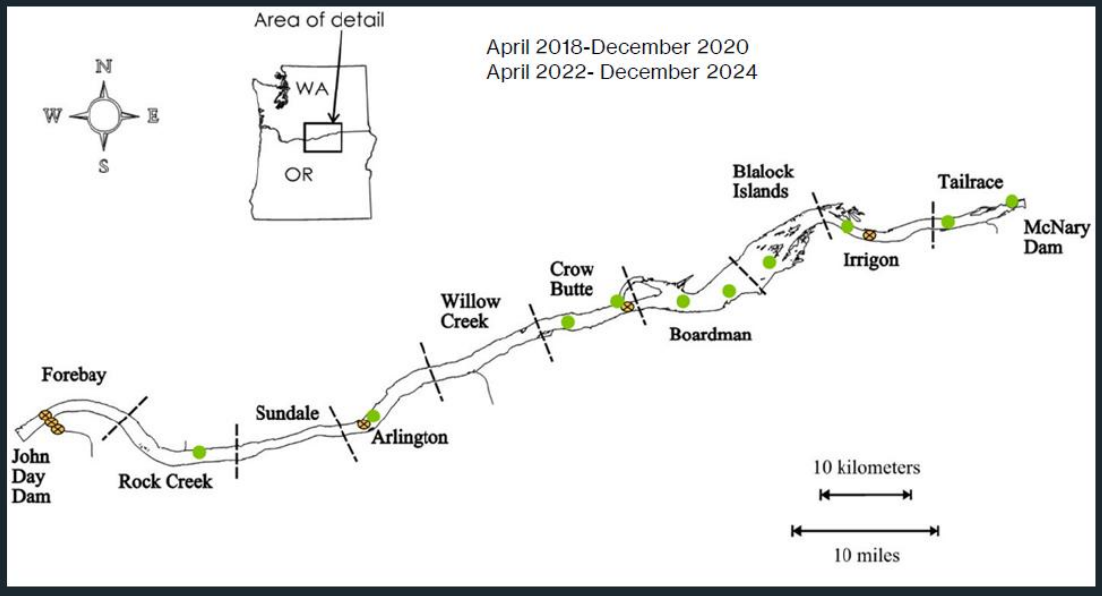
Range Movement Data Collection

- 58 fish were tagged in 2018-2021 with 69kHz acoustic transmitters
- Biological data collected for sex-specific analysis
- Daily detection data from two different study periods:
  - April 2018-December 2020
  - April 2022-December 2024





Range Movement Data Collection



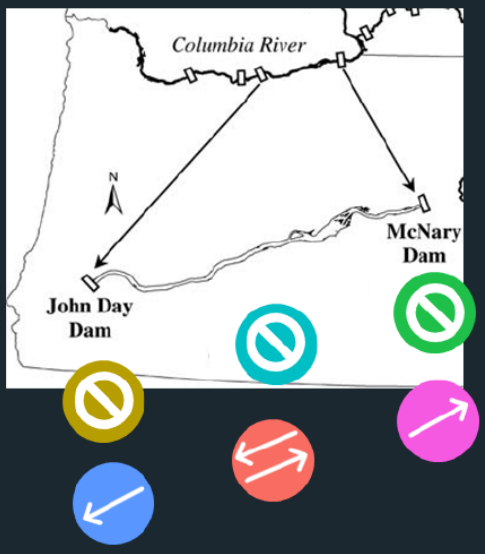
Range Movement Behavioral Classification

- Assessed detection data for quality
- Individual movement variables for each annual dataset consisted of:
  - Daily average River Kilometer (RKM)
  - Daily directionality
  - Daily speed (km/h)
  - Daily movement variance ("daily activity")

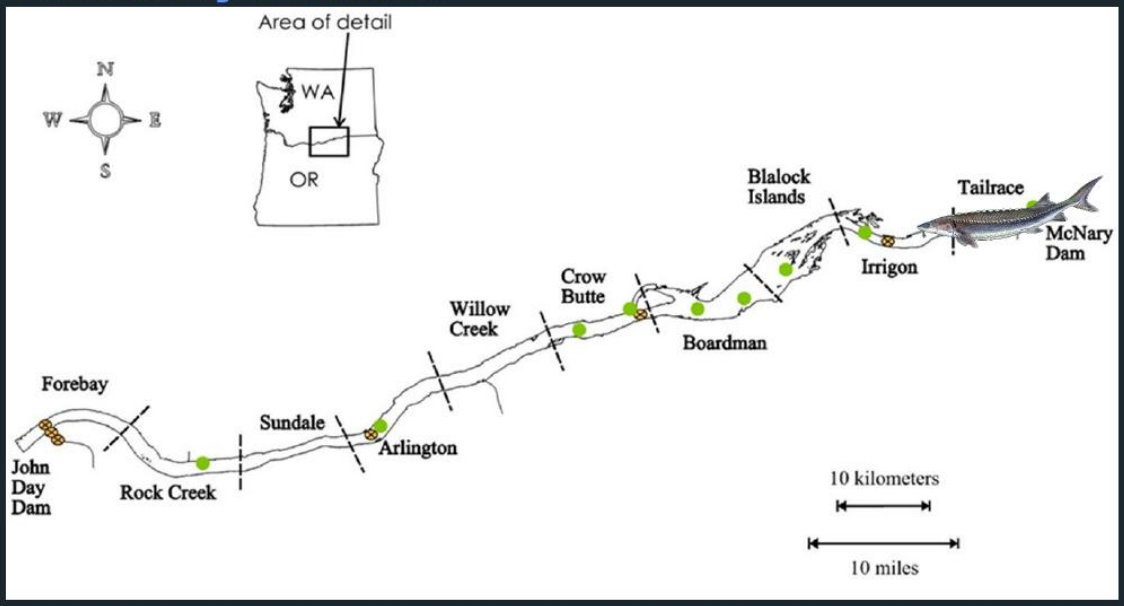
ID	Sex_Code	Sex	FL_cm	Julian_Day	Mean_RKM	Movement_Var	Directionality	Mean_Speed_Kmh
5478	M5	Male	221	228	443	0	0	0
5478	M5	Male	221	229	444.2778	0.967387	0	1.7976931
5478	M5	Male	221	230	443	0	0	0
5478	M5	Male	221	231	458.6429	11.75419	25	0
5478	M5	Male	221	232	468	0	0	0

Range Movement Behavioral Classification

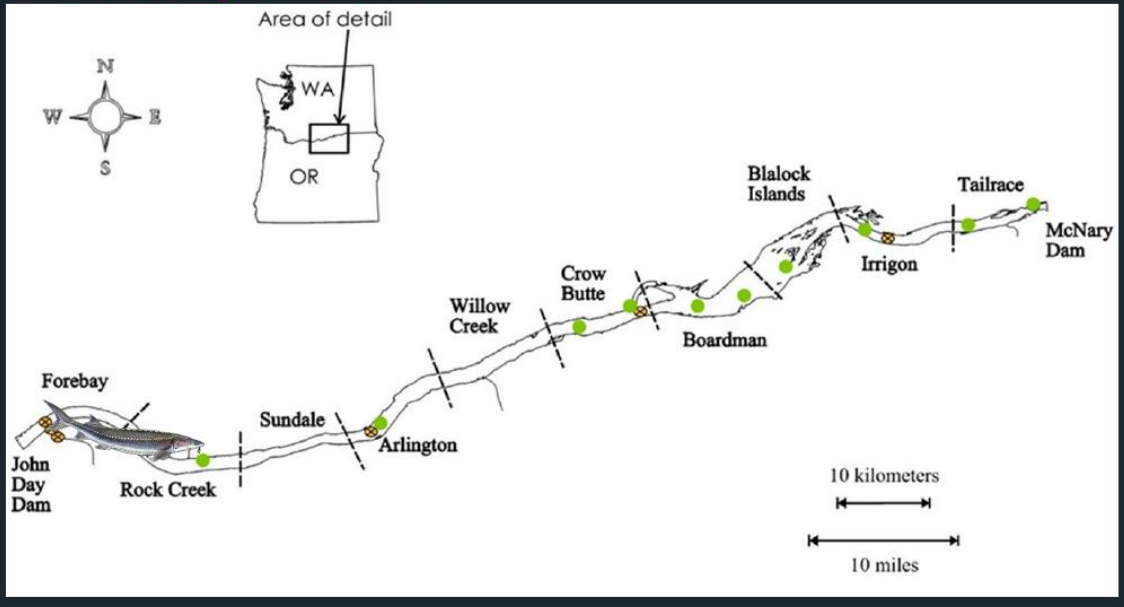
- The Six Behavioral States:
  - Holding in McNary
  - Holding in John Day
  - Holding in River
  - Transitory Upstream
  - Transitory Downstream
  - Exploratory



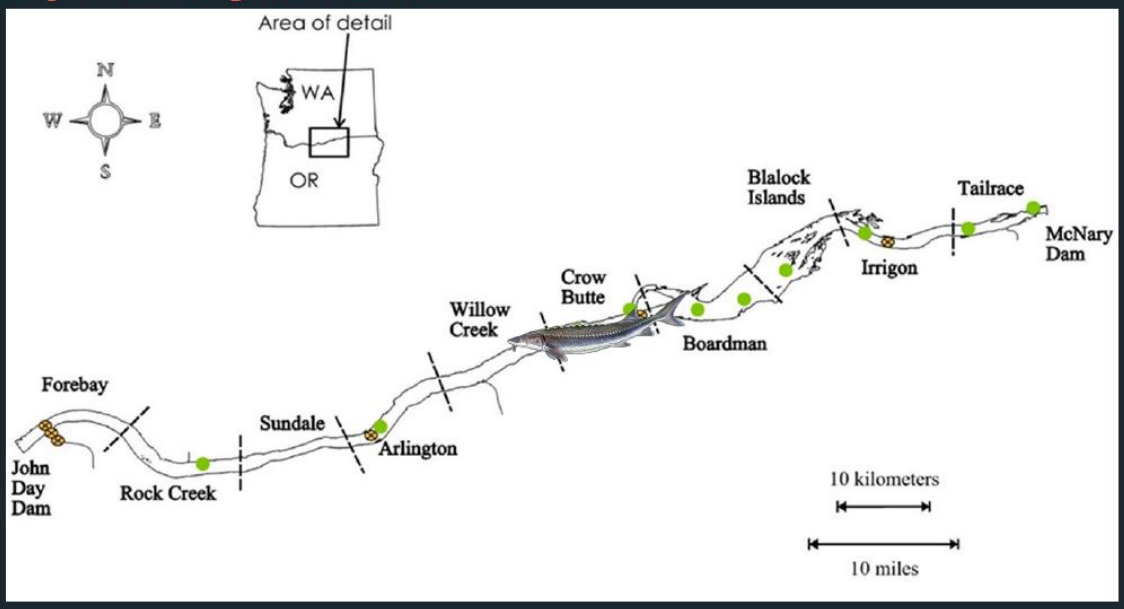
Transitory Behavior



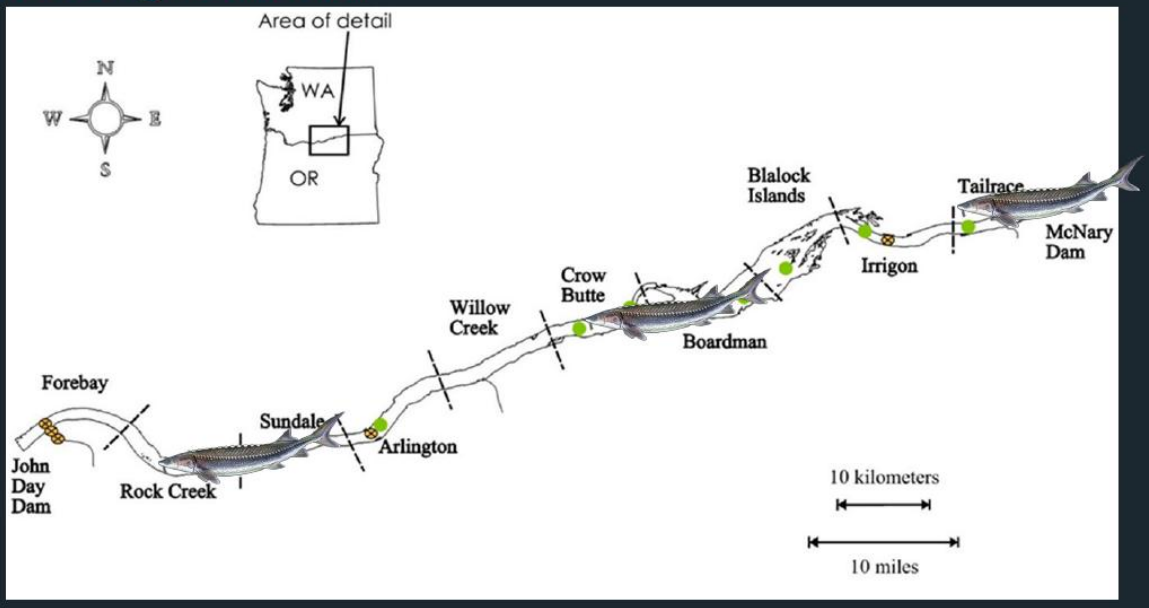
Transitory Behavior



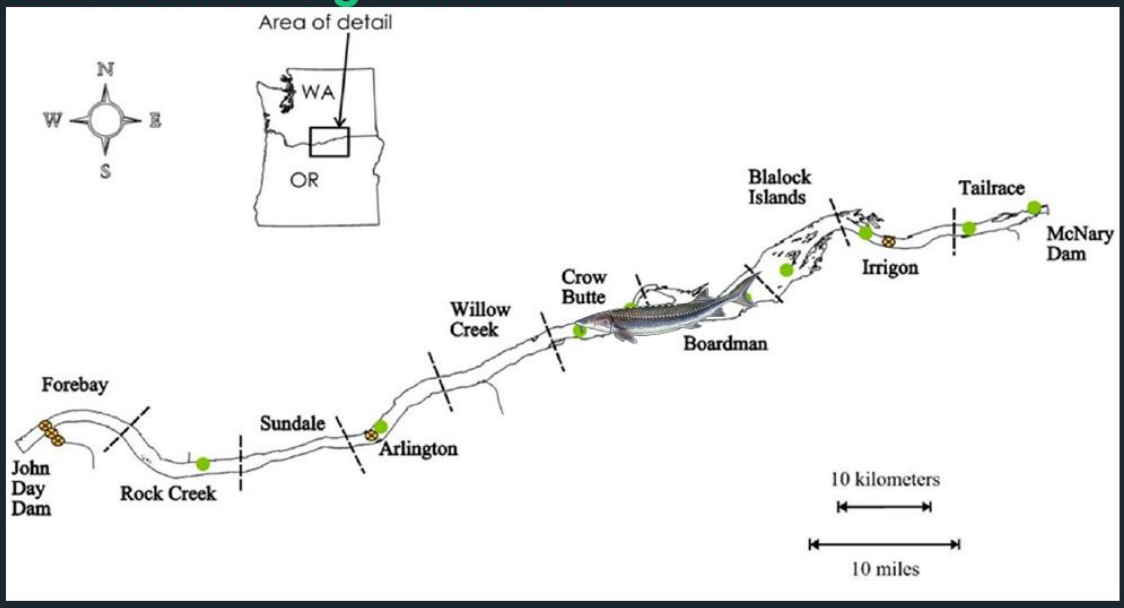
Exploratory Behavior



Holding Behavior



State Switching Behavior



Behavioral State Classifications -2022

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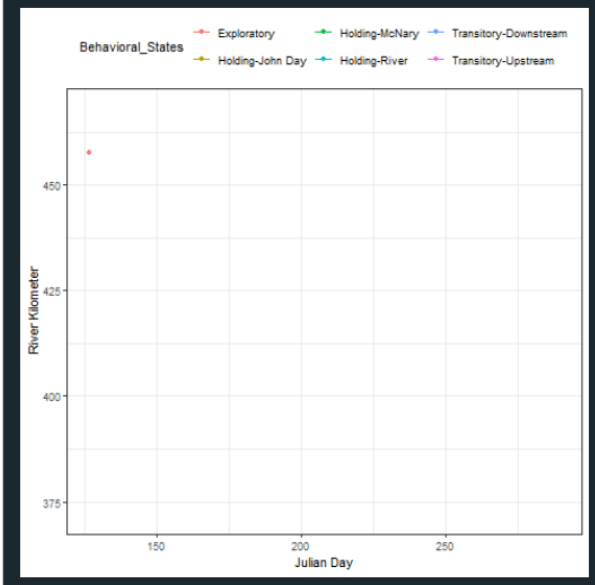
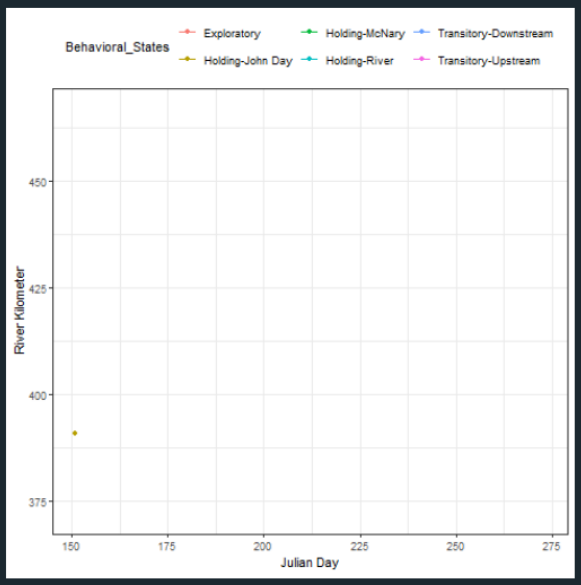
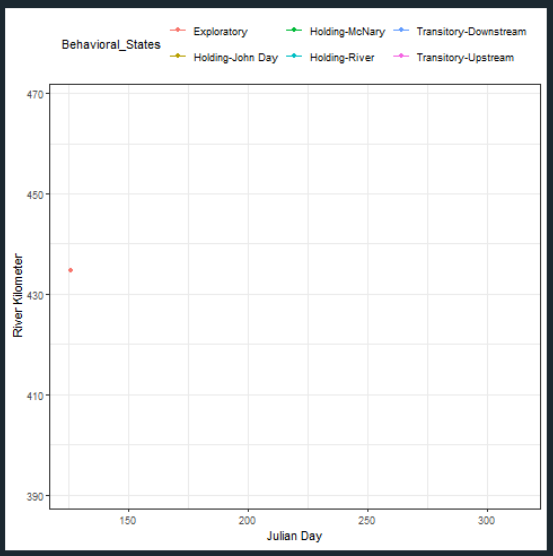
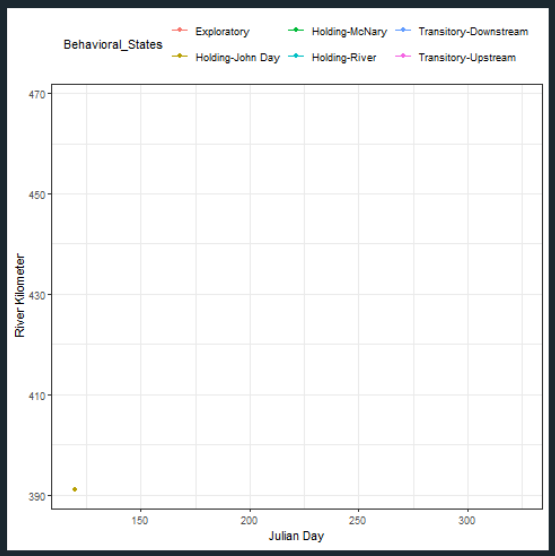


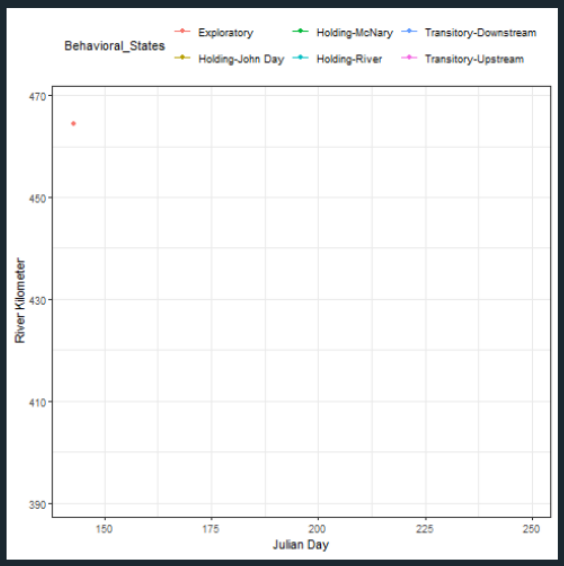


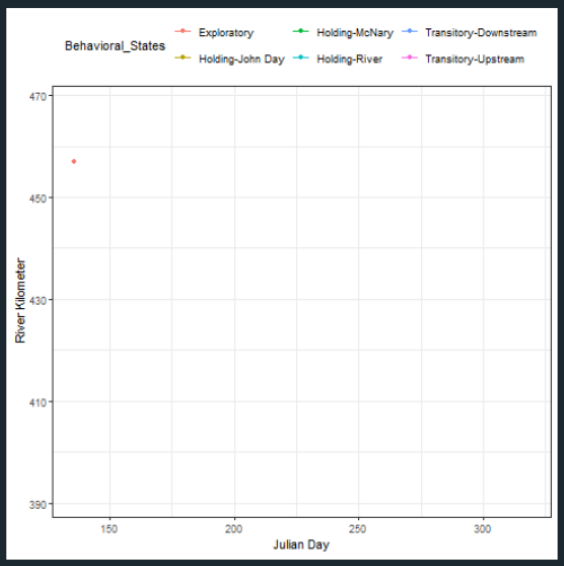
Behavioral State Classifications -2022

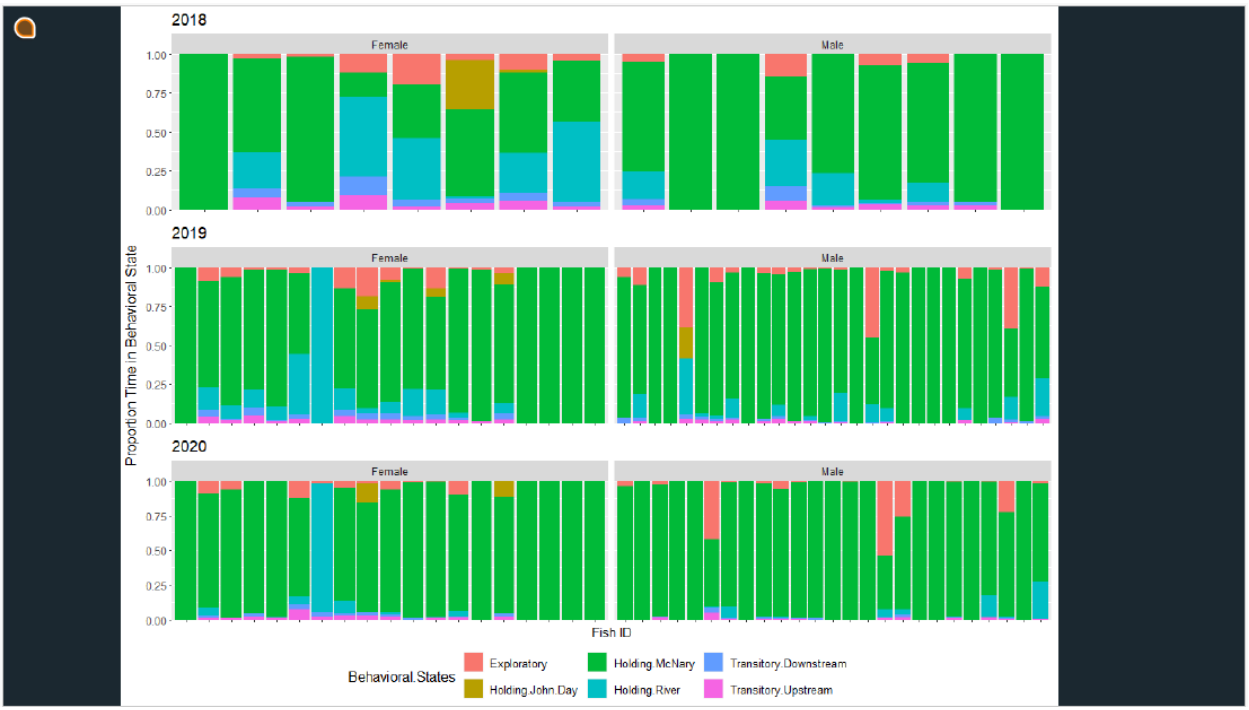




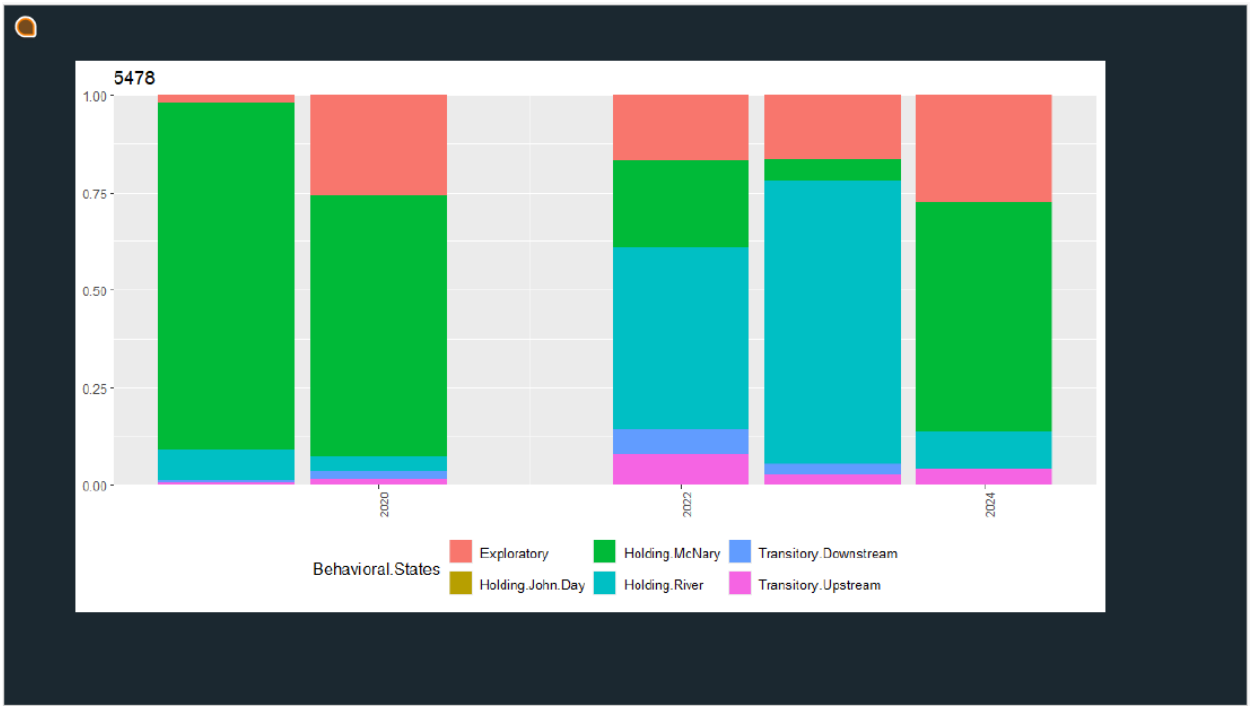
Behavioral State Classifications -2022





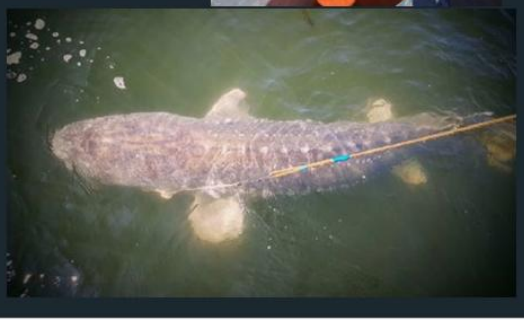



2022
2023
2024
Female
Male
Proportion Time in Behavioral State
1.00
0.75
0.50
0.25
0.00
Fish ID
Behavioral.States
Exploratory
Holding.John.Day
Holding.McNary
Holding.River
Transitory.Downstream
Transitory.Upstream


5478
1.00
0.75
0.50
0.25
0.00
2020
2022
2024
Behavioral.States
Exploratory
Holding.John.Day
Holding.McNary
Holding.River
Transitory.Downstream
Transitory.Upstream

Range Movement Data Analysis

- General Linear Mixed Model (GLMM) to evaluate occupation time in behavioral states (response variable)
- Fixed Effect (predictor variables):
  - Sex
  - Size (Fork Length)
  - Year
- Random Effect: Fish ID
- Two Sets of Models for Each Time Period



Drivers of Proportion Time: Period 1

- Larger fish less likely to engage in exploratory behavior
- Transitory behavior was correlated with a year-sex interaction
  - Time in Transitory behavior differed by year
  - Females more likely to engage in transitory behavior
- All fish were less likely to hold in John Day and hold in River across all years (2018-2020)
- All fish were 7 times more likely to hold in McNary in 2018, 2 times as likely in 2019, and 4 times more likely in 2020

Behavioral State	Covariates	AICc
Exploratory	Size	544.97
Transitory	Sex + Year	442.95
Holding in John Day	Year	99.74
Holding in River	Year	516.25
Holding in McNary	Year	698.82

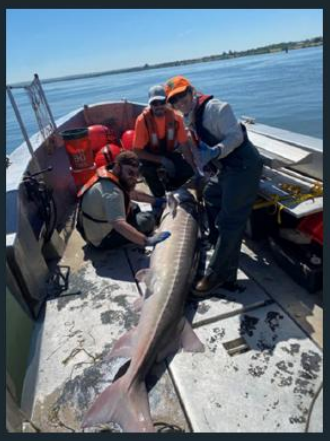
Drivers of Proportion Time: Period 2

- Exploratory behavior was correlated to sex and size interaction
  - Males of a larger size were almost 3 times more likely to engage in this behavior
- Fish were more likely to engage in transitory behavior in 2023
- Fish were equally likely to hold in the John Day in 2024
- Holding in River and McNary was correlated to Year-size interaction
  - Fish were more likely to hold in River in 2023, with smaller fish having a stronger likelihood
  - Fish were more likely to hold in McNary in 2024, with larger fish having a stronger likelihood

Behavioral State	Covariates	AICc
Exploratory	Sex*Size	527.89
Transitory	Size	429.22
Holding in John Day	Year	182.30
Holding in River	Year + Size	554.73
Holding in McNary	Sex + Year	622.01

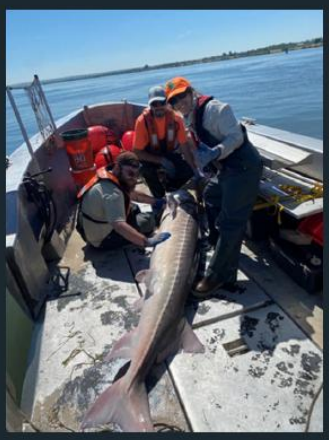
Key Takeaways

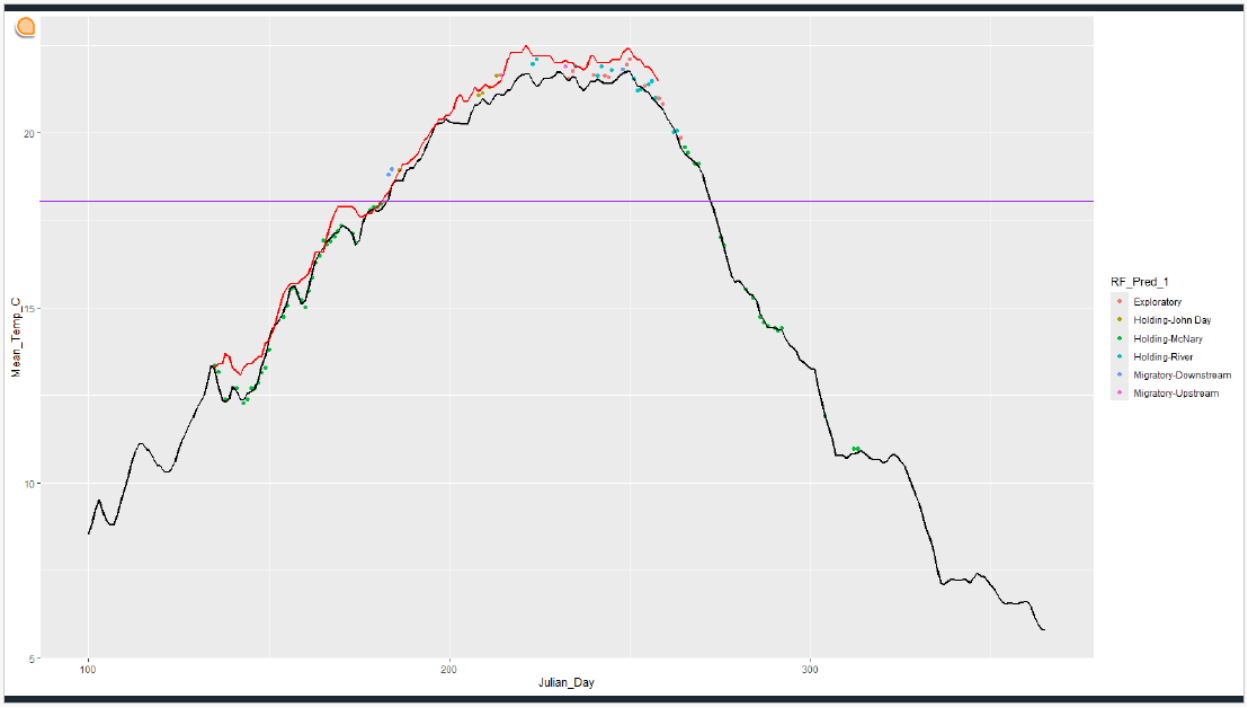
- Majority of occupation time in Holding behavioral states
- JDA had extensive use by both males and females
  - Site fidelity and thermal plasticity
- River habitat used as both holding and intermediary habitat
- Exploratory state in both JDA and River-as state switching occurred in both



Key Takeaways

- Nearly all fish engaged in Exploratory and Transitory behavior
- Increased activity during warmer months
- Sex-specific occupation of behavioral states
  - Females exhibited more transitory behavior
  - Males exhibited more exploratory behavior



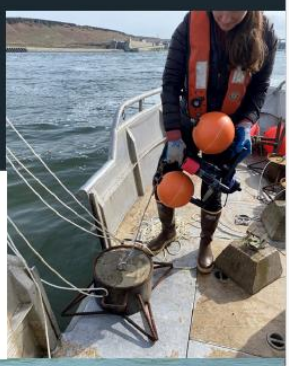


McNary Habitat Space Use

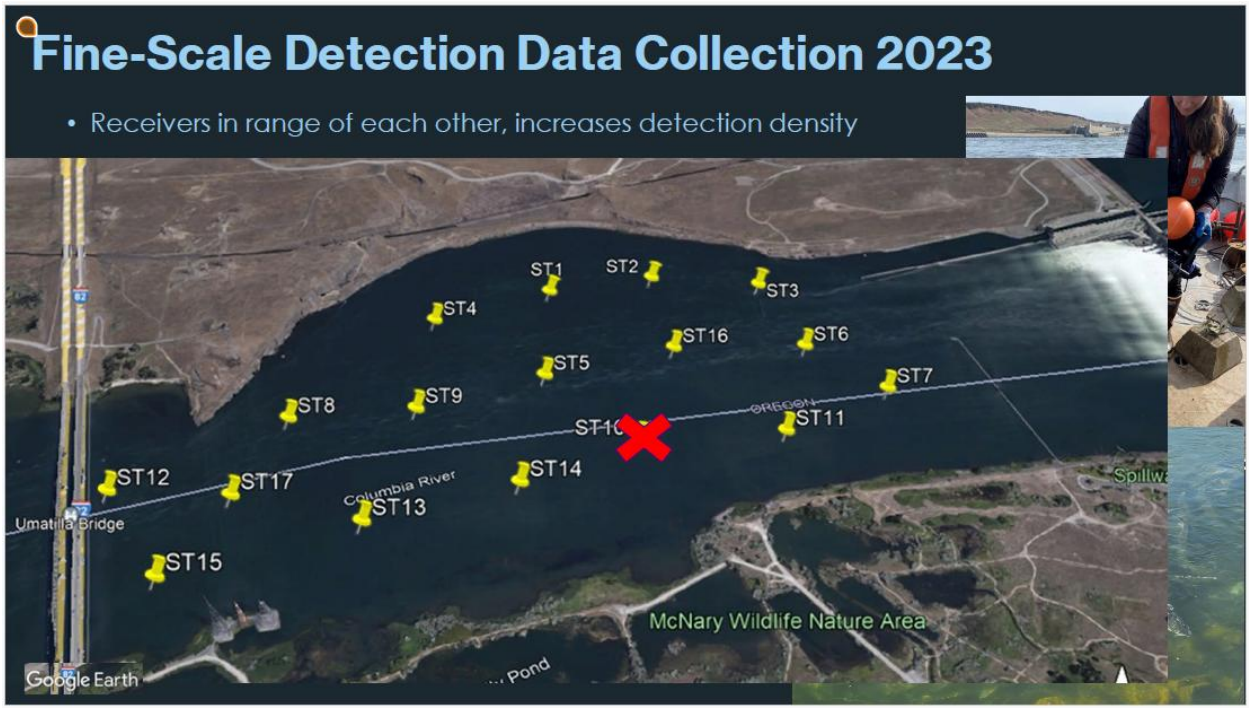
- Observed recruitment failure in the John Day Reservoir
- Determine if female and male adult white sturgeon were present in the McNary Dam tailrace habitat during the assumed spawning period
- Identify spatio-temporal overlap during spawning and non-spawning periods

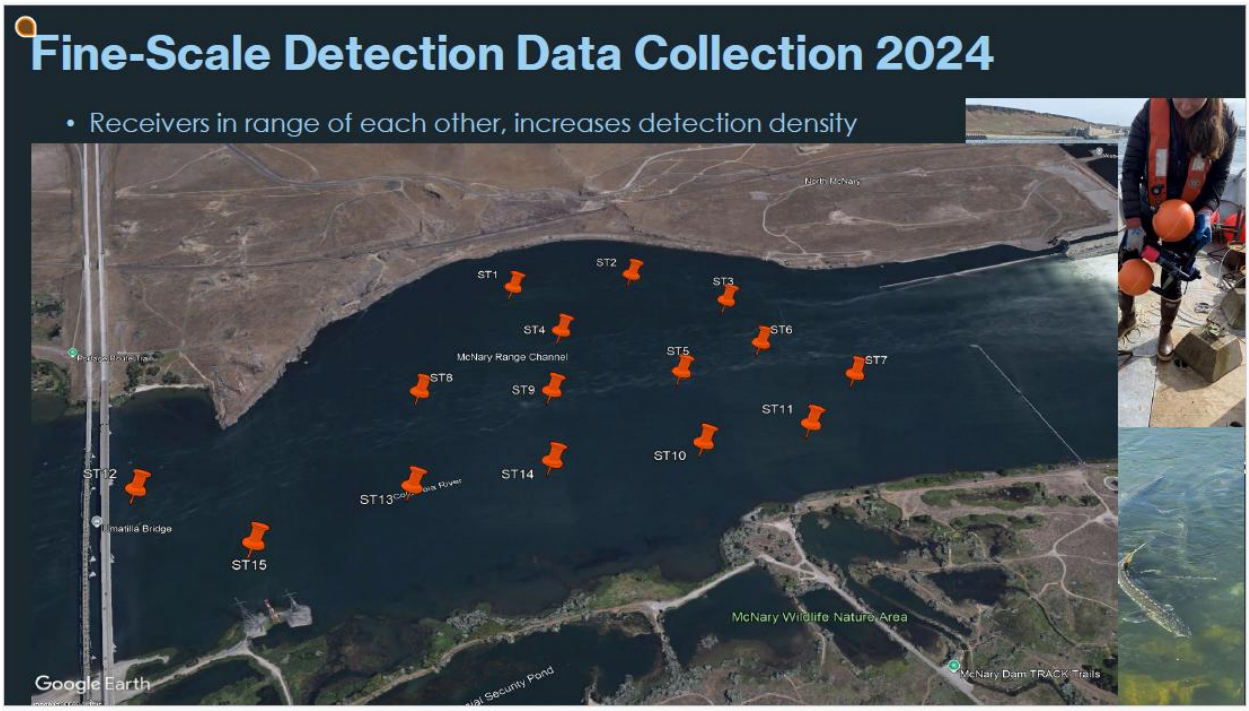
Fine-Scale Detection Data Collection

- From April 26-September 24, 2023
- April 24-October 2, 2024
- 23 of the previously tagged fish
- 15/16 subsurface receivers in McNary Dam tailrace
  - Configuration confirmed with Range Testing



Fathom Position

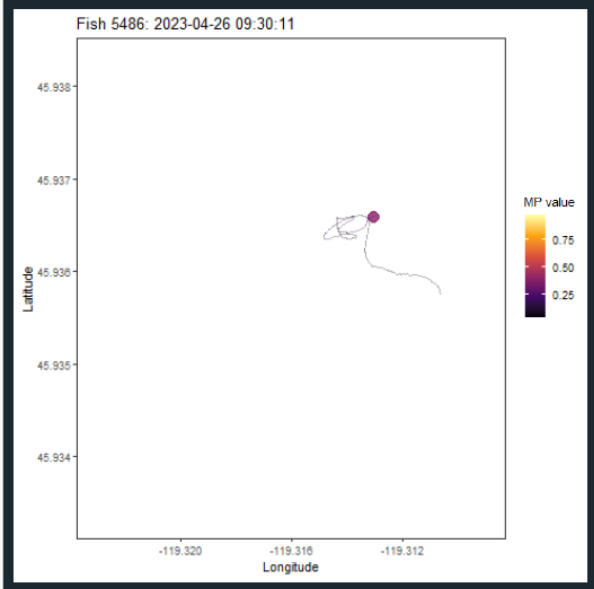

Fine-Scale Detection Data Collection 2023
• Receivers in range of each other, increases detection density
ST1
ST2
ST3
ST4
ST16
ST6
ST5
ST7
ST8
ST9
ST11
ST12
ST17
Columbia River
ST13
ST14
ST15
Umatilla Bridge
McNary Wildlife Nature Area
Google Earth

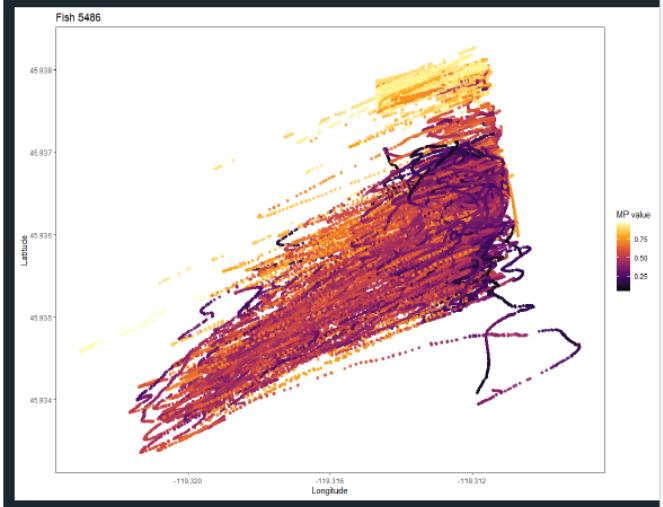

Fine-Scale Detection Data Collection 2024
• Receivers in range of each other, increases detection density
ST1
ST2
ST3
ST4
ST6
McNary Range Channel
ST5
ST7
ST8
ST9
ST11
ST10
ST12
ST13
ST14
ST15
Umatilla Bridge
McNary Wildlife Nature Area
McNary Dam TRACK Trails
Google Earth

Fine-Scale Detection Data Analysis

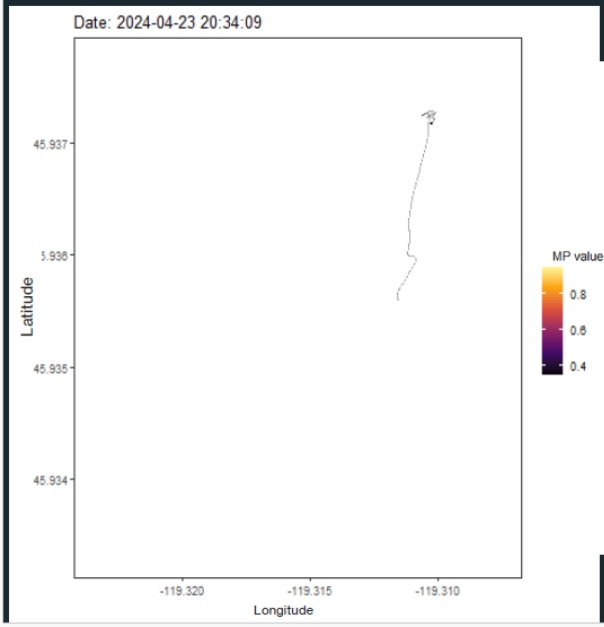
- Generated location estimates with a Correlated Random Walk(CRW) state-space model
- Joint movement persistence model to analyze activity
  - Movement Persistence (MP) accounts for autocorrelation between directionality and speed

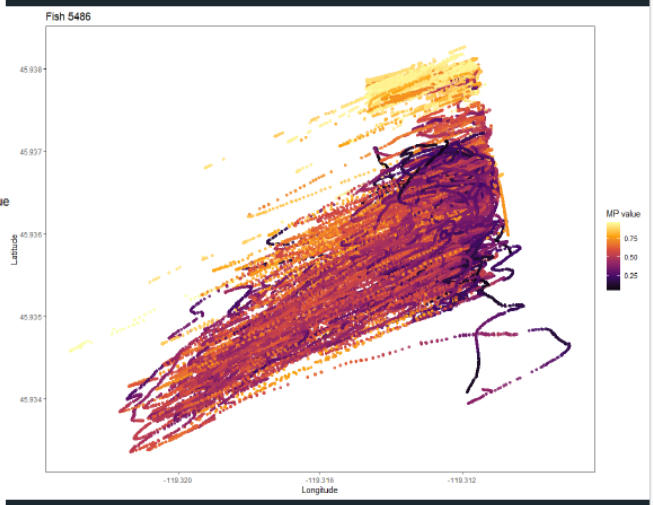
Example of Movement Persistence



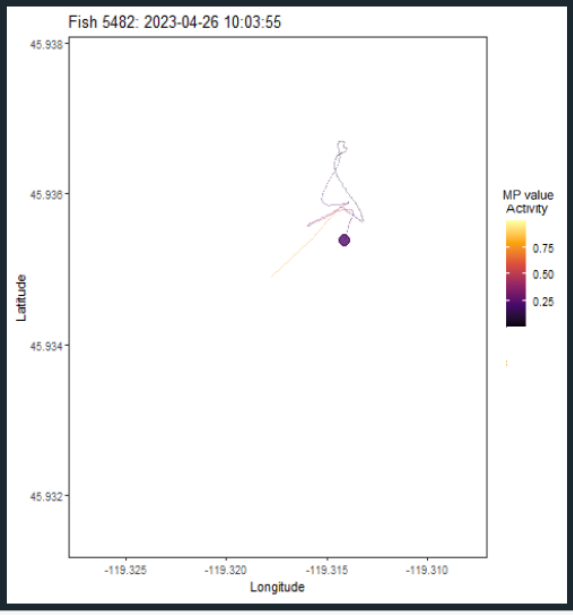


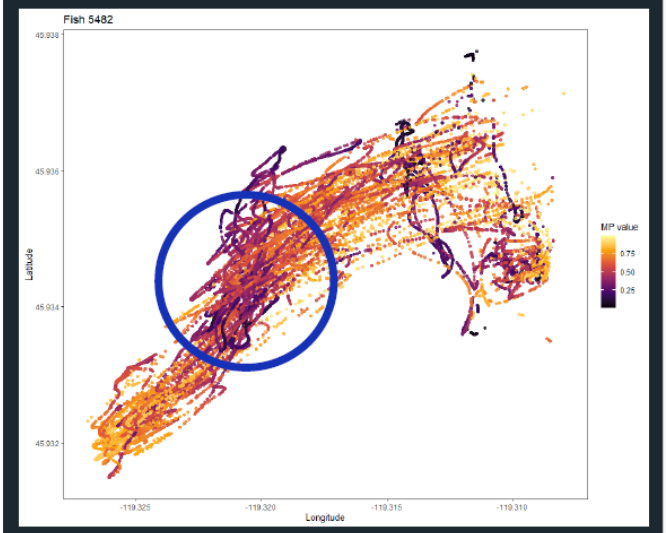
Example of Movement Persistence



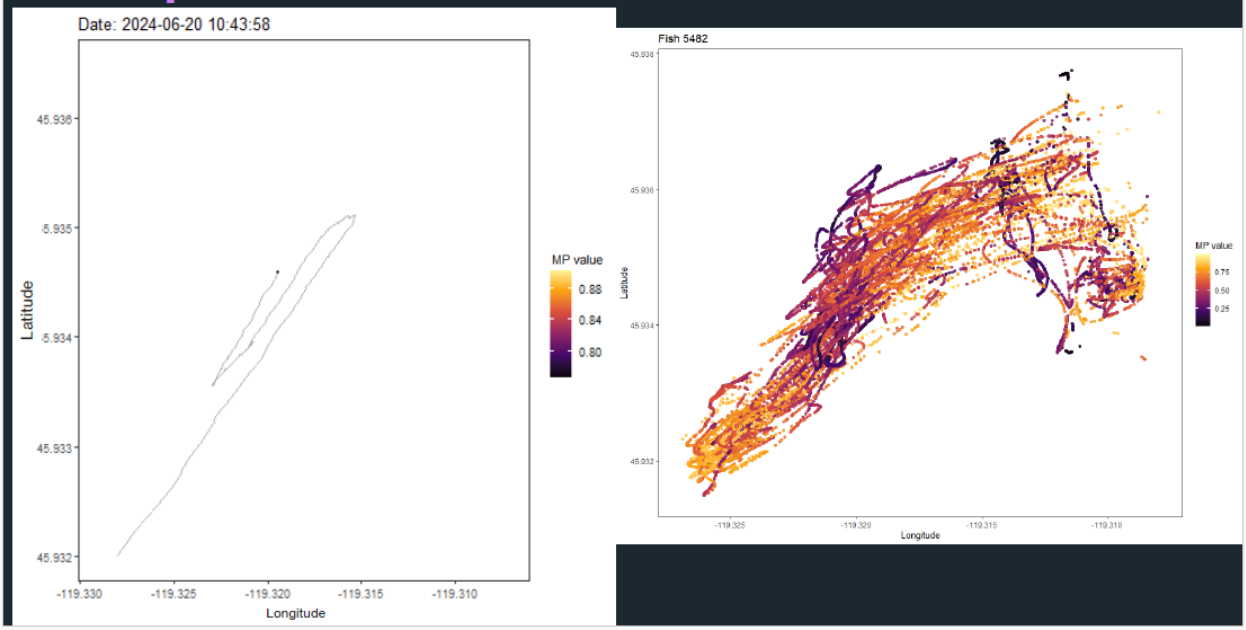


Example of Movement Persistence



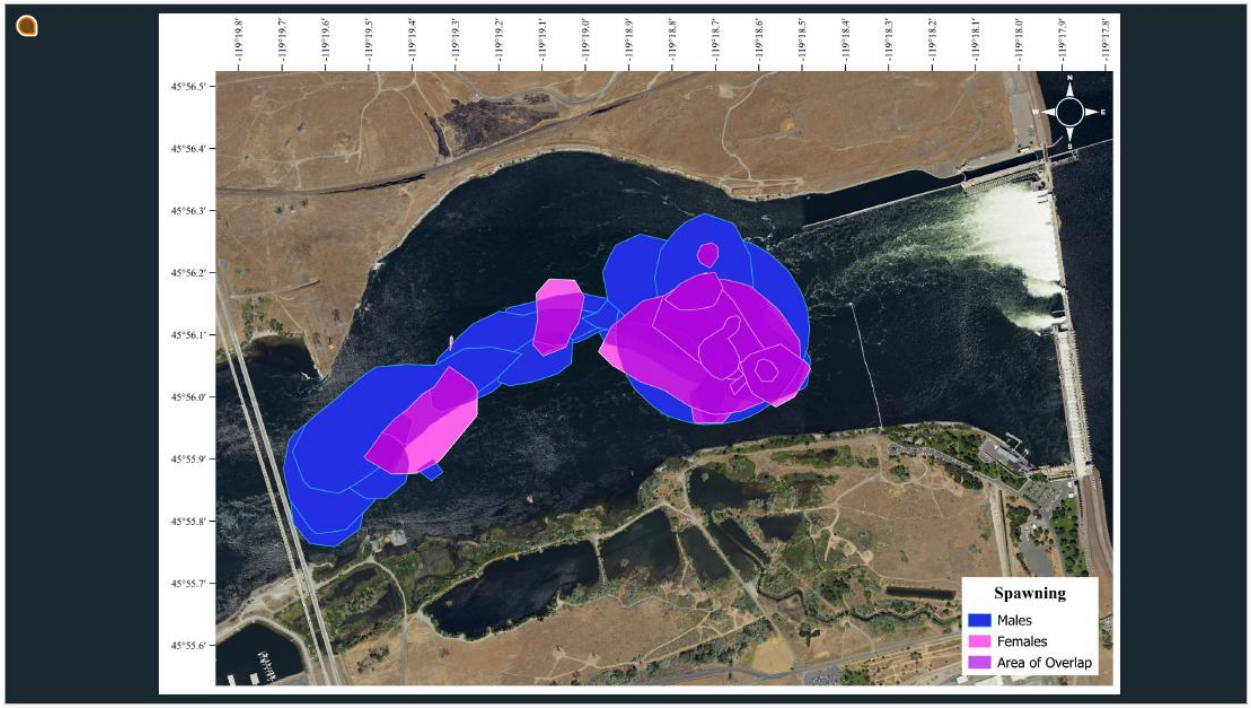


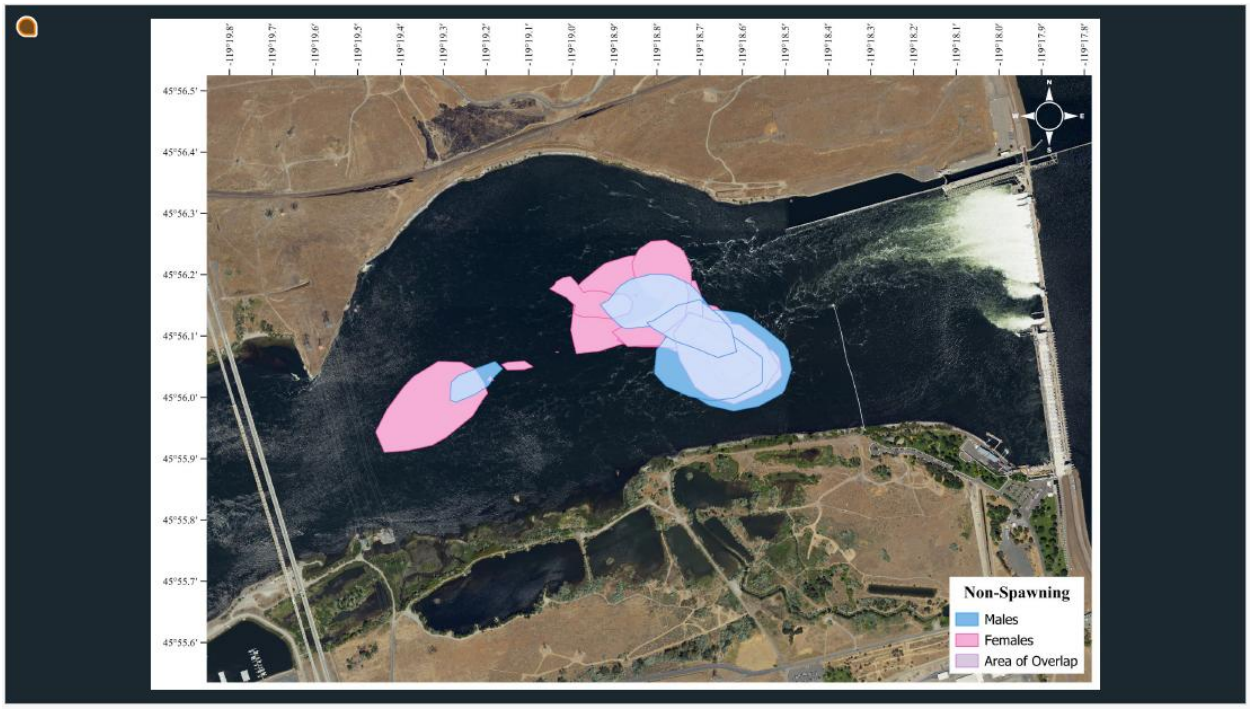
Example of Movement Persistence

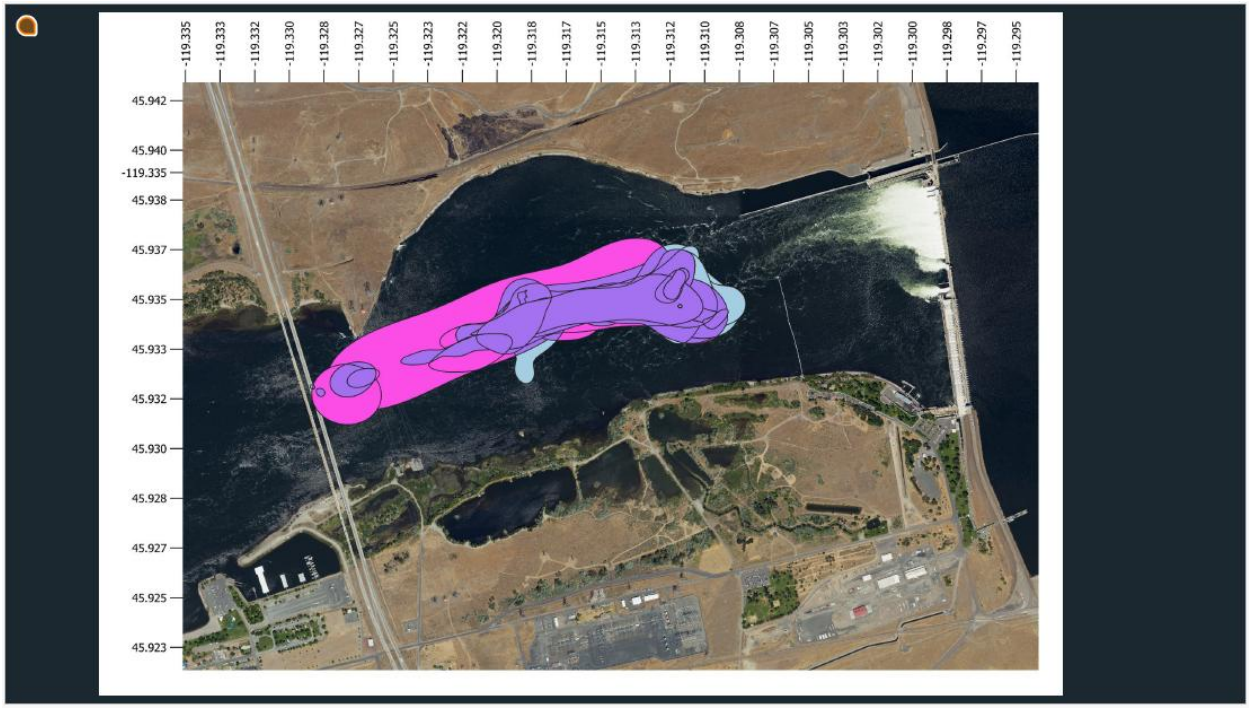


Kernel Utilization Distributions

- Kernel Utilization Distributions (KUD) to analyze space use and area overlap for:
  - Spawning period: April through July 31
  - Non-Spawning period: August 1 to September/October
- KUD is used for estimating the probability, or utilization distribution, of an individual being at a specific location in space and time
  - Home Range: 90% utilization area
  - Core Range: 50% utilization area
- Open system and KUD relies on fish presence to calculate densities


Spawning
Males
Females
Area of Overlap


Non-Spawning
Males
Females
Area of Overlap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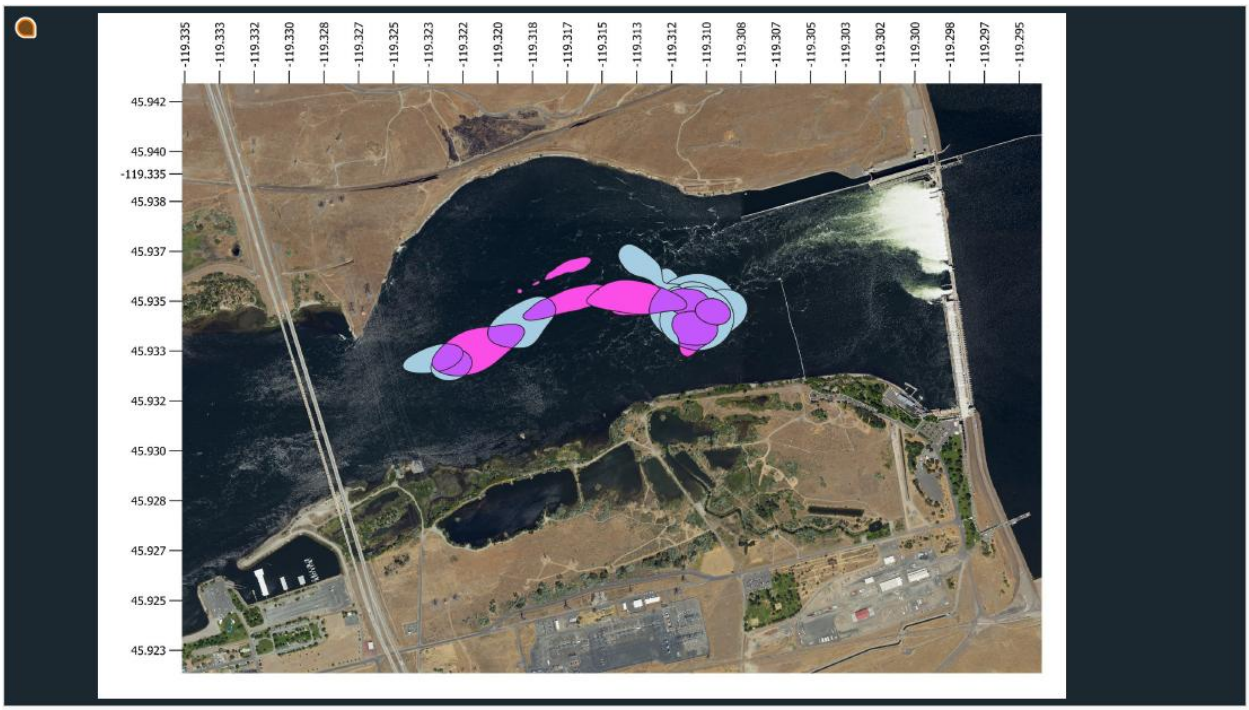
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45.932
45.930
45.928
45.927
45.925
45.923

McNary Habitat and Space Use

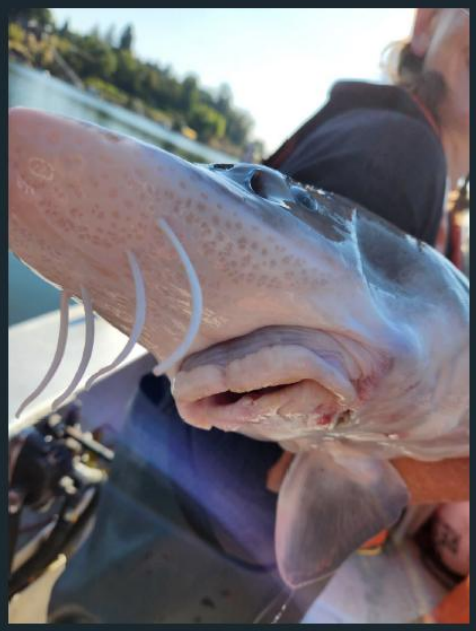
- Movement persistence showed complex space use
- Males showed greater use of entire habitat
- Females had restricted core ranges with greater concentrations
- Larger core ranges during the spawning period versus non-spawning period

McNary Habitat and Space Use

- KUD estimates of core range showed males and females were present within the McNary Dam tailrace during the spawning period
- Congregate in the upstream reach of the tailrace
  - This area had the greatest overlap of female and male ranges
  - Each female overlapped with at least one male

Further Research

- Analyze movements within a finer temporal scale
- Calculate movement values to potentially identify different behavioral states
- Test behavioral states against environmental conditions



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