Klamath Basin Fisheries Collaborative
2024 Annual Meeting

June 12 - 13, 2024

Klamath Falls, Oregon

"If you want to go fast, go alone; If you want to go far, go together"

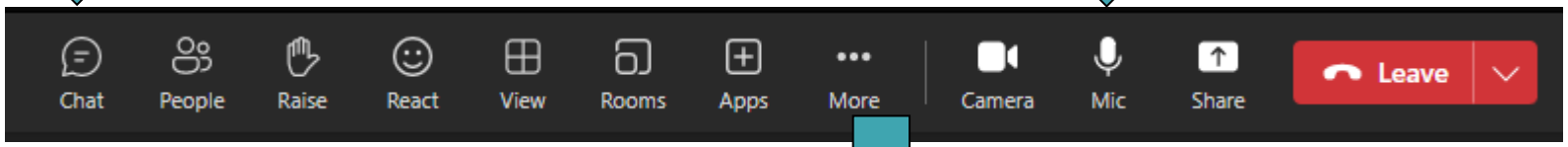
Use the meeting chat if you need assistance.

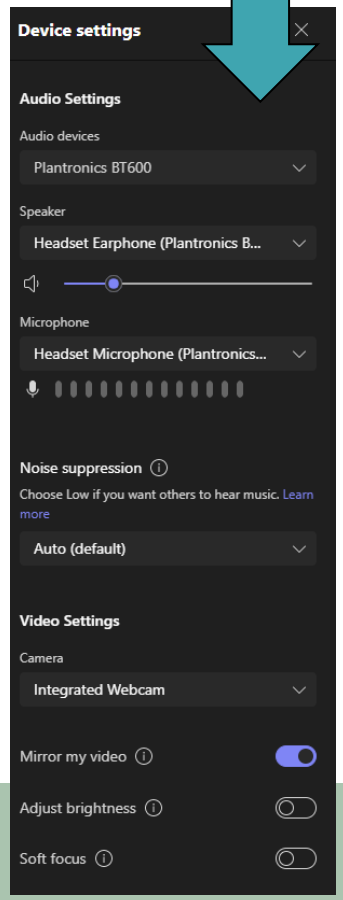
Chats can be seen by all participants.

Please mute yourself when not speaking.

Use *6 to mute phone audio.

Use the microphone icon on the control bar to mute computer audio.





Virtual participants:

Please leave web cameras on to facilitate discussion

Please use the chat to introduce yourself (name and affiliation)

In-person participants:

Please sign in on sheet

Please state your name/affiliation when speaking

If you are having problems with audio/video, check your device settings.

Welcome – Day 2

- Logistics
- Overview of the day
- Post meeting survey (QR code at end)

Timeline	Agenda items
8:30 am	Welcome/ Announcements
8:35 am	Presentations: Research & monitoring of fish- PIT and telemetry tagging
9:35 am	Interactive Discussion: Project Design
10:15 am	**Break**
10:30 am	Presentations: Research & monitoring of fish: Suckers
11:30 am	**Adjourn**
12:00 pm	Gather for field visit (registration required)

Presentations: Research and monitoring of fish - PIT and telemetry tagging

Chris Adams- Fish Wiz

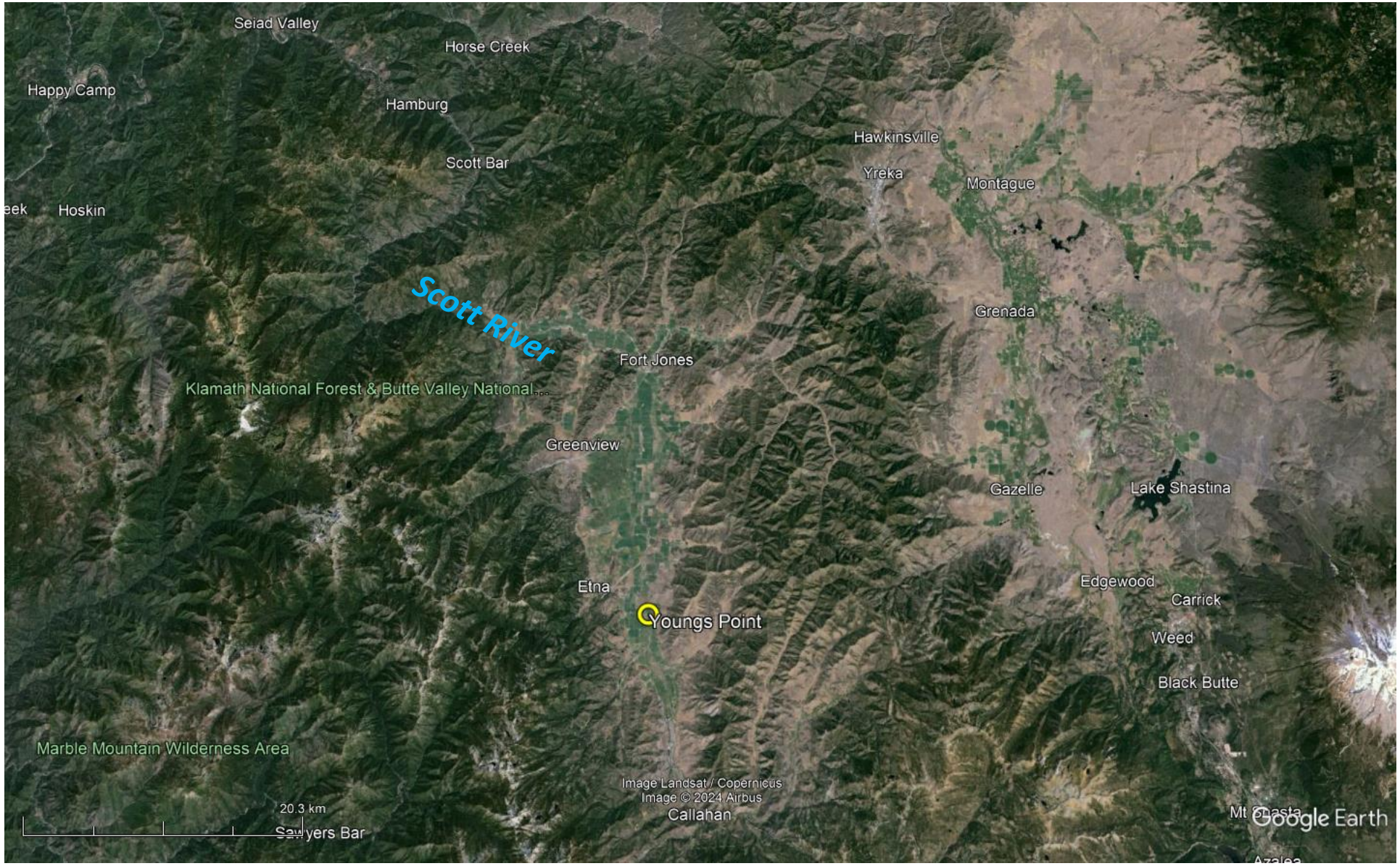
Juvenile Fish Passage at Youngs Point Fish Ladder on the Scott River

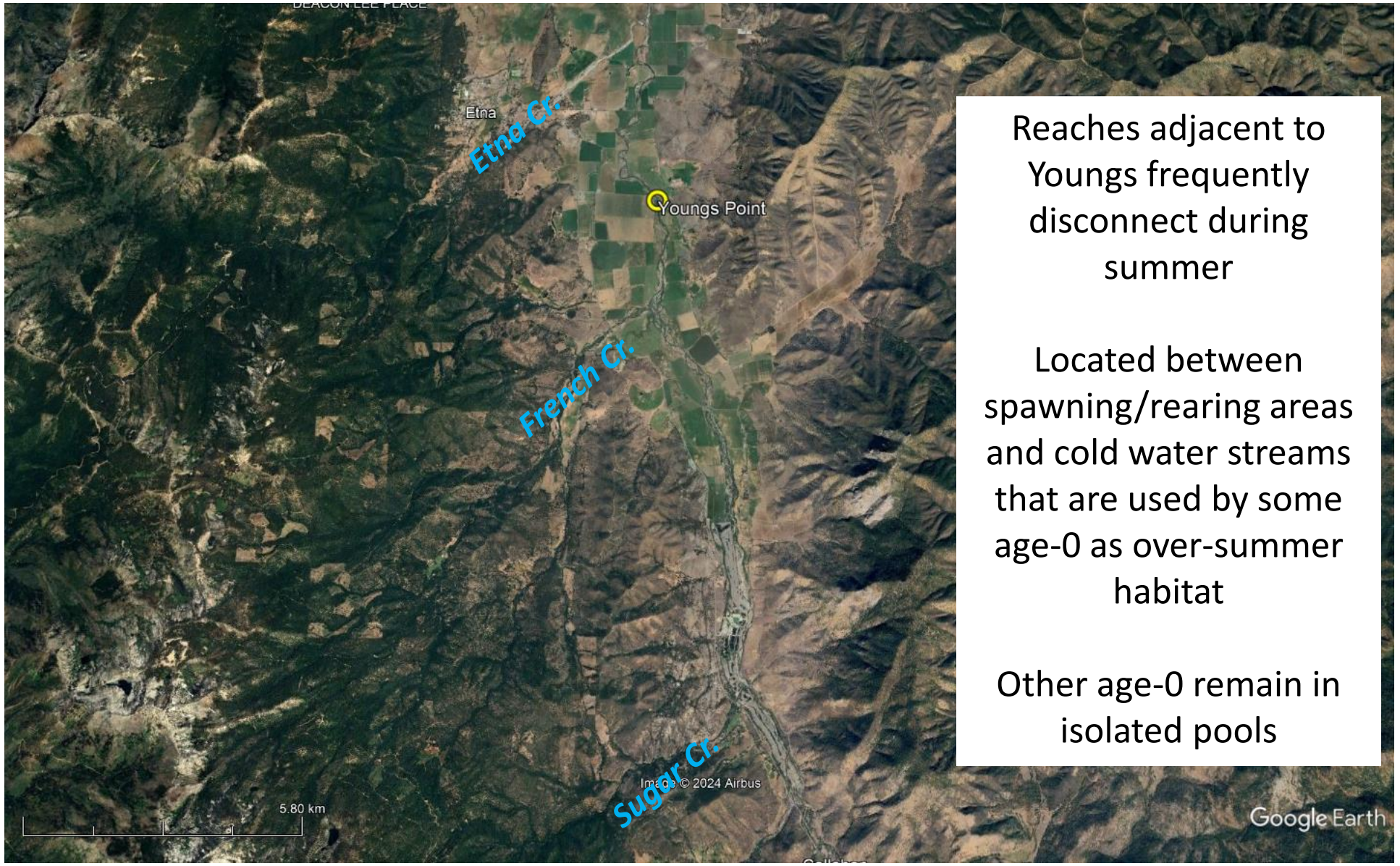
Juvenile Fish Passage at the Youngs Point Fish Ladder, Scott River CA

Dr. Christopher Adams, Fish Wiz LLC

Siskiyou RCD

Scott River Water Trust


Seiad Valley
Horse Creek
Happy Camp
Hamburg
Hawkinsville
Scott Bar
Yreka
Montague
Hoskin
Scott River
Grenada
Fort Jones
Klamath National Forest & Butte Valley National...
Greenview
Gazelle
Lake Shastina
Etna
Edgewood
Carrick
Youngs Point
Weed
Black Butte
Marble Mountain Wilderness Area
Image Landsat / Copernicus
Image © 2024 Airbus
20.3 km
Callahan
Sawyers Bar
Google Earth



Reaches adjacent to Youngs frequently disconnect during summer

Located between spawning/rearing areas and cold water streams that are used by some age-0 as over-summer habitat

Other age-0 remain in isolated pools

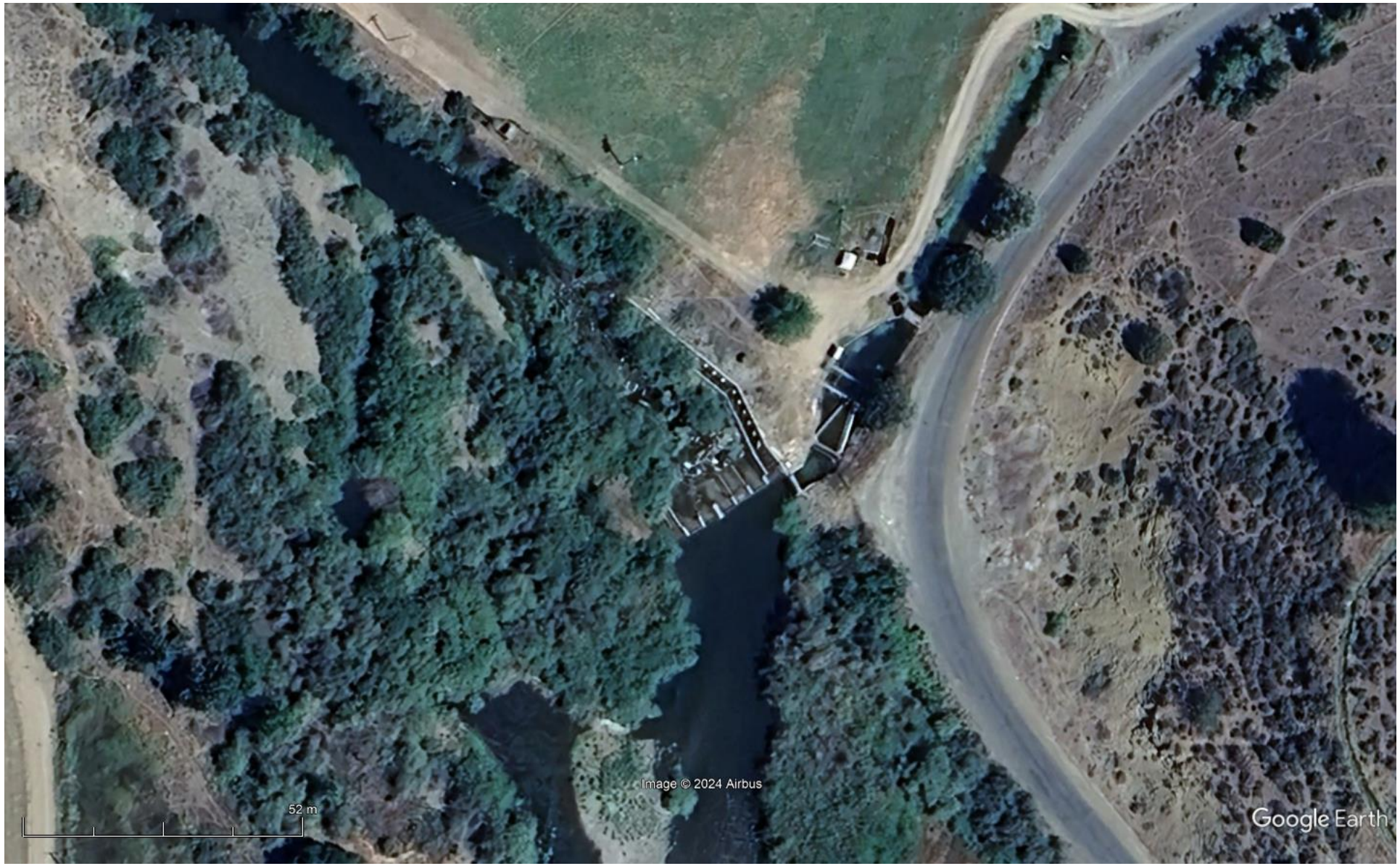


Image © 2024 Airbus
52 m
Google Earth


Ladder built in 2006 to facilitate upstream movement (primarily adults)
Flashboard dam to manipulate flow in main channel, ladder, and ditch
Scott Valley Irrigation District
Scott River
Image © 2024 Airbus
21 m
Google Earth


05.09.2022 12:26


06.08.2022 08:59

Background

As part of larger ranch plan,

Collaboration between Siskiyou RCD, Scott River Water Trust, Siskiyou Land Trust, Gareth Plank

Potentially modify existing structure, some additional water may be kept in-stream

Consultants Waterways and Fish Wiz LLC to evaluate structure and fish passage

Evaluate juvenile fish passage in summer

What use of that water will maximize benefit to juvenile salmonids?

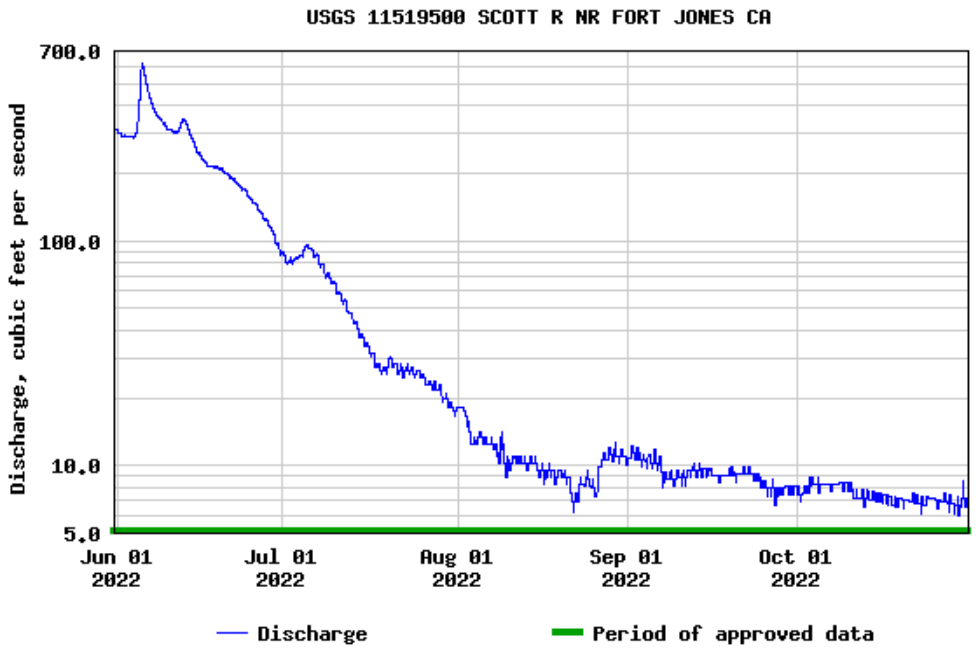
Provide passage for as long as possible

2022

Plan to PIT tag age-0 salmonids and monitor with antennas

Early disconnection, age-0 likely not large enough to tag before migration window

Utilized underwater cameras



Barlus 5mp camera housed in cinder block

Can run up to 8 cameras by ethernet cable to an NVR, data stored on hard drive

Al low light level, switched to infrared

Power supplied by solar panel/battery, then switched to AC per in Aug 2022


1
2
3
Image © 2024 Airbus
21 m
Google Earth

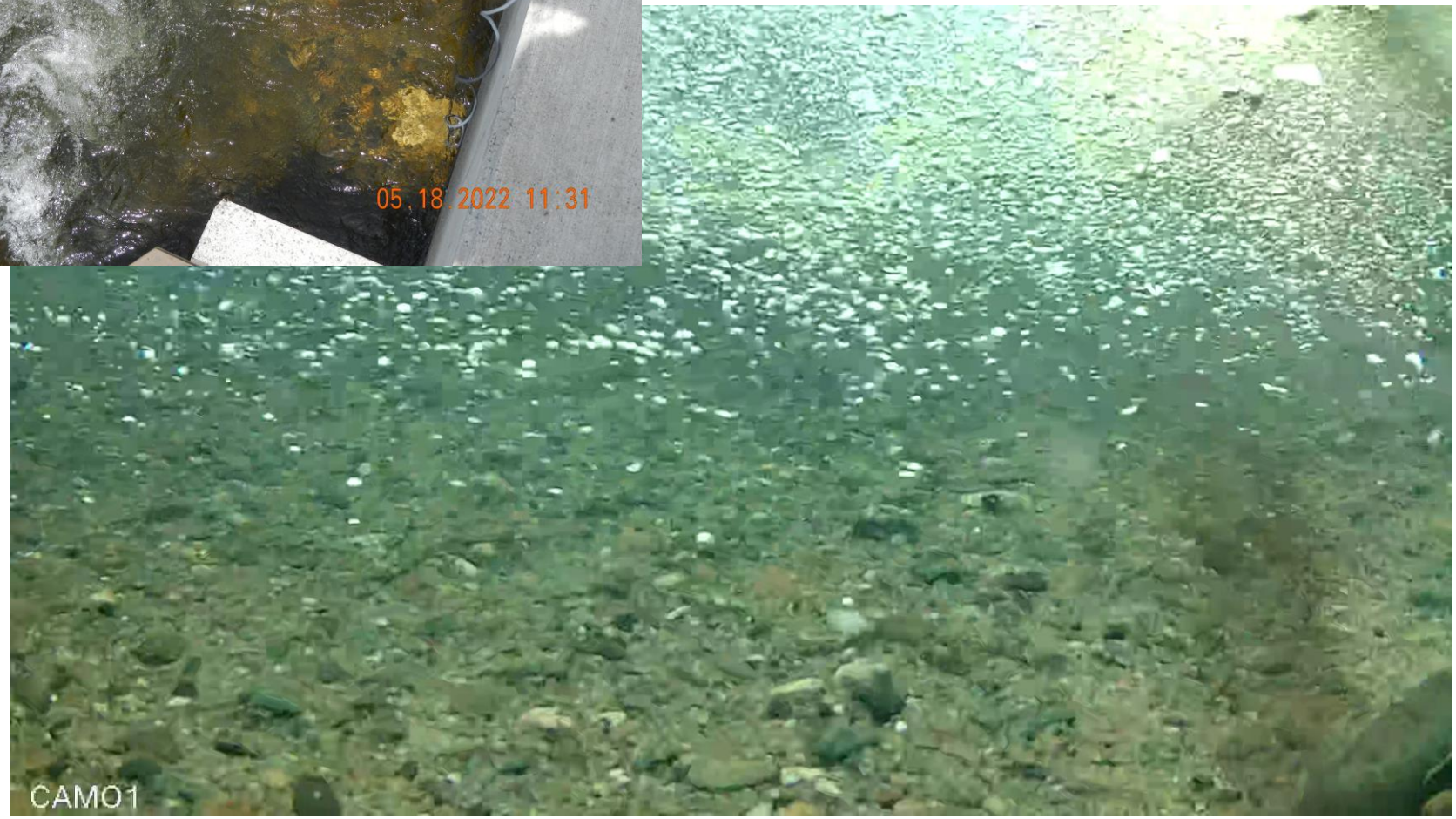

05.25.2022 11:17


1
2
3
Google Earth


CAMO1


05.18.2022 11:31

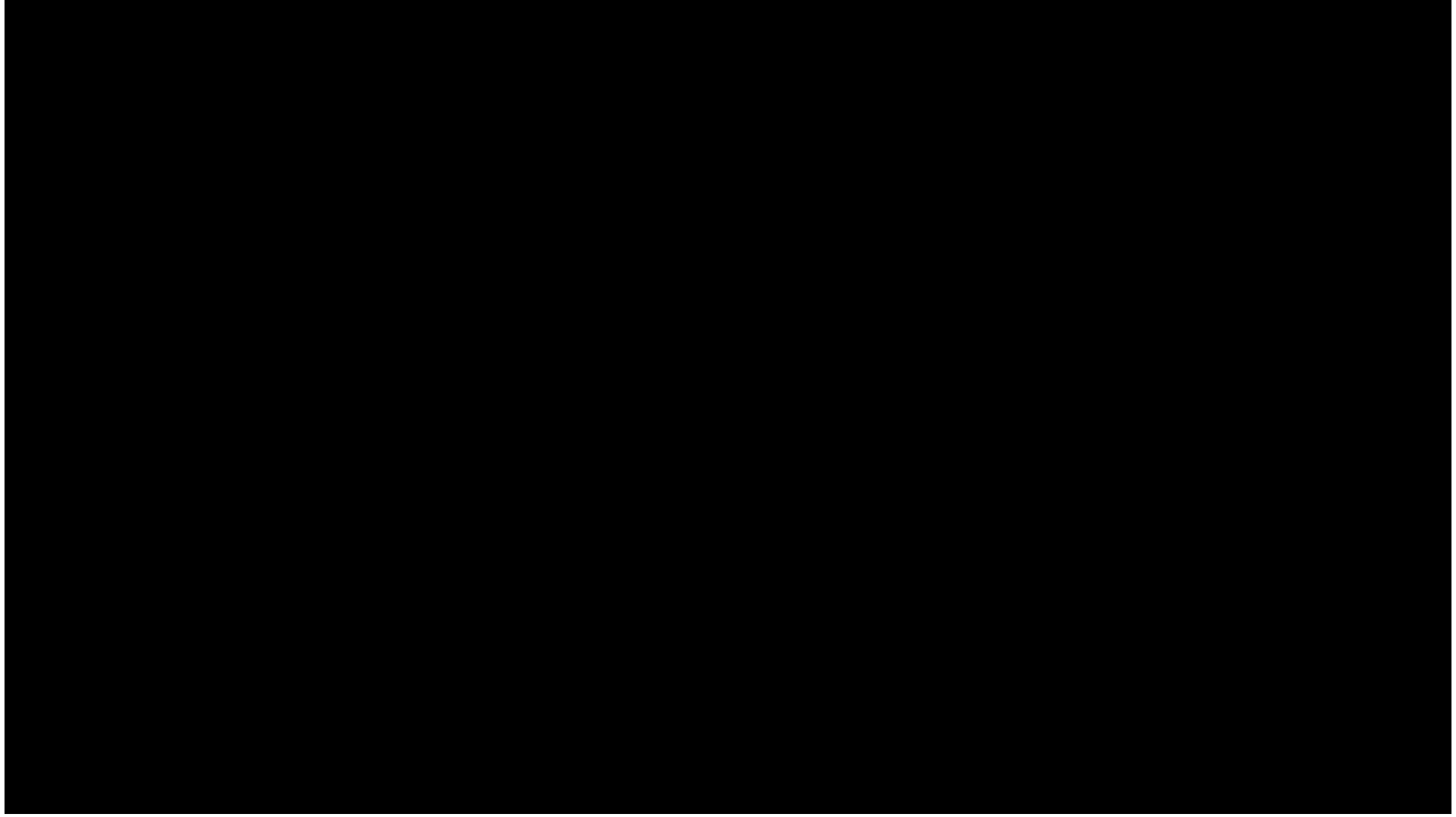

1
2
3
Google Earth


CAM01


05.11.2022 13:46


1
2
3
Google Earth


CAM01




2022-07-20 17:59:59
CAM01


2022-07-05 08:29:58
CAM01

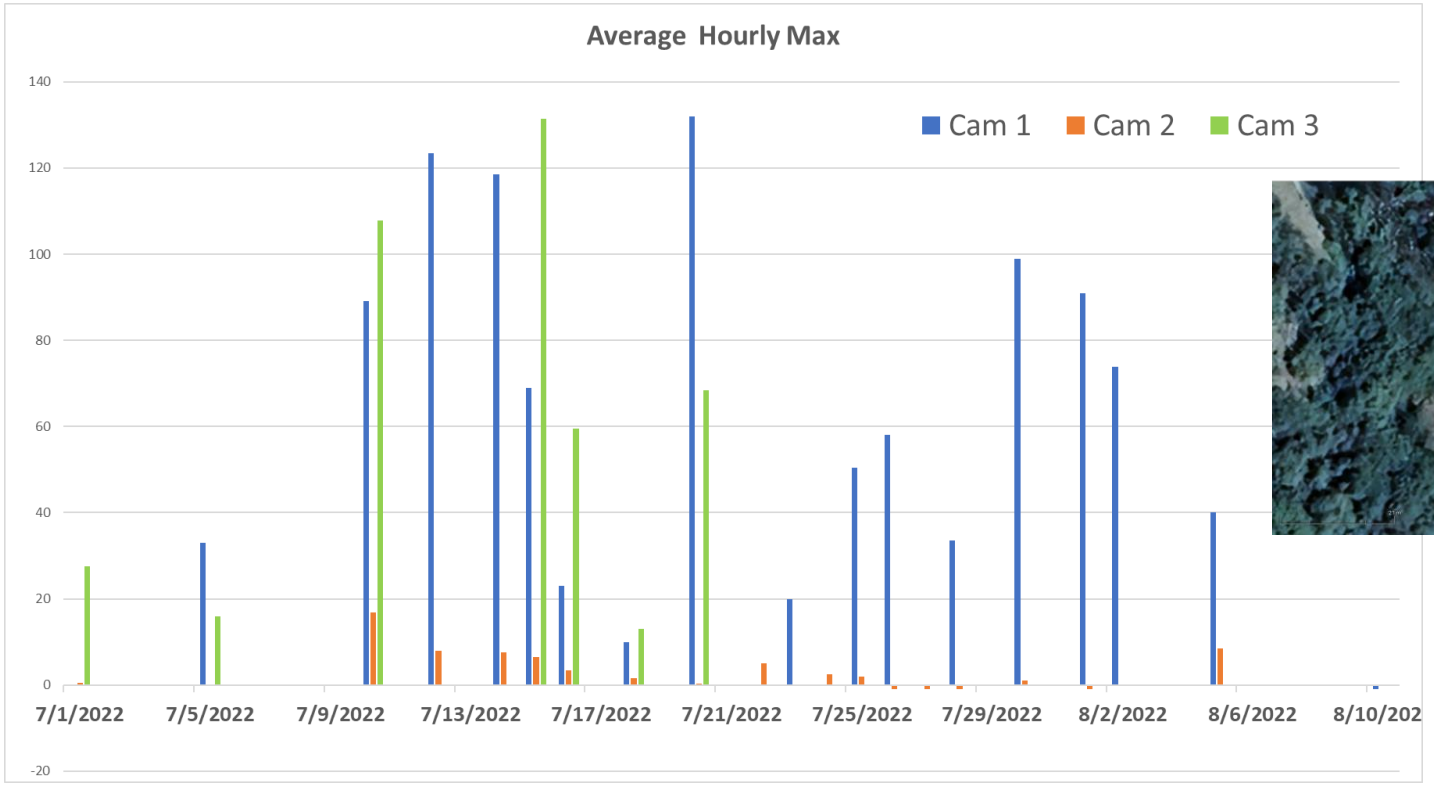
Video Review

0 and 14 hour reviewed for most days, one dark and one light hour, several days 12 hours of review (every other hour)

3 data point recorded for each hour

- Total fish move into frame from outside frame (maximum possible individuals) Many may move back into view, counted multiple times
- Max in one frame during hour (minimum possible individuals)
- Reviewers estimated total, considering above and fish behavior

Video Review



High counts partly due to same individuals seen multiple times (hanging out)

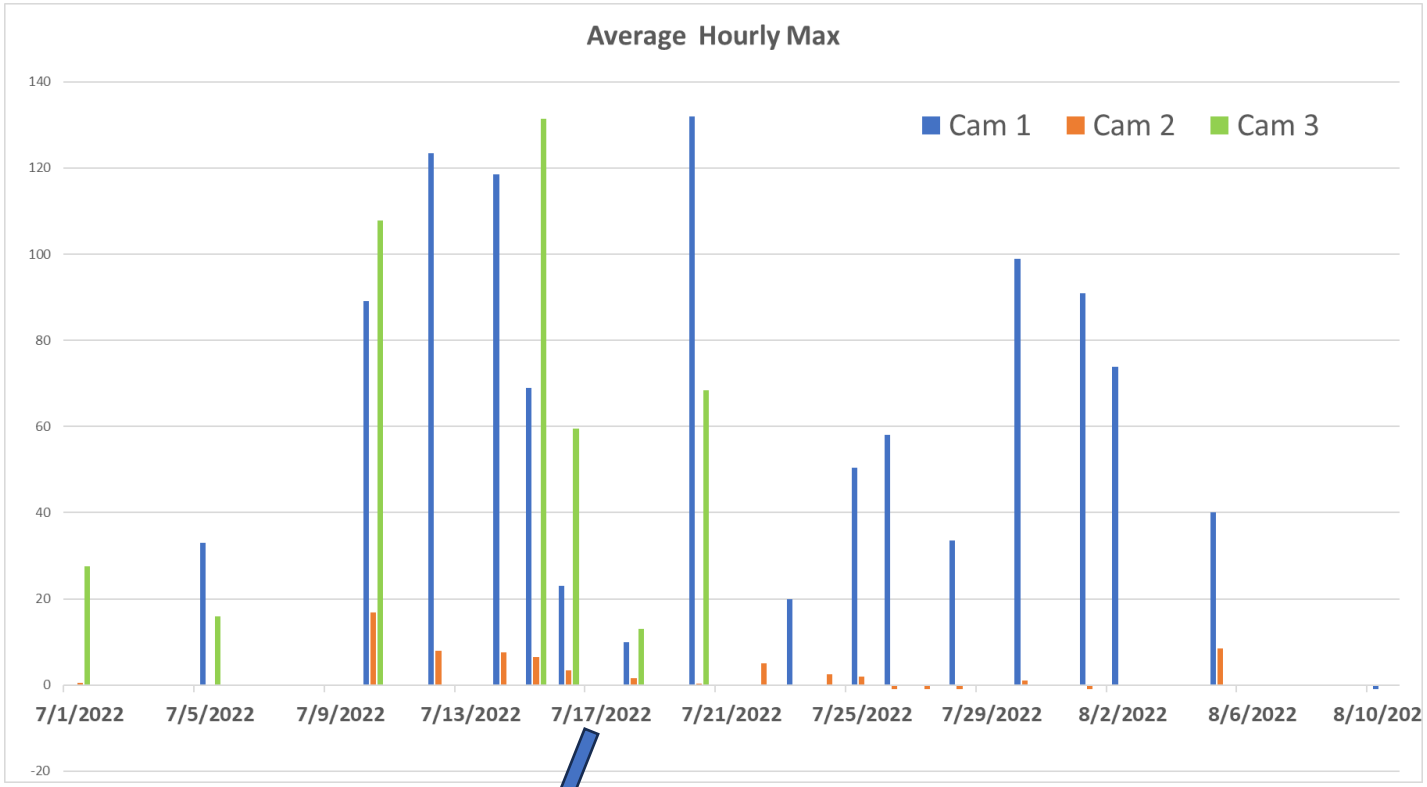
Cam 2 tended to be individuals seen briefly during hour (movers)

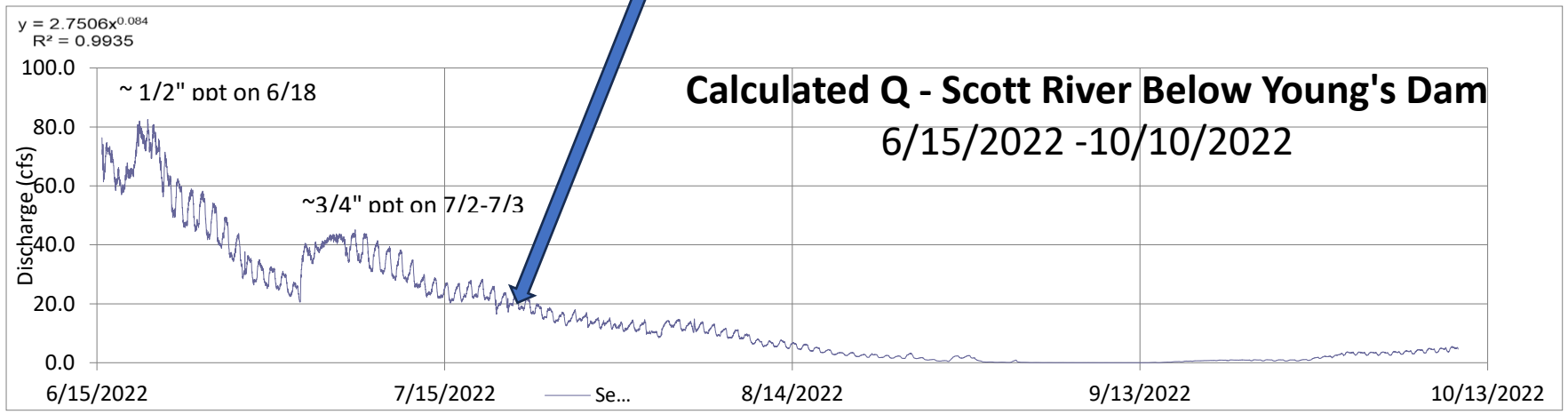
After about July 15, minimal ladder use, still observations at base of ladder

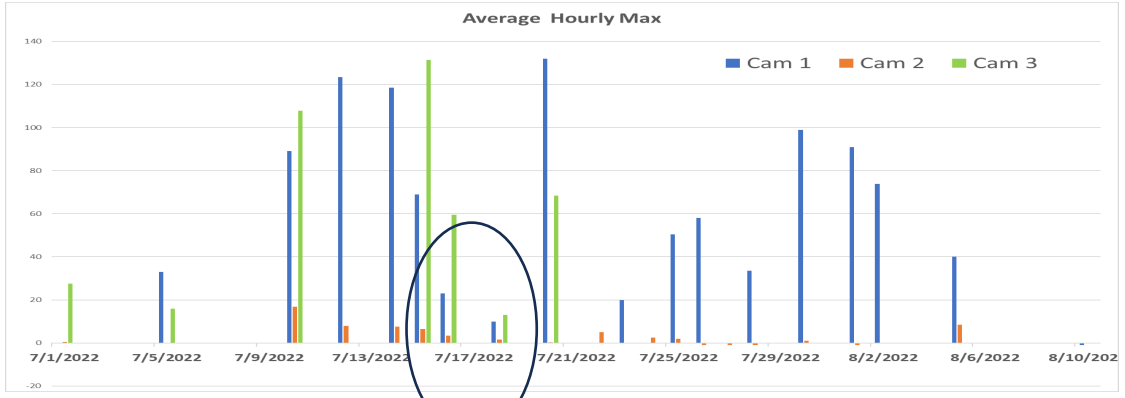
Cam 3 no data second half of July

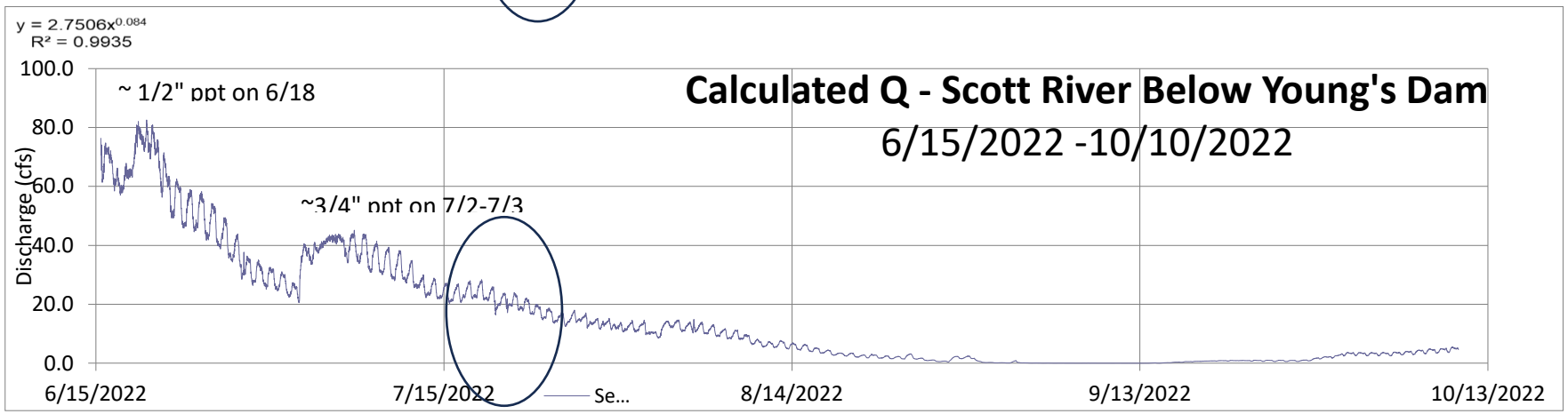

Pressure
Transducer 2022
23 m
Google Earth

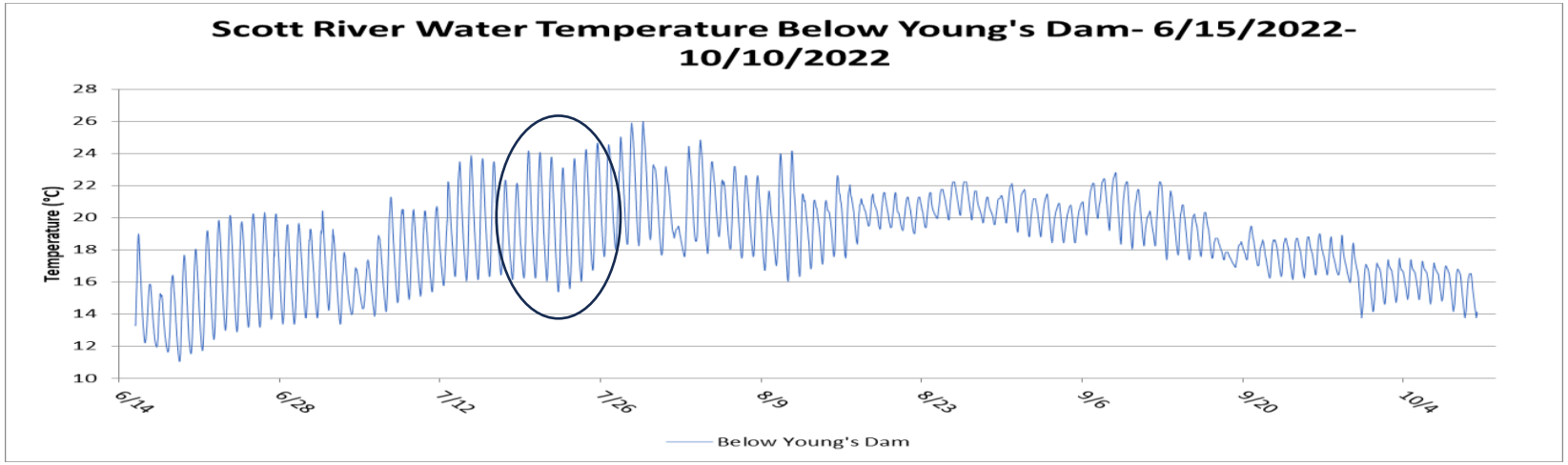
Video Review






Average Hourly Max
Cam 1
Cam 2
Cam 3
140
120
100
80
60
40
20
0
-20
7/1/2022
7/5/2022
7/9/2022
7/13/2022
7/17/2022
7/21/2022
7/25/2022
7/29/2022
8/2/2022
8/6/2022
8/10/202

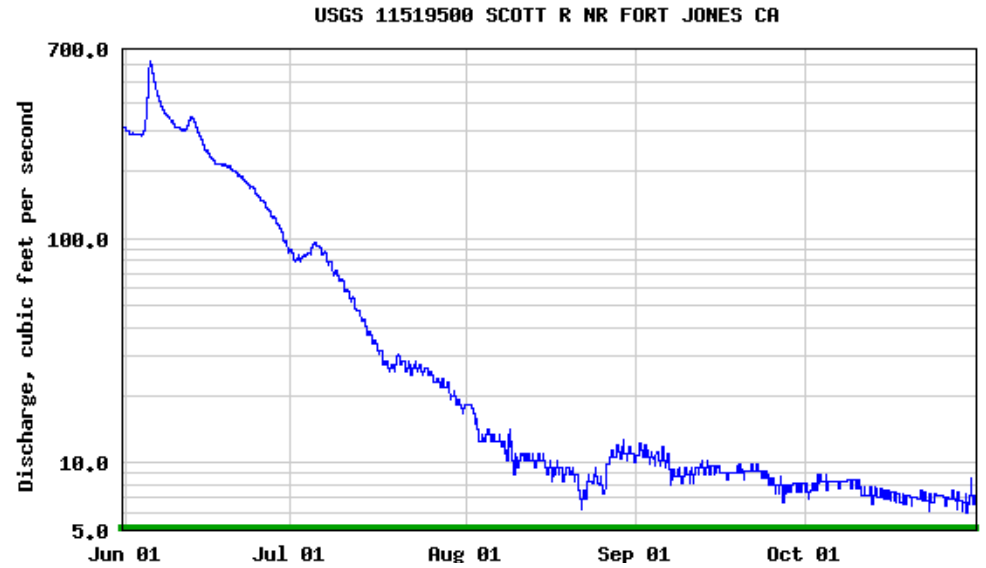

y = 2.7506x^0.084
R² = 0.9935
Calculated Q - Scott River Below Youngs Dam
6/15/2022 -10/10/2022
~ 1/2" ppt on 6/18
~3/4" ppt on 7/2-7/3
Discharge (cfs)
100.0
80.0
60.0
40.0
20.0
0.0
6/15/2022
7/15/2022
8/14/2022
9/13/2022
10/13/2022
Se...

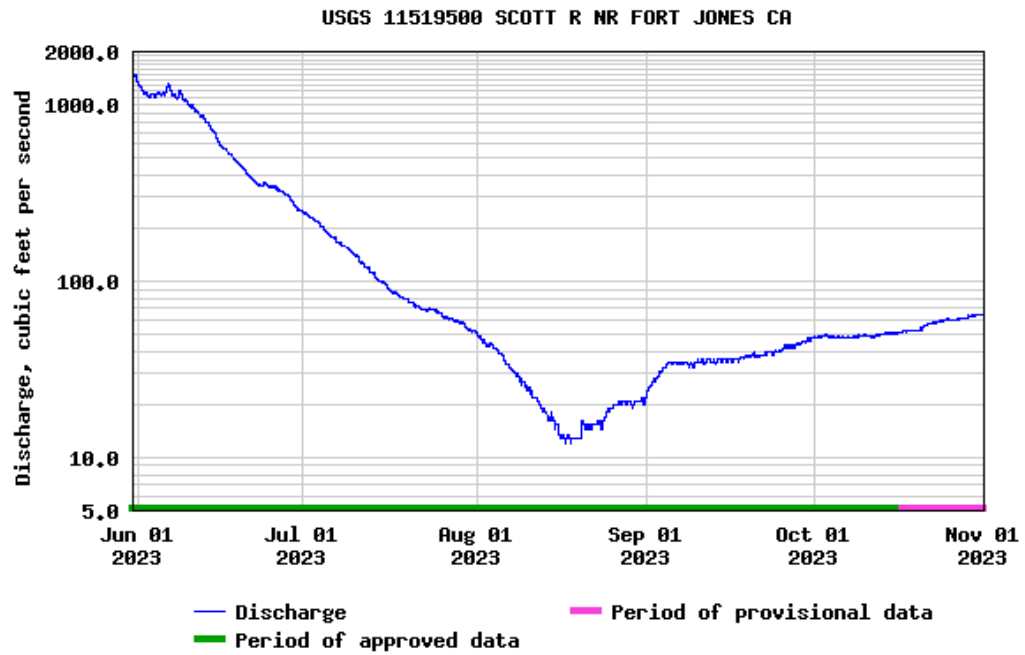

Scott River Water Temperature Below Young's Dam- 6/15/2022-10/10/2022
Temperature (°C)
28
26
24
22
20
18
16
14
12
10
6/14
6/28
7/12
7/26
8/9
8/23
9/6
9/20
10/4
Below Young's Dam

2023

PIT tag age-0 salmonids and monitor with antennas

Velocity measurements in ladder



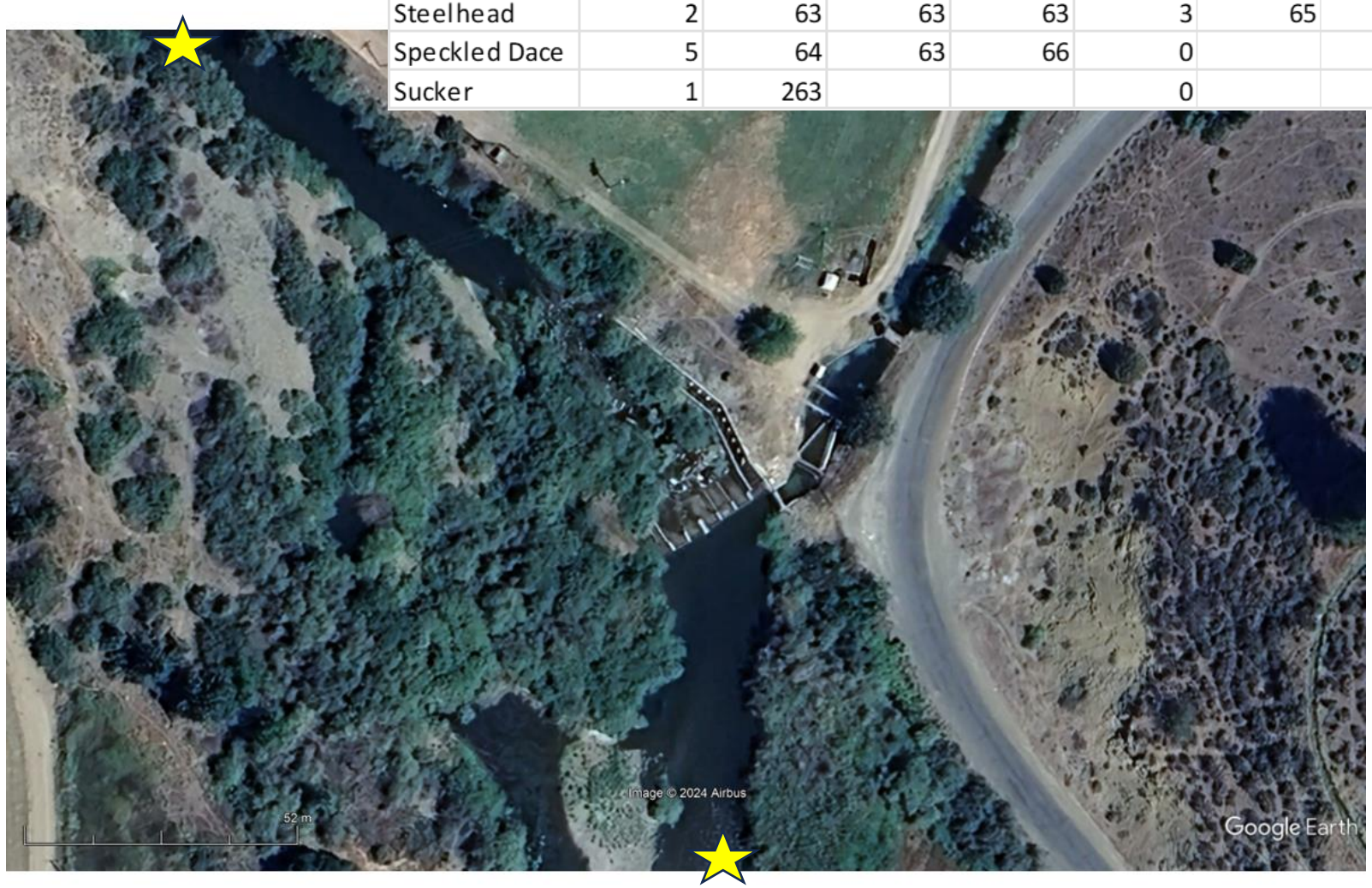


PIT tag antenna station (Fish Wiz LLC) installed on July 5, 2023, operated through October

3 antennas: downstream end, middle, and upstream end (downstream of flashboards)

2023

	Downstream of Ladder				Upstream of Ladder			
Species	**Total**	**Mean FL**	**Min FL**	**Max FL**	**Total**	**Mean FL**	**Min FL**	**Max FL**
Coho Salmon	65	68	63	90	79	68	63	0
Steelhead	2	63	63	63	3	65	64	67
Speckled Dace	5	64	63	66	0			
Sucker	1	263			0			



2023

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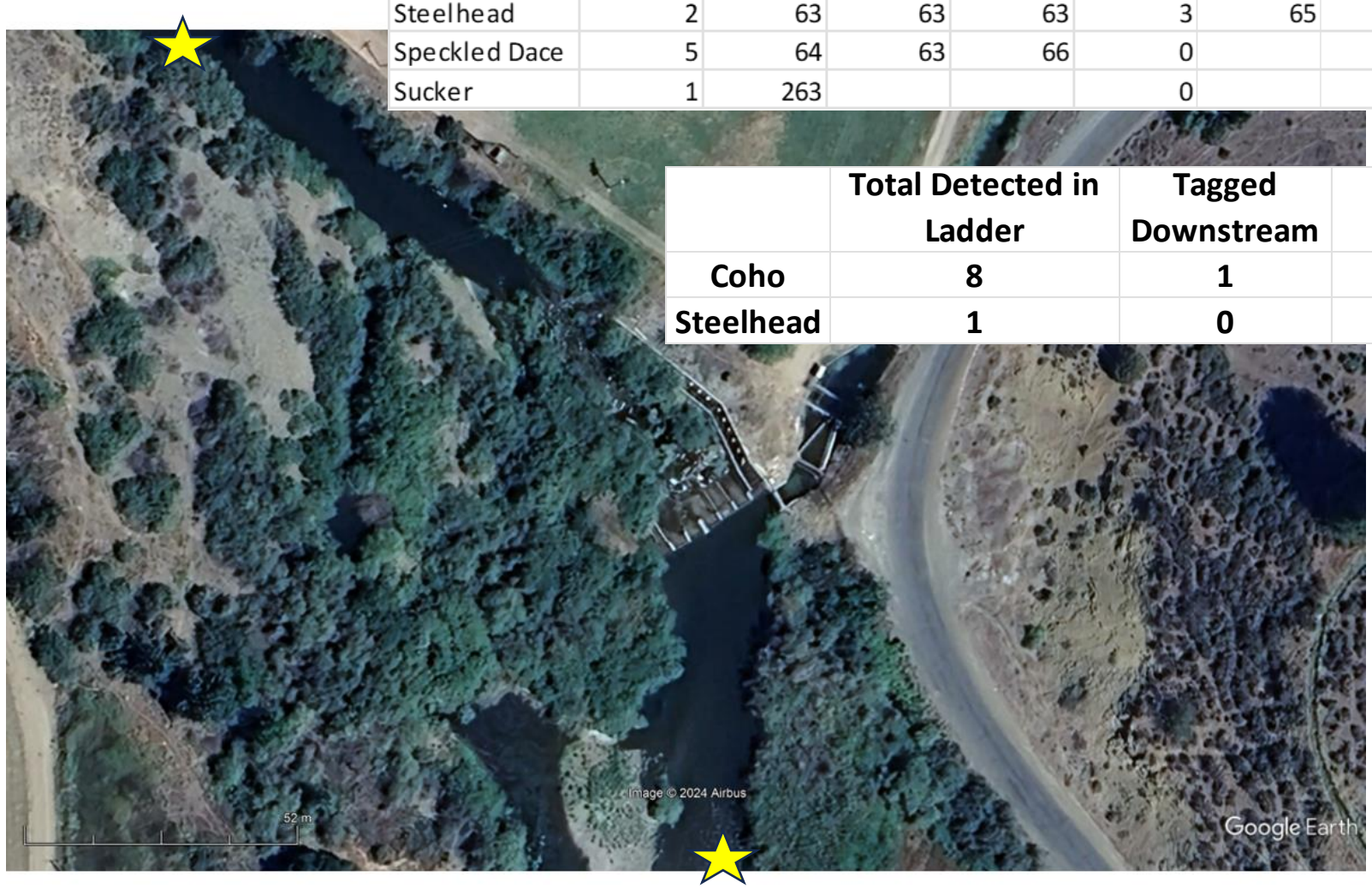
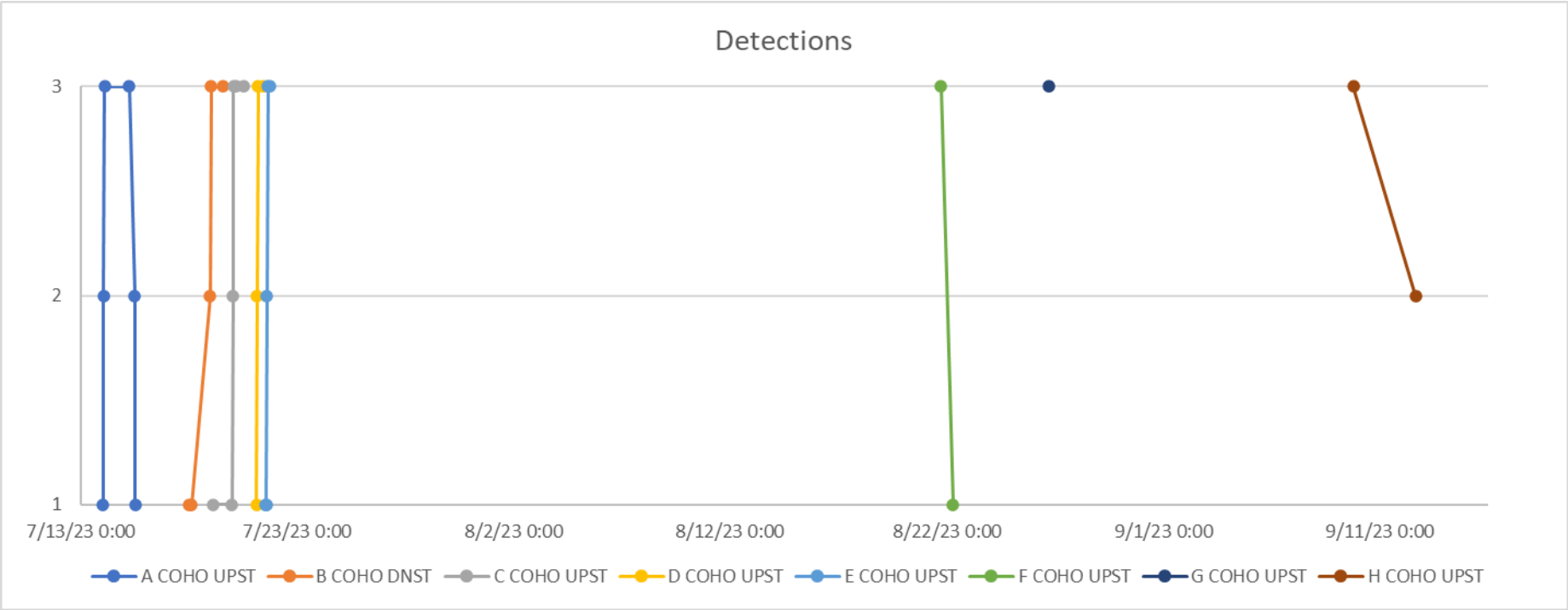
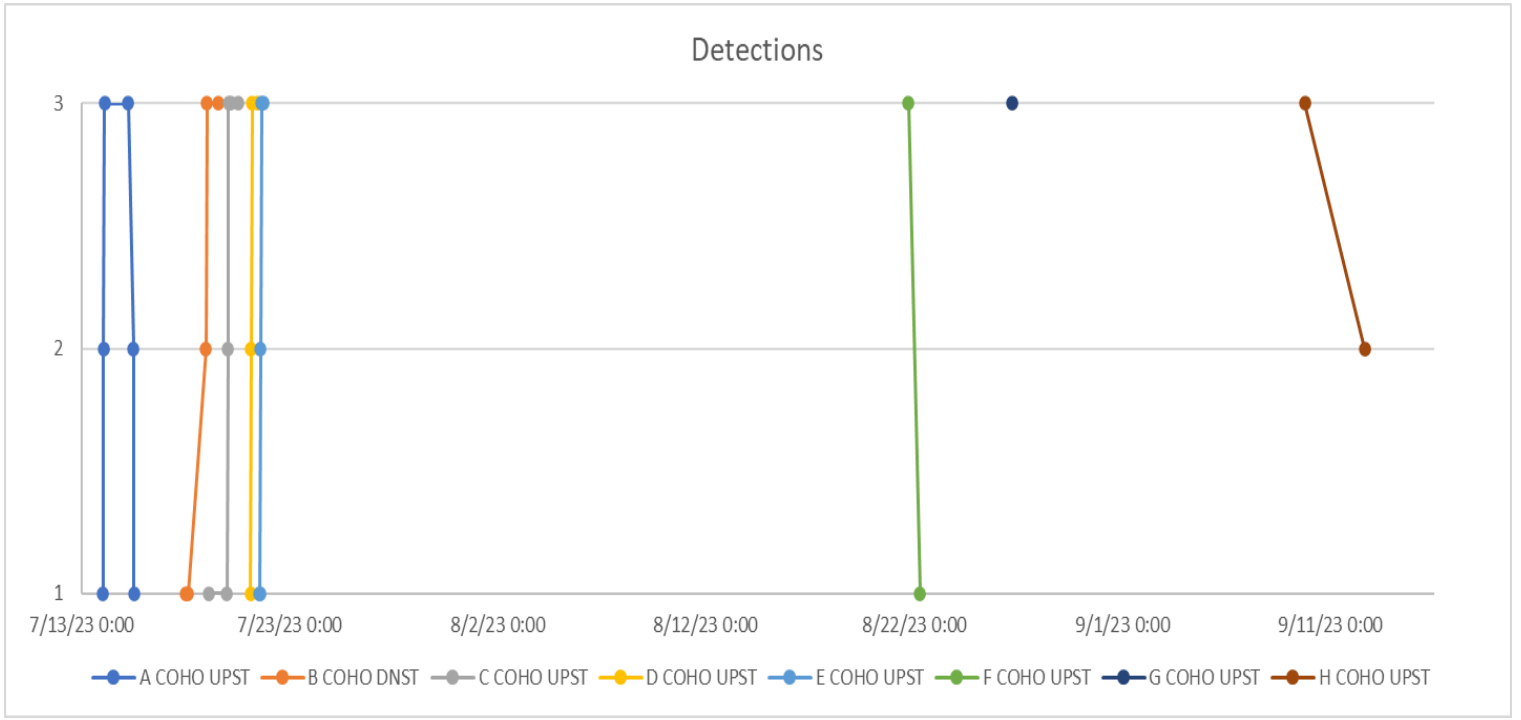


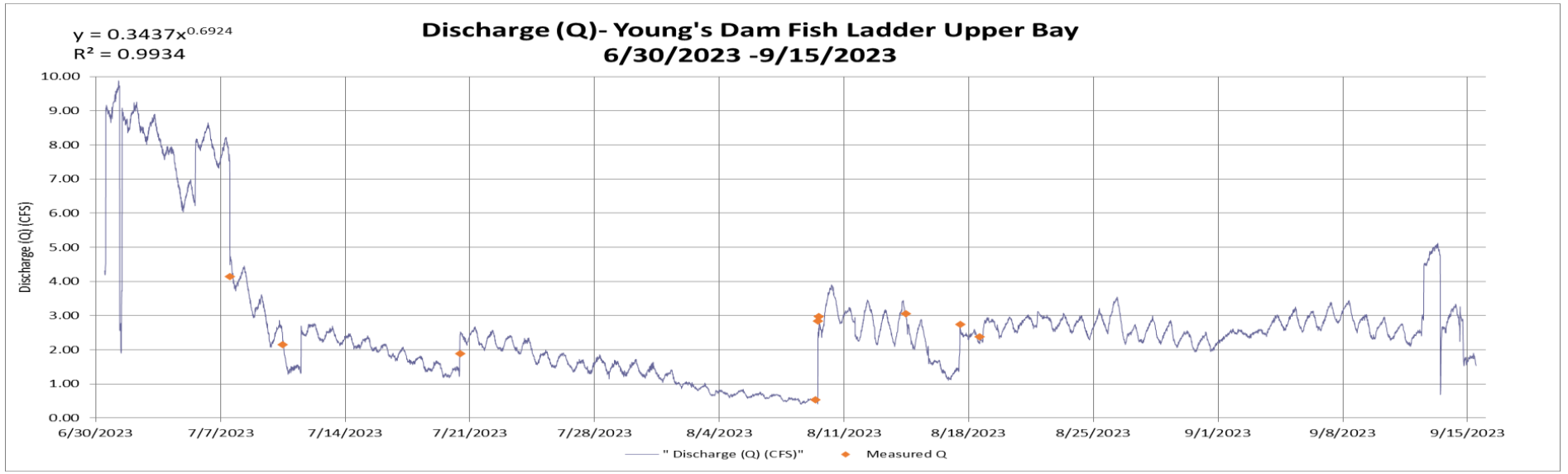
	Total Detected in Ladder	Tagged Downstream	Tagged Upstream
Coho	**8**	**1**	**7**
Steelhead	**1**	**0**	**1**

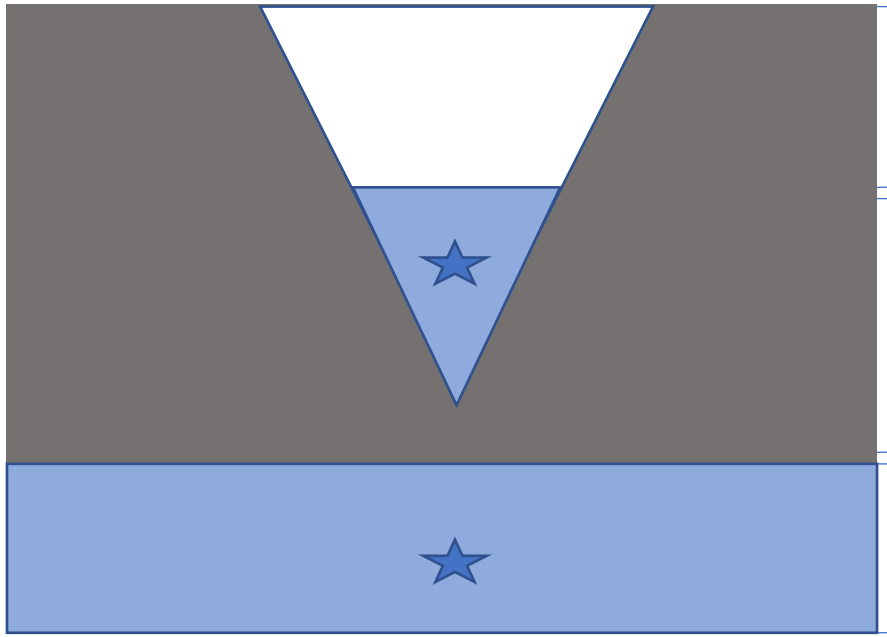


Relatively few tagged fish detected in ladder

Several coho tagged upstream entered ladder from downstream end


Detections
3
2
1
7/13/23 0:00
7/23/23 0:00
8/2/23 0:00
8/12/23 0:00
8/22/23 0:00
9/1/23 0:00
9/11/23 0:00
A COHO UPST
B COHO DNST
C COHO UPST
D COHO UPST
E COHO UPST
F COHO UPST
G COHO UPST
H COHO UPST

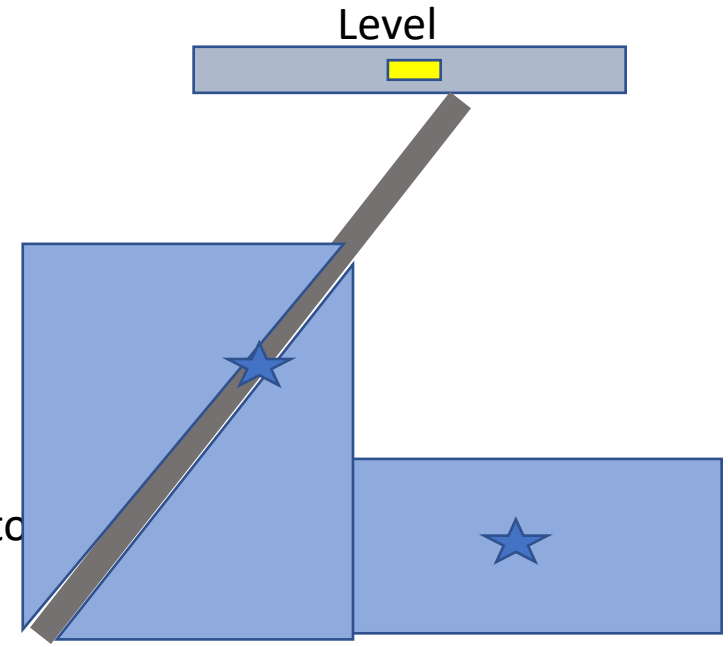

y = 0.3437x^0.6924
R² = 0.9934
Discharge (Q)- Young's Dam Fish Ladder Upper Bay
6/30/2023 -9/15/2023
Discharge (Q) (CFS)
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
6/30/2023
7/7/2023
7/14/2023
7/21/2023
7/28/2023
8/4/2023
8/11/2023
8/18/2023
8/25/2023
9/1/2023
9/8/2023
9/15/2023
" Discharge (Q) (CFS)"
Measured Q



Baffle Top to Fall Crest

Fall Crest to Bay Surface

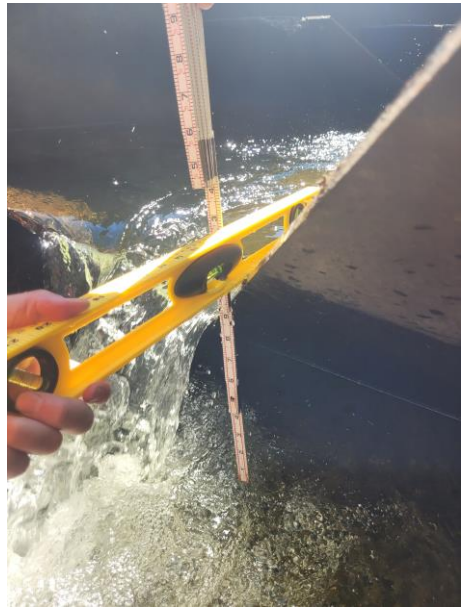
Bay Surface to Bay Bottom



Looking Upstream

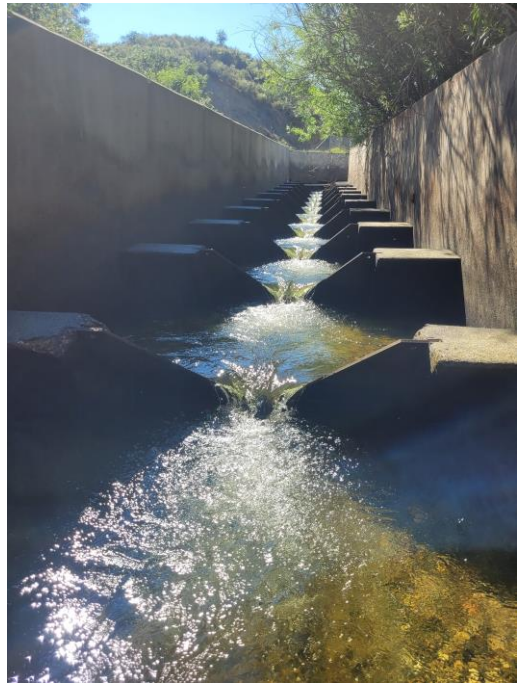
Velocity Measurement

Looking From River Right



CFS	**1.85**	**4.47**	**7+**	
Flash Boards In	**2**	**1**		**0**
Baffle 1 Mean Velocity in Crest (fps)	**1.12**	**2.88**	**NA**	
Baffle 17 Mean Velocity in Crest (fps)	**1.76**	**3.26**		**3.12**

At lowest flow, velocities over 1 fps



Conclusion/Recommendation

Analysis still ongoing

Ladder not sufficient or being utilized for substantial juvenile movement during low flow period for upstream juvenile passage

Remove Ladder/ Reprofile dam?

Further study on environmental conditions/fish behavior

Summer Burdick- USGS

Insights from Acoustic Telemetry Studies on the Influence of Flow Dynamics on Juvenile Chinook Salmon Migration in the Lower Klamath River

Variation in Chinook Outmigration Timing and Survival Through the Lower Klamath River in 2023

Summer Burdick, Collin Smith, Russ Perry, John Plumb, and Tyson Hatton

U.S. Department of the Interior, U.S. Geological Survey

USGS
science for a changing world

Klamath Basing Fisheries Collaborative

Klamath Falls, Oregon

June 11-13, 2024

Acknowledgements

Funded by U.S. Bureau of Reclamation

Toz Soto and Alex Corum (Karuk)

Leanne Knutson, Oshun O'Rourke, and Andrew Antonetti (Yurok)

Morgan Knechtle and Domenic Giudice (CDFW)

Ryan Tomka (USGS)

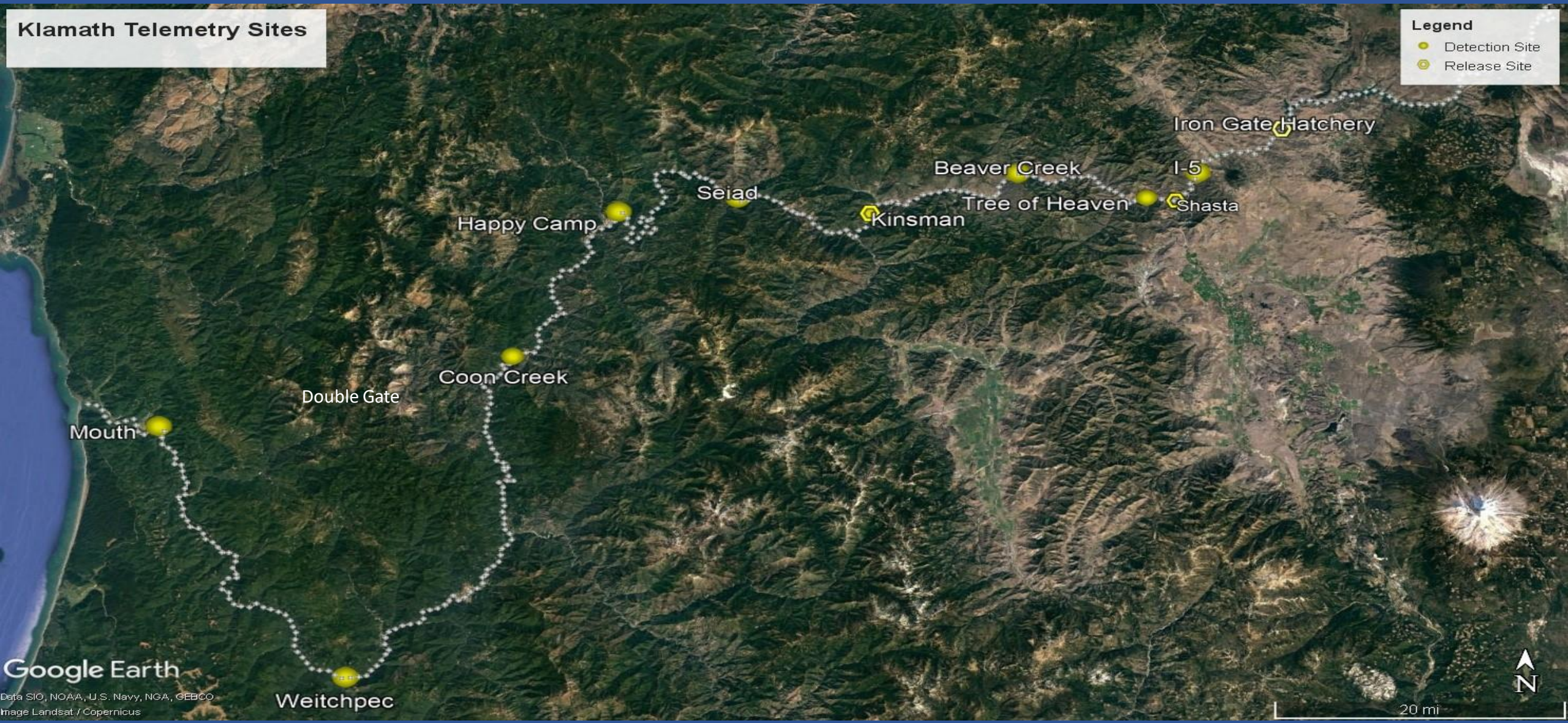
Recent Goals of Flow Regulation in the Lower Klamath River

- Reduce outmigration mortality of juvenile salmonids
  - Manage C. shasta (flushing flows)
  - Decrease juvenile Chinook residency in the river
- Manage habitat availability for juvenile Chinook
  - Stream Salmonid Simulator (S3)

For juvenile Chinook in the lower Klamath River:

Does outmigration rate vary across the spring season?

How does outmigration rate and timing effect survival?


Klamath Telemetry Sites
Legend
Detection Site
Release Site
Iron Gate Hatchery
Beaver Creek
I-5
Seiad
Tree of Heaven
Shasta
Happy Camp
Kinsman
Coon Creek
Double Gate
Mouth
Weitchpec
Google Earth
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat / Copernicus
N
20 mi

Tag Release Summary 2023 (N=556,11 groups)

		Week			
Release	Tag	10-May	17-May	24-May	1-Jun
Shasta	SS400	100	100	100	100
Shasta	ELAT			25	25
Kinsman	ELAT	12	29	11	
Iron Gate*	ELAT			25	25

*Iron Gate fish were hatchery origin. All others are run of river fish.

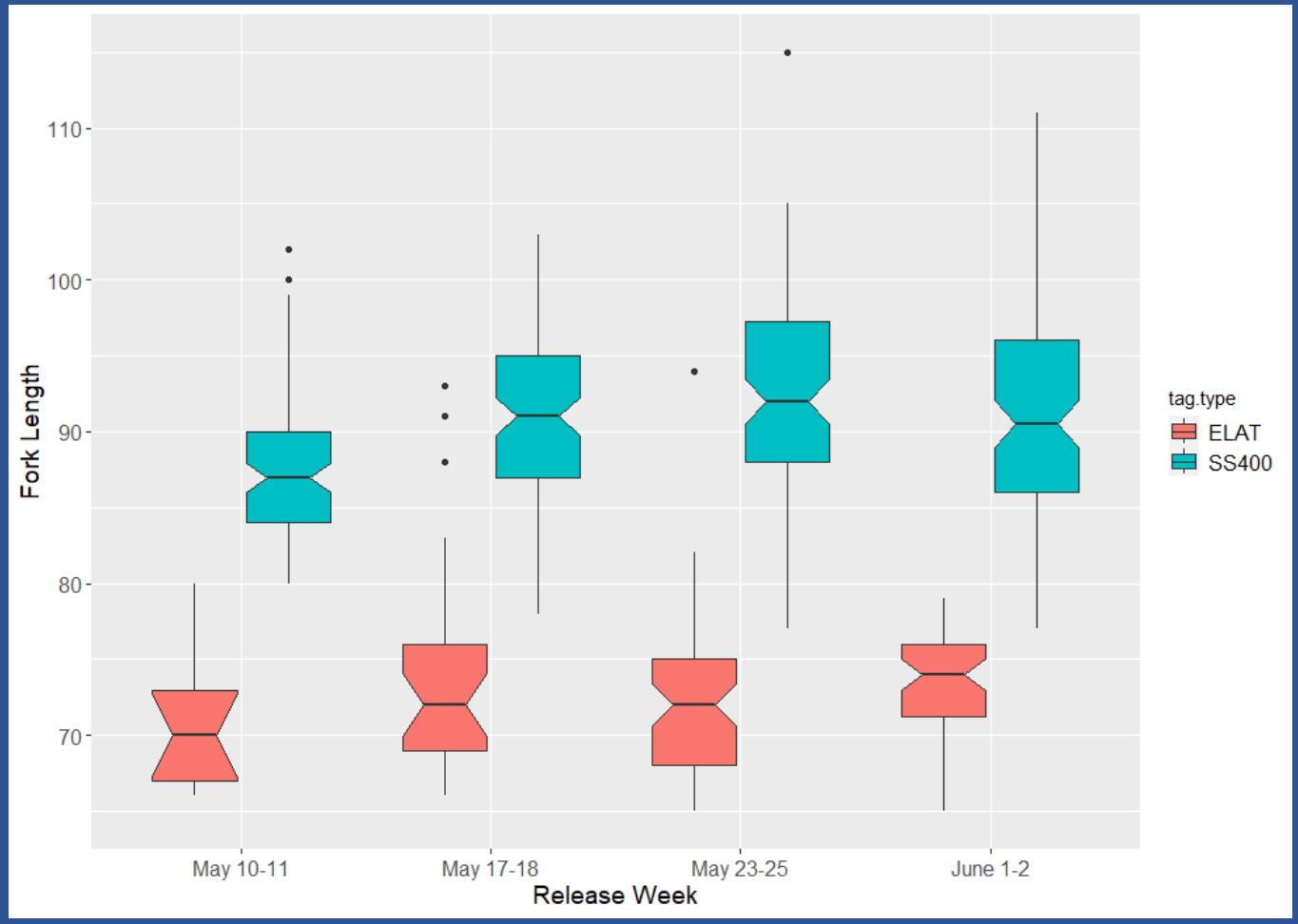
Photo taken by Georgia Martin, USGS

Tag Life

- 15 tags of each model and shipment batch

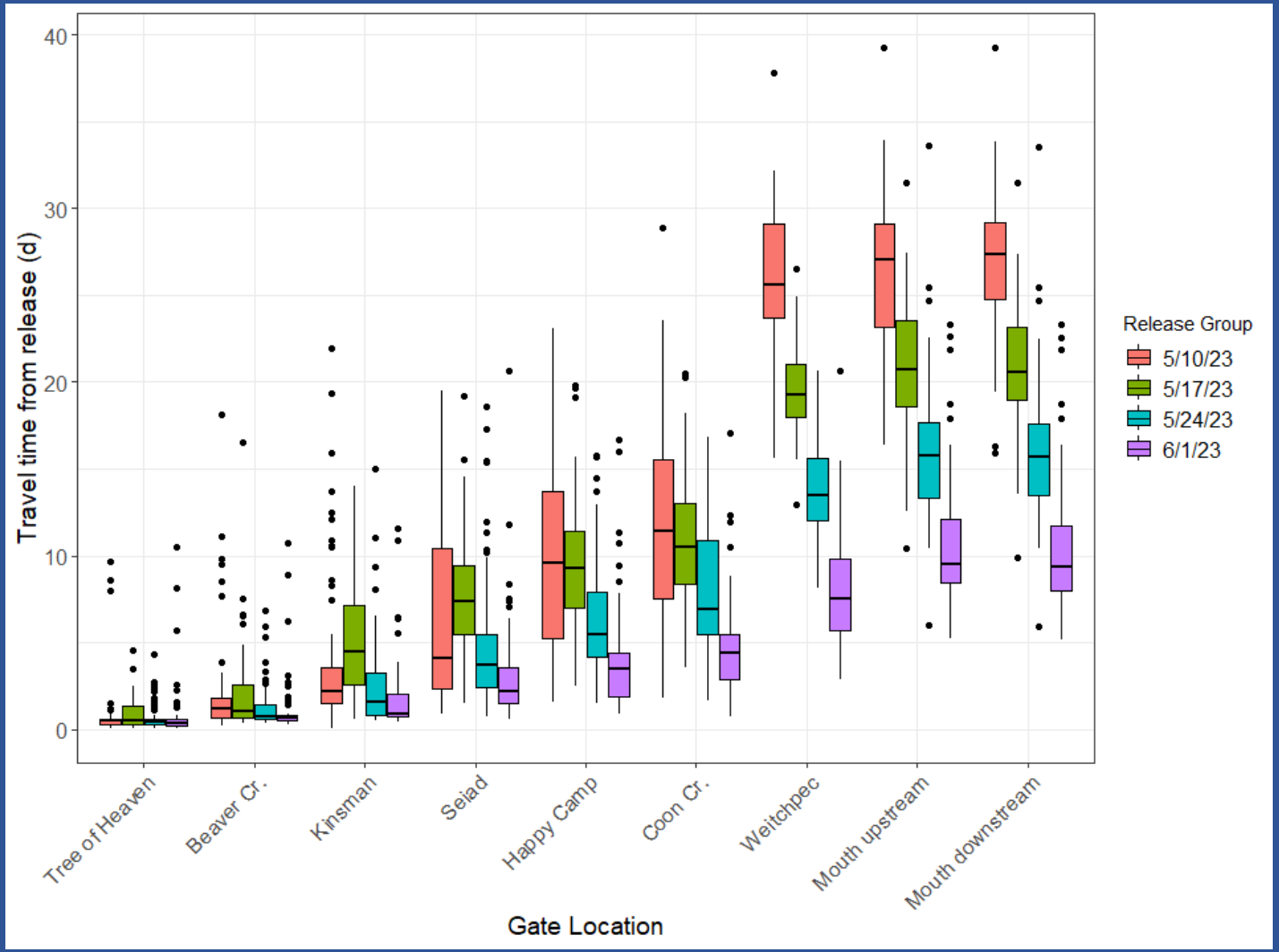
Photo taken by Ryan Tomka, USGS

Fork Length by Week



USGS

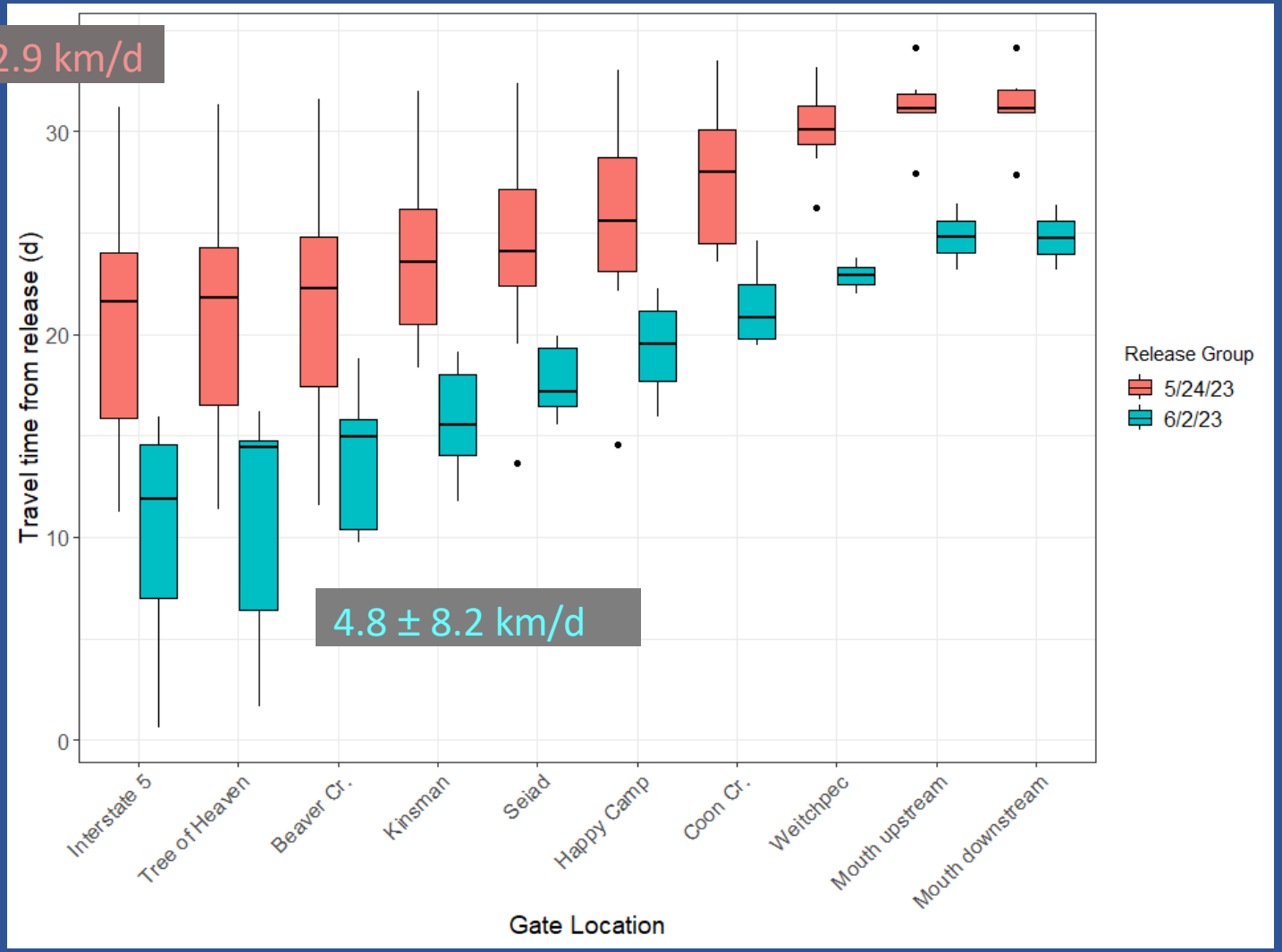
Travel Time from Release, by Release Date, for SS400-tagged fish released at Shasta



USGS

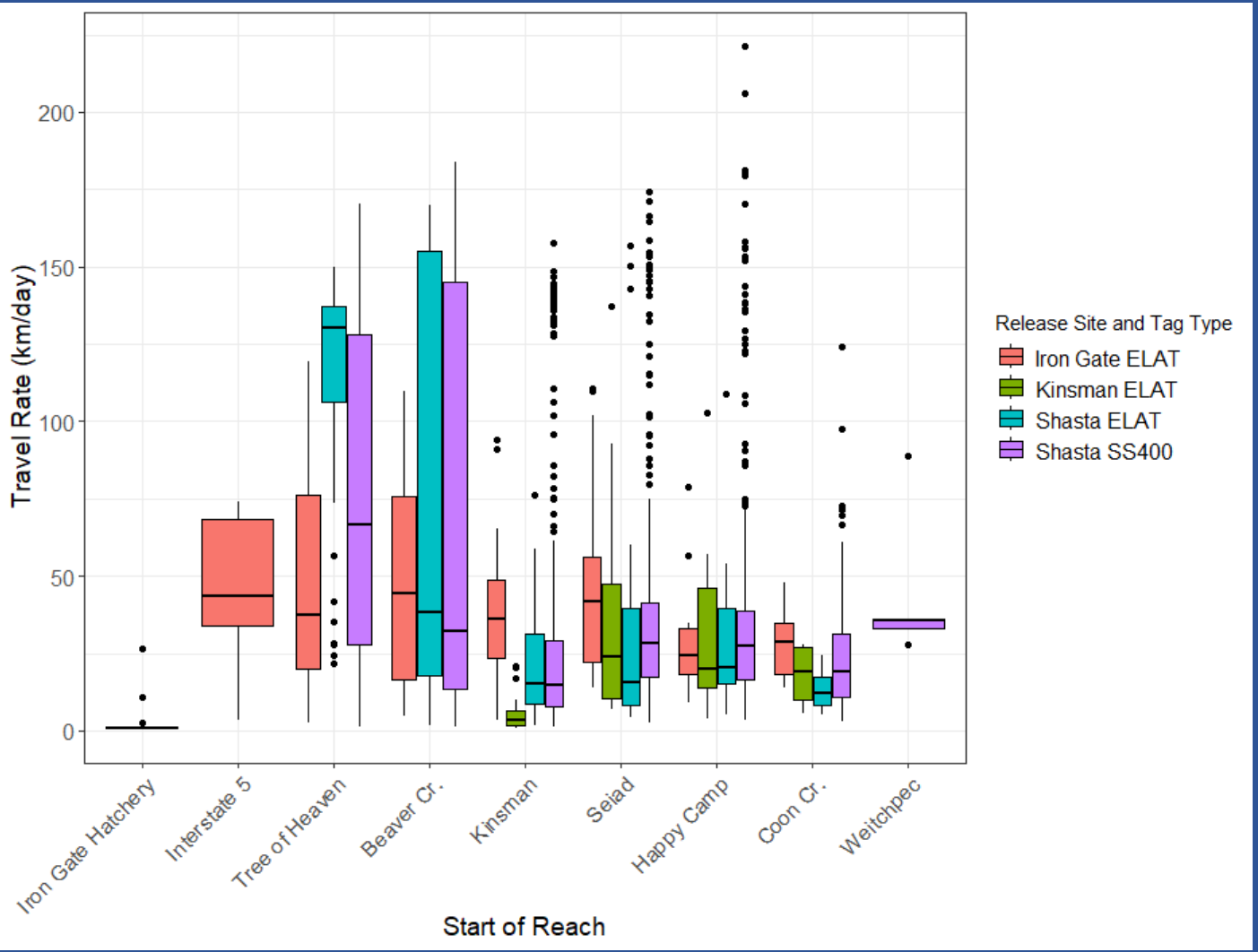
Travel Time From Release, by Release Date for IGH Fish

0.8 ± 2.9 km/d



USGS

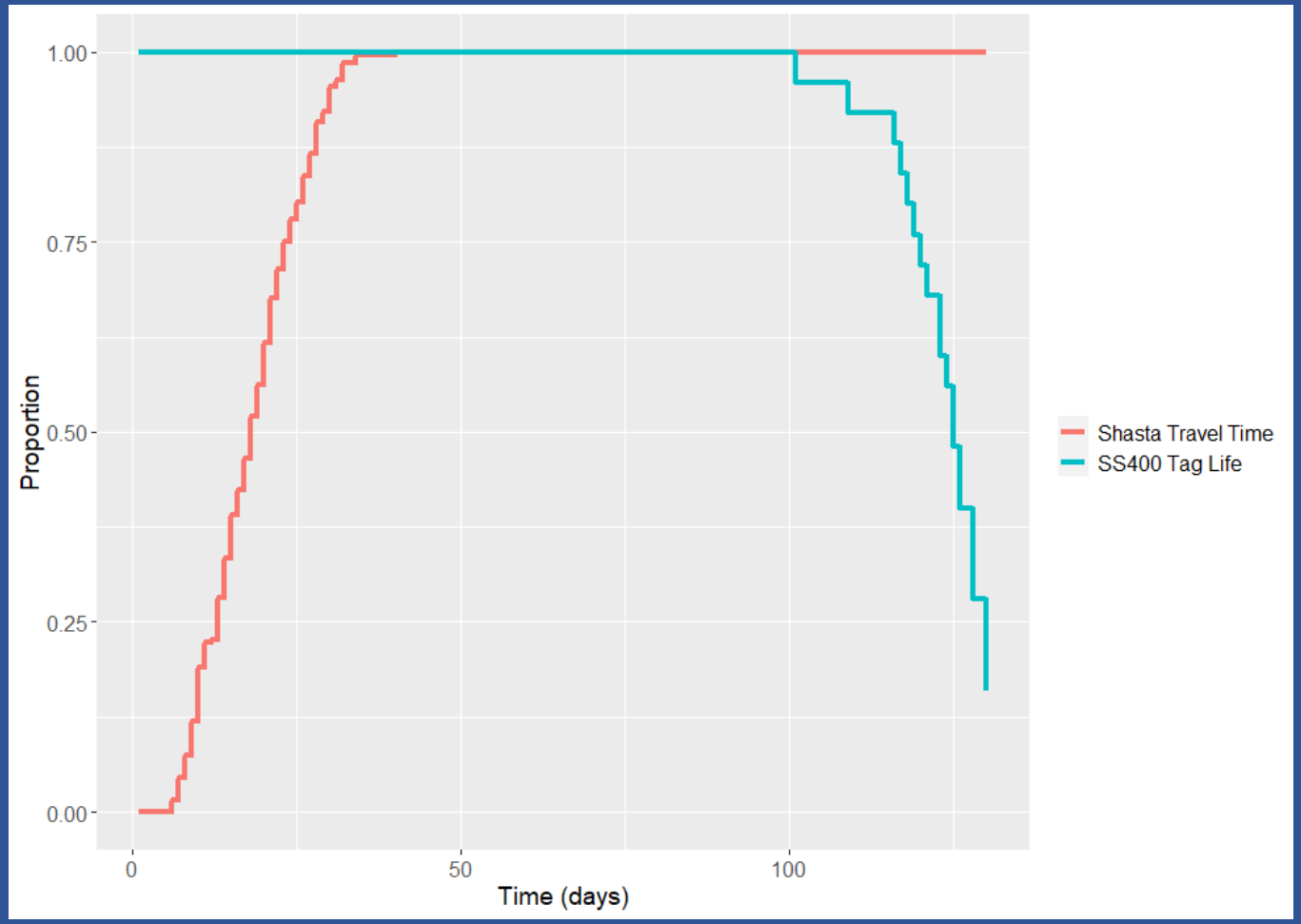
Travel Rate by Reach, Release Site, and Tag Type



Preliminary Survival Estimation

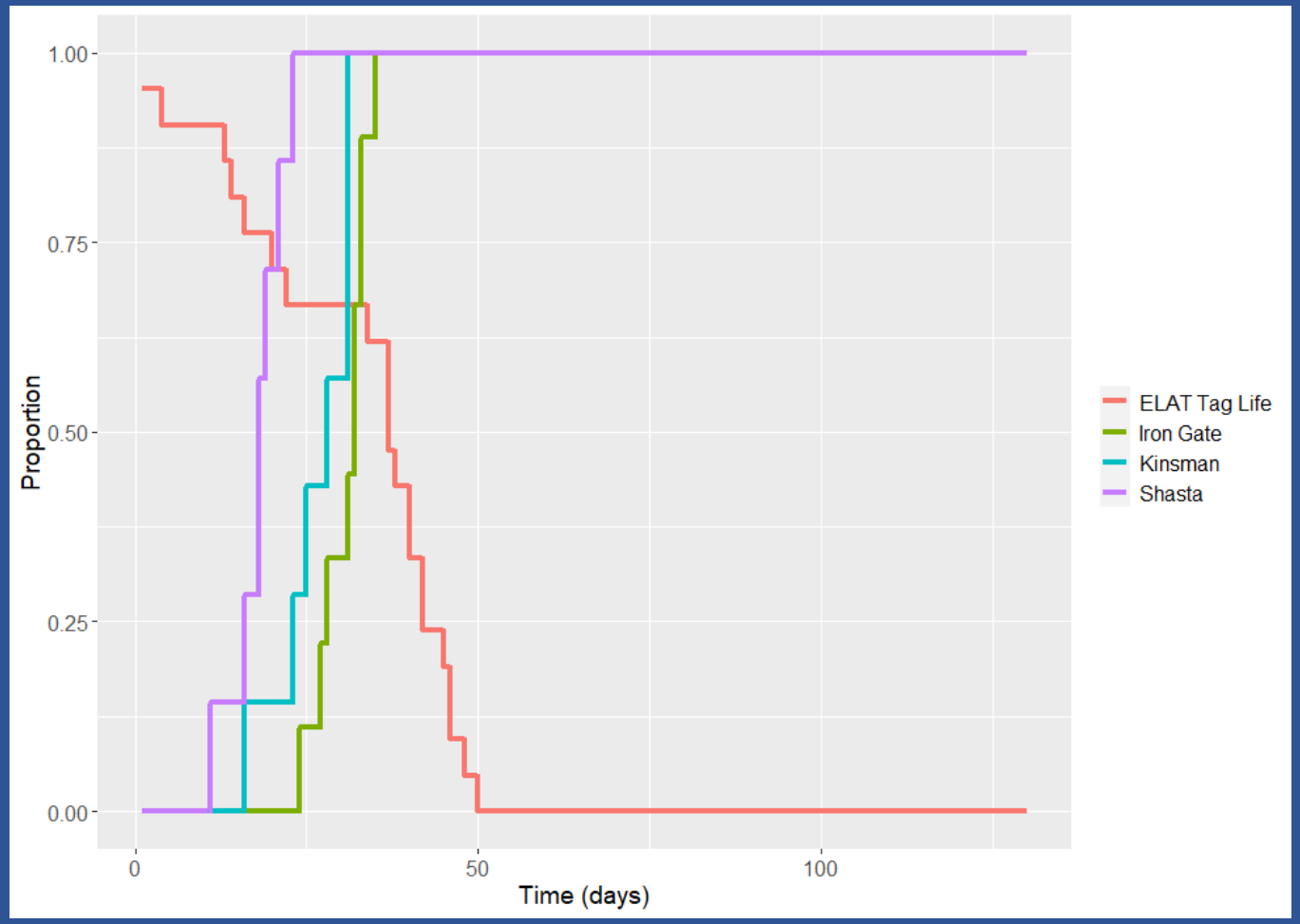
- Survival was estimated using space-for-time Cormak-Jolly-Seber Models (Skalski et al. 1998)
  - Assumes downstream directional movement
  - Capture history is constructed across receiver locations
    (1=detected, 0=not detected)
  - Accounts for imperfect detection
  - Tag battery failure is not accounted for, and if it occurs will cause negative estimates of survival

Travel Time to Mouth SS400-tagged fish and SS400 Tag Life



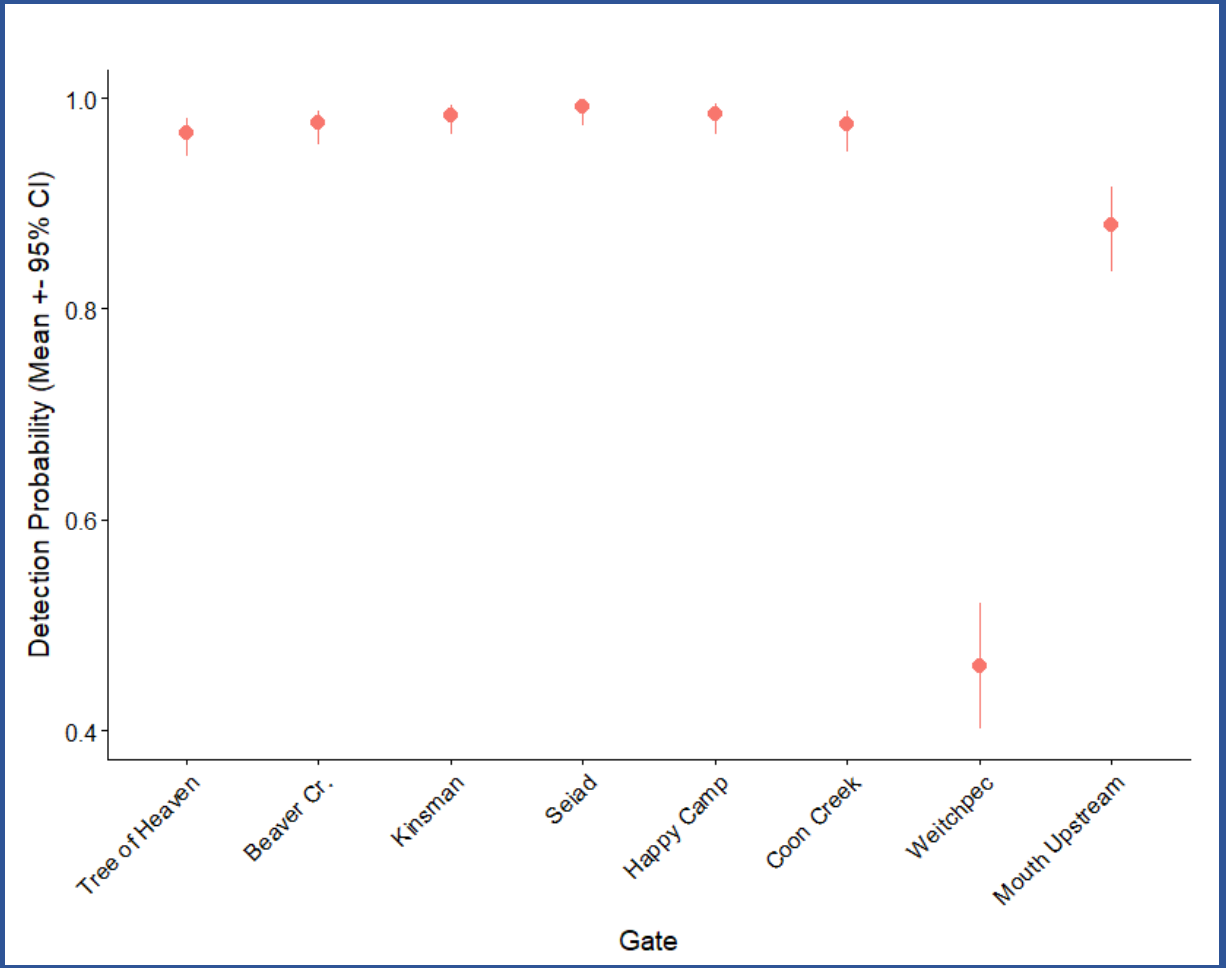
USGS

Time to Mouth and ELAT Tag Life



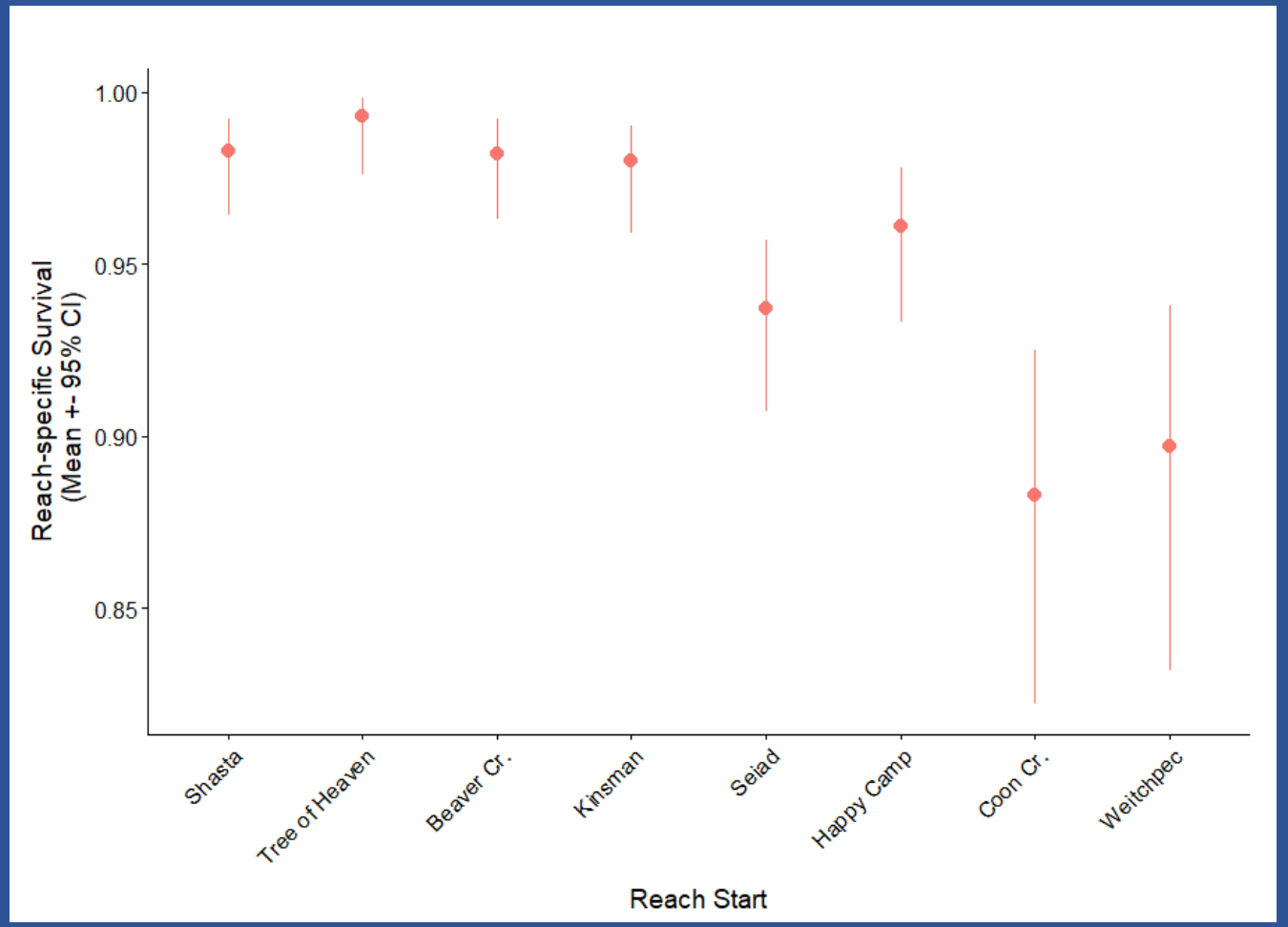
USGS

Detection Probability for SS400-Tagged Fish Released at Shasta



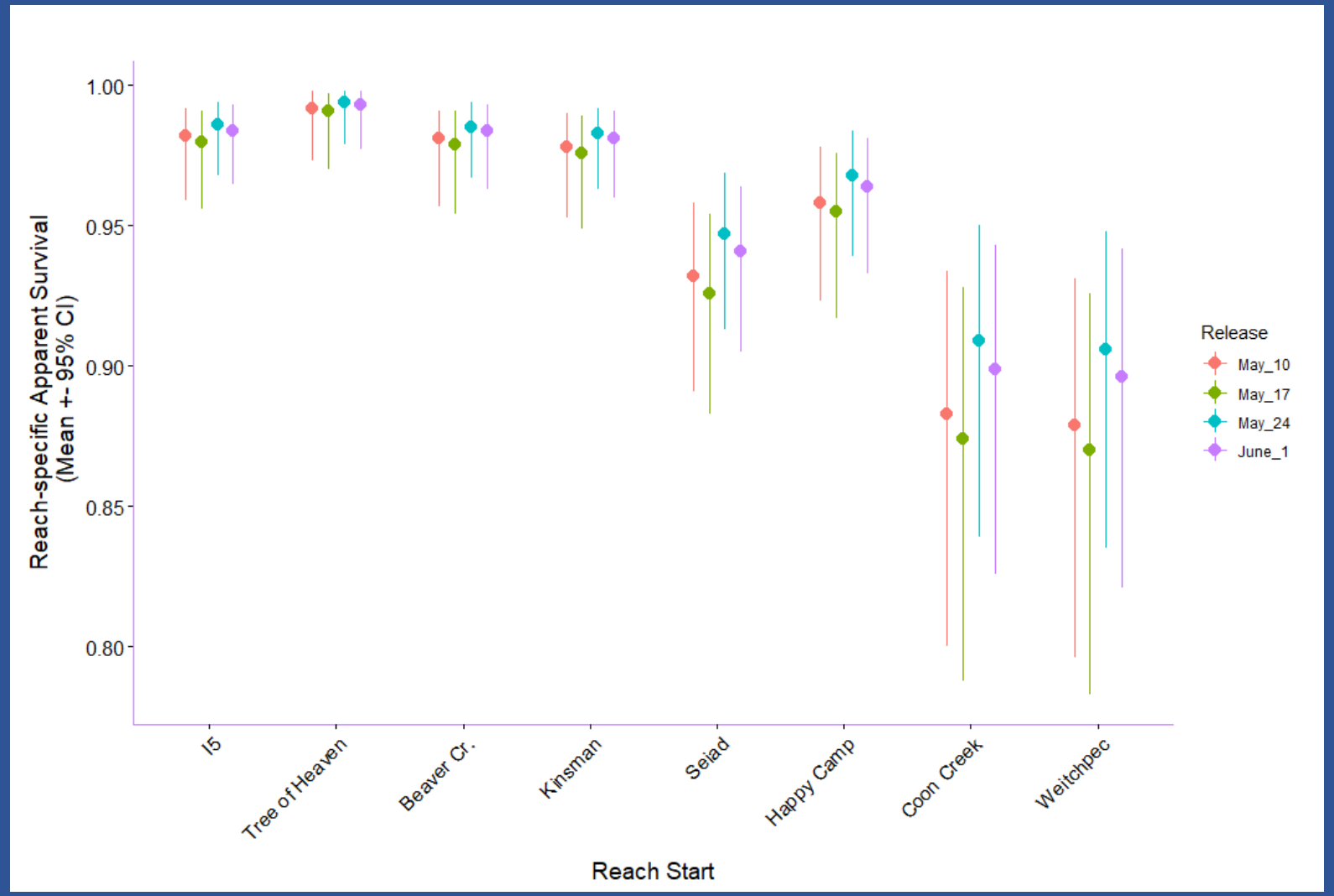
USGS

Survival of SS400-Tagged Shasta Fish



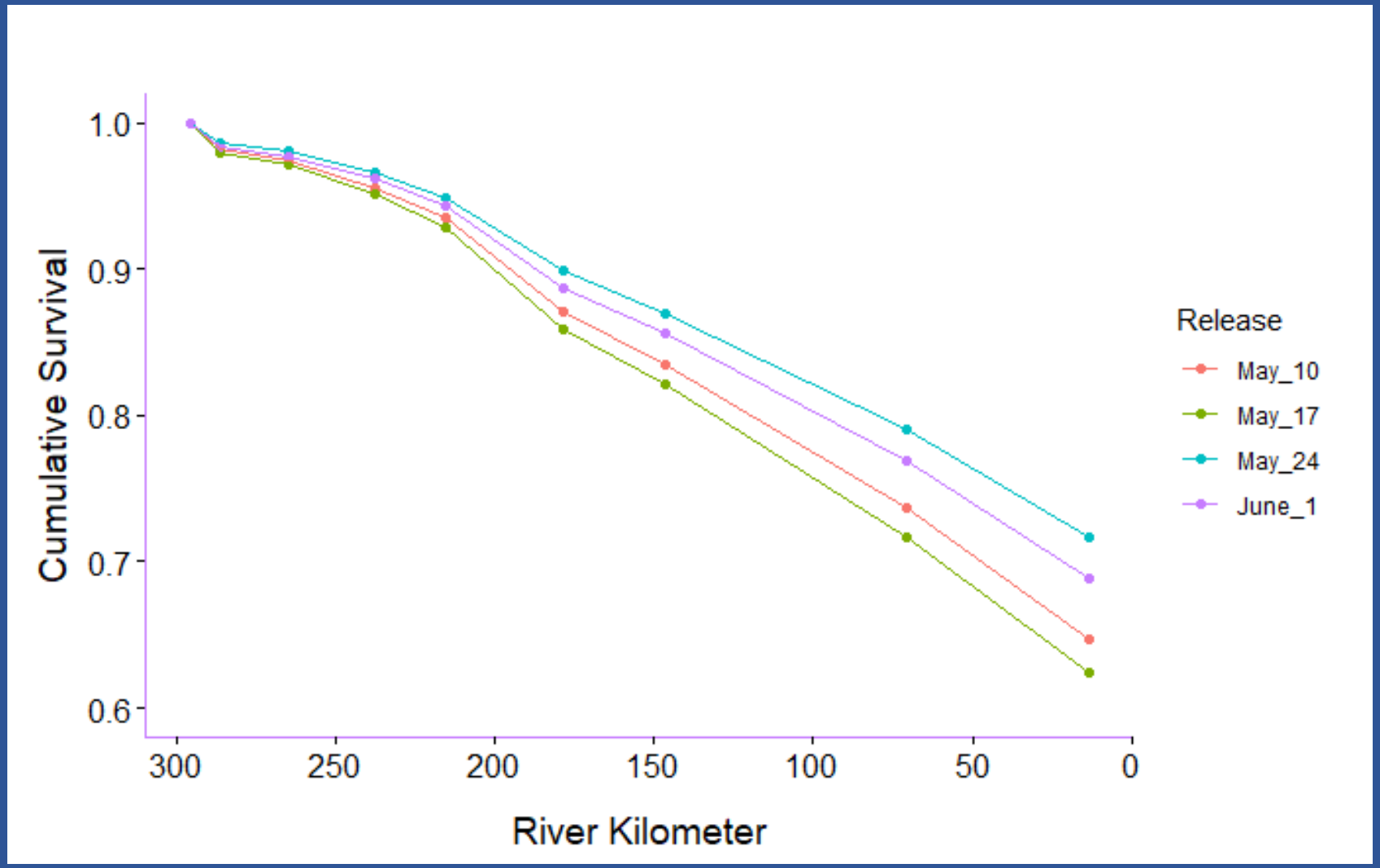
USGS

Survival by Reach, Release Group for SS400-Tagged Shasta Fish



USGS

Cumulative Survival of Shasta SS400 tagged juvenile Chinook



USGS

Important Take Aways

- Fish released later moved faster than fish released earlier
- Survival from Shasta to the mouth was a little bit better for faster moving fish than slower moving fish
- The duration in delayed movement for Iron Gate after hatchery release varied among release dates

Next Steps

- Extend analysis to include 2022-2024 data
- Model effects of size, flow, and release group on outmigration timing
- Use tag life curves in a multistate model to correct for short battery life of the ELAT tags

QUESTIONS ?

USGS

Nate Banet- Real Time Research

Avian Predation: A Synopsis of Methods and Results from Studies in the Klamath River and Columbia River basins

Avian Predation:

A Synopsis of Methods and Results from Studies in the Klamath and Columbia River Basins

June 13, 2024
Klamath Basin Fisheries Collaborative
Annual Meeting

RTR
REAL TIME RESEARCH

Acknowledgments

Authors: Nate Banet*, Quinn Payton, and Allen Evans

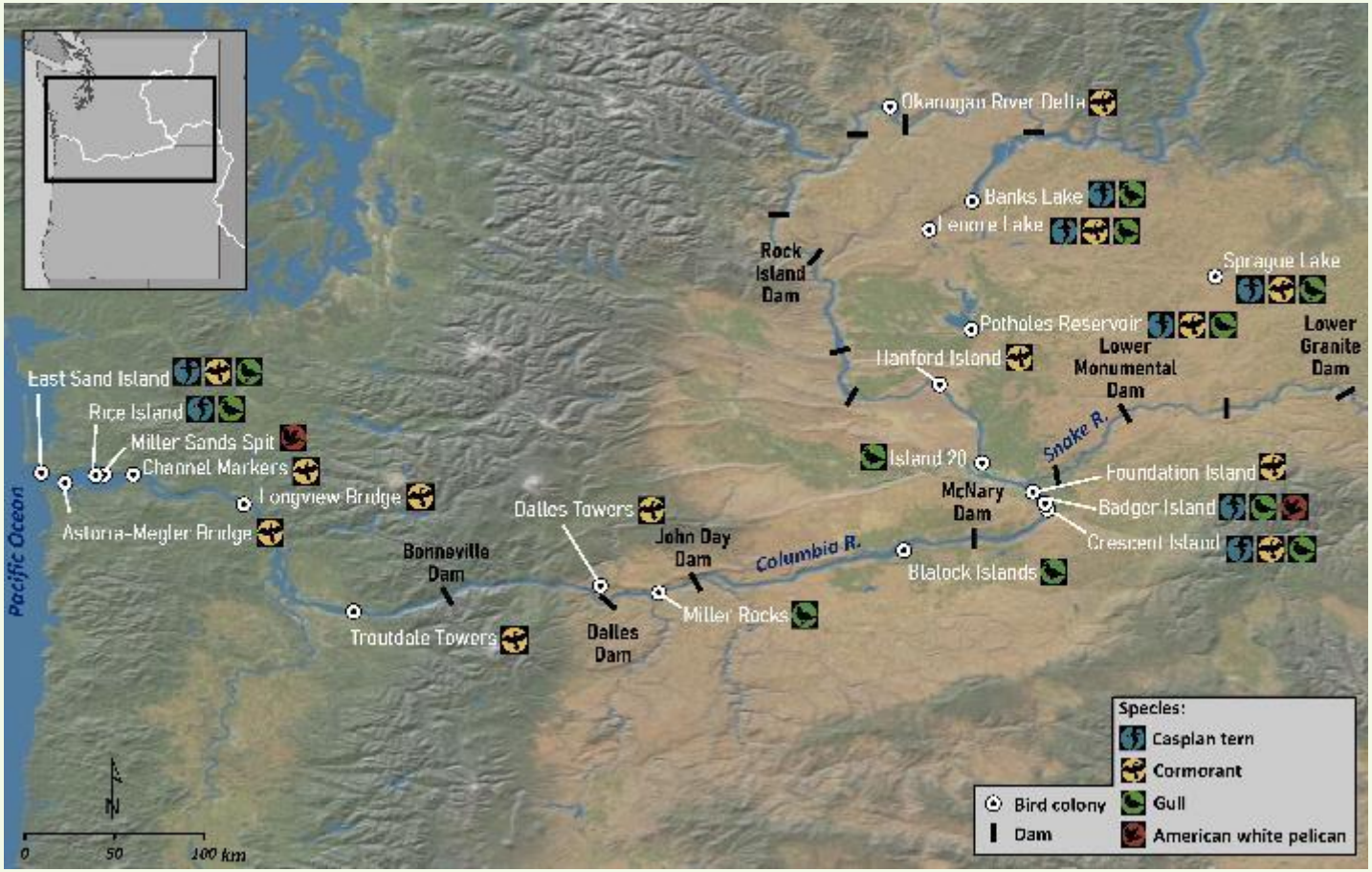
Funding: Bonneville Power Administration
U.S. Army Corps of Engineers
Grant County PUD & Priest Rapids Coordinating Committee
U.S. Bureau of Reclamation

Collaborators: U.S. Geological Survey
NOAA Fisheries
U.S. Fish and Wildlife Service

Background

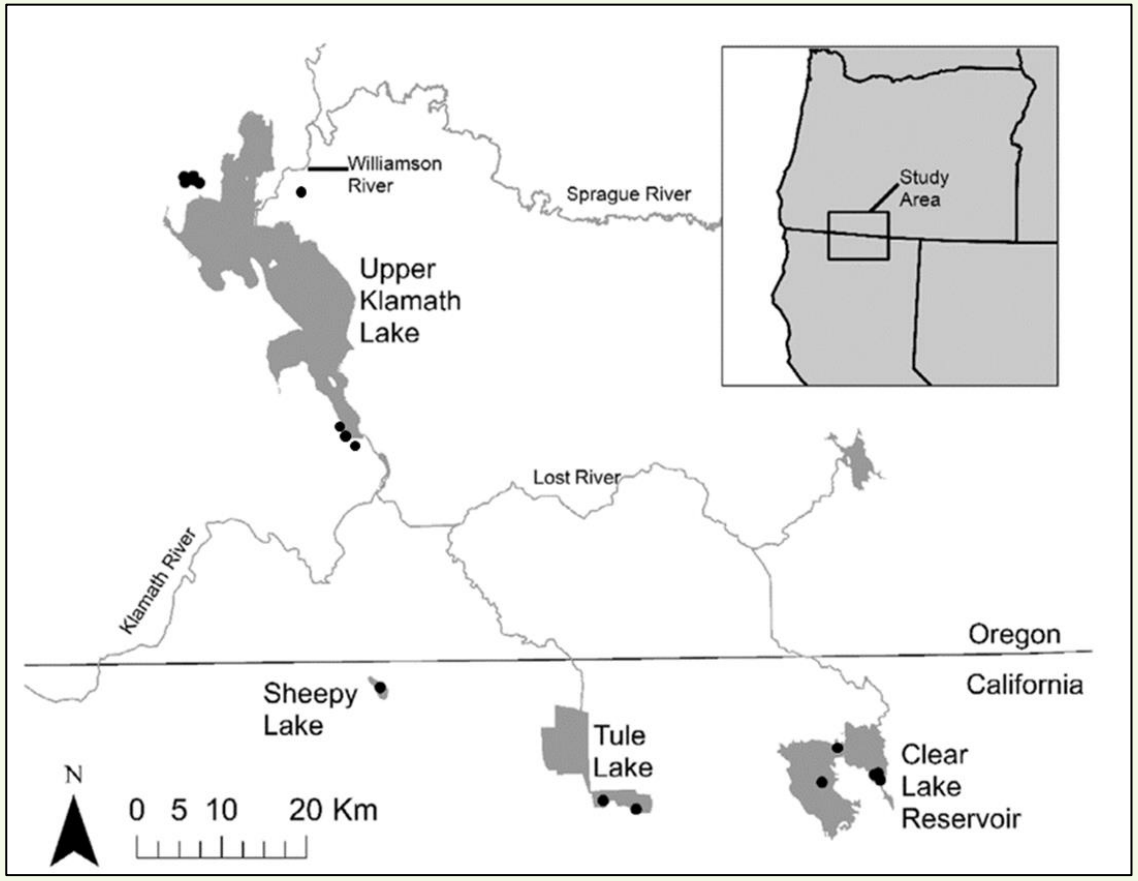
- Avian predation research initiated in late 1990's in Columbia River Basin & 2000's in Upper Klamath Basin
- Four primary species investigated (Caspian terns, double-crested cormorants, California/ring-billed gulls, and American white pelicans)
  - *Nesting occurs over a broad geographic area within each region*
  - *Nesting overlaps with salmonid outmigration period (April – September) in the Columbia basin & the spawning period for suckers in Upper Klamath basin (April – May)*

Colony Locations in the Columbia River Basin

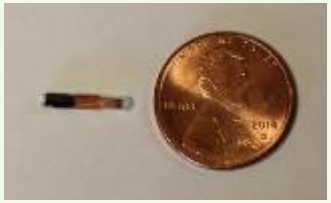


Evans et al. (2024)

Colony Locations in the Upper Klamath Basin

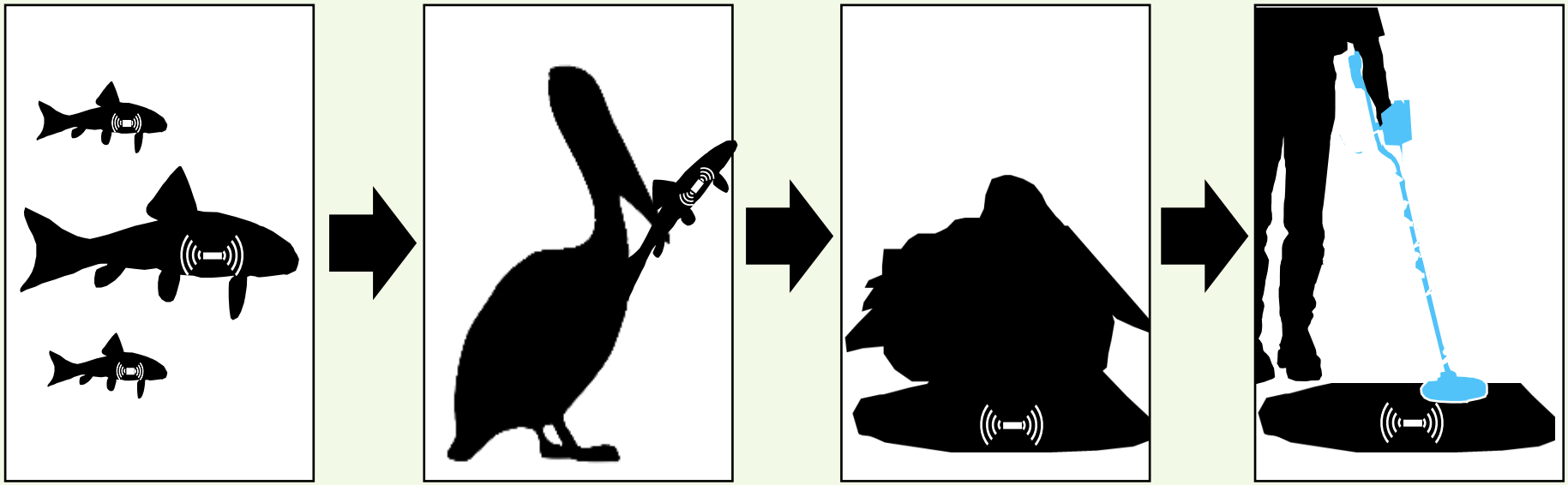


PIT Tag Recovery on Bird Colonies



Recoveries of PIT tags on colonial waterbird breeding sites can be used to estimate predation impacts

Avian Predation Rates



Θ

Predation

Φ

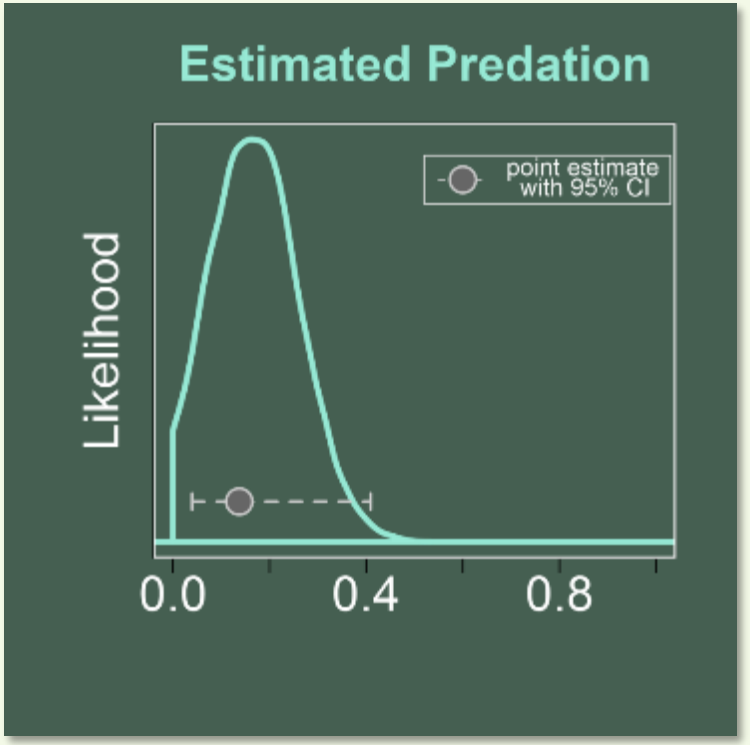
Deposition

Ψ

Detection

Avian Predation Rates

- Output: predation rate or probability (% or proportion of available fish consumed)
  - Species/population/stock
  - Sample sizes often large, offering good precision
  - Relative susceptibility of tagged groups
  - Relative susceptibility of fish with different intrinsic characteristics
  - Predation rates in the context of survival rates
  - Non-invasive or passive technique (recovery tags after the breeding season)



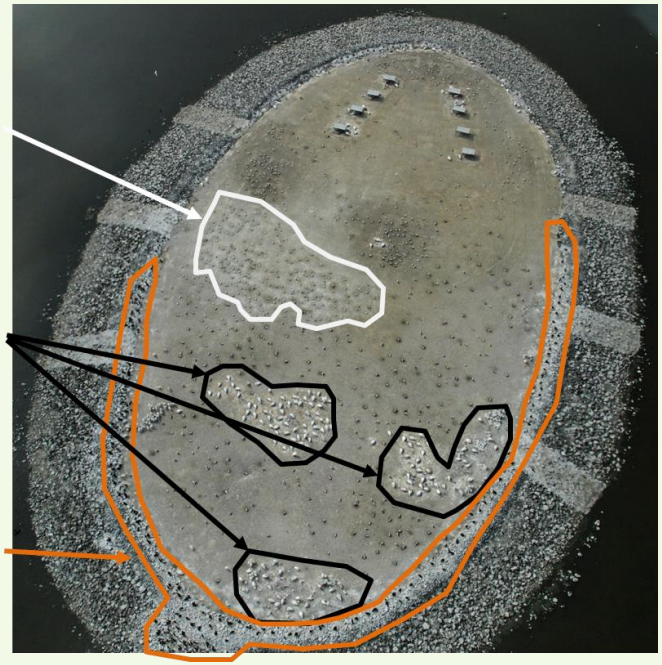
Hostetter et al. (2015)

PIT Tag Recovery - CRB

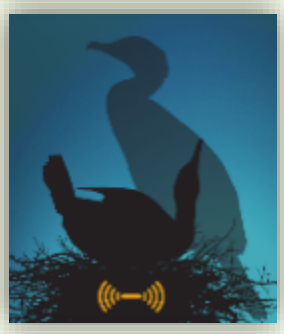
- 1.5 million fish PIT tags recovered from bird colonies since 1999
  - > 50 individual nesting and loafing sites scanned
  - 11 species recovered (e.g., Chinook, coho, sockeye, steelhead trout, cutthroat trout, bull trout, northern pikeminnow, smallmouth bass, white sturgeon, Pacific lamprey, and shad)
  - All tagged salmonid populations, run-, and rear-types recovered; including juvenile and adult salmonids (up to 760 mm in length)

PIT Tag Recovery - UKB

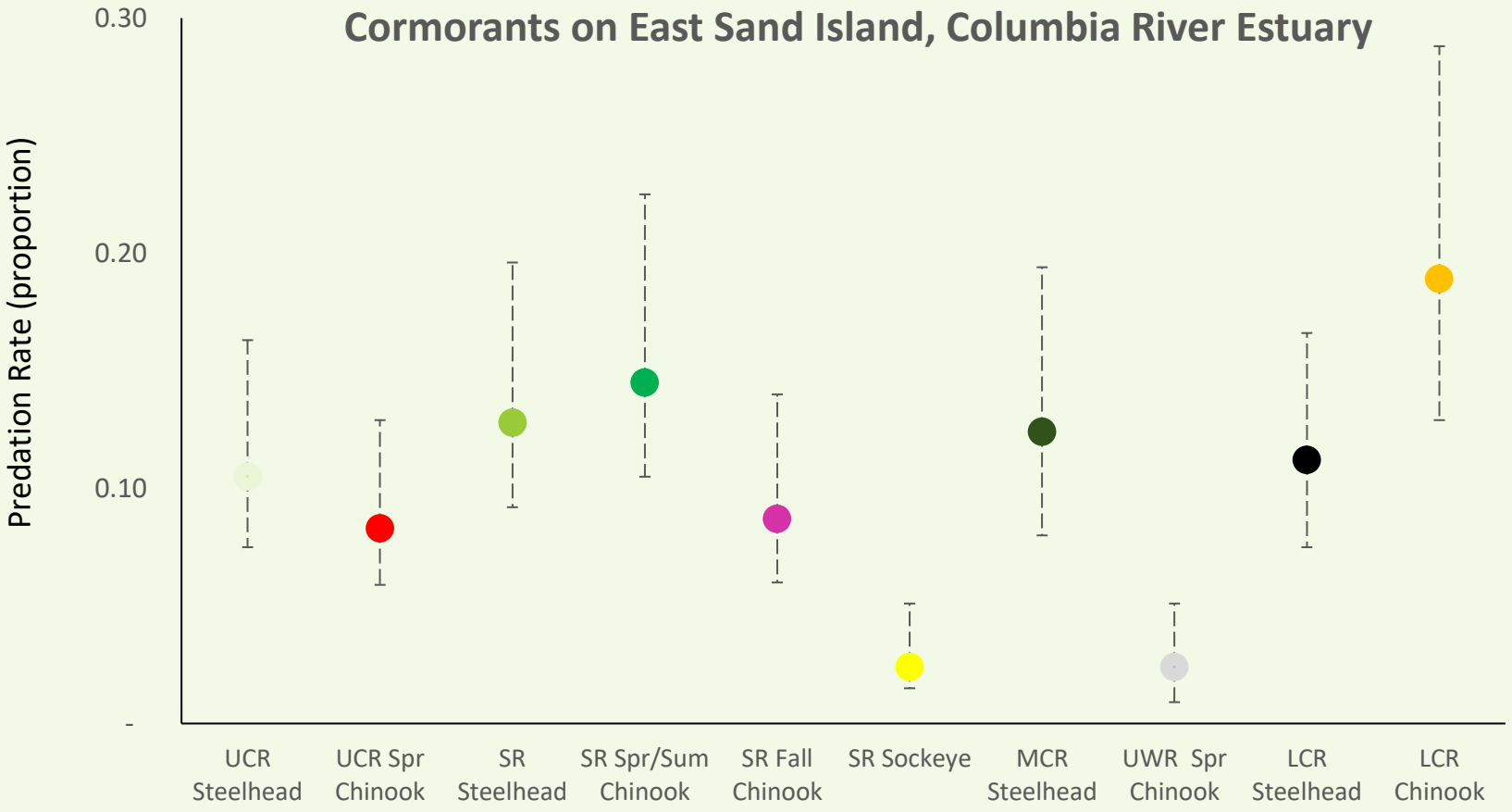
- > 5,000 fish PIT tags recovered from bird colonies during 2009 -2023
  - Half of recovered tags were from 2021 - 2023
  - > 20 individual nesting and loafing sites scanned
  - 6 species recovered (Lost River sucker, Shortnose sucker, Klamath largescale sucker, Redband trout, Chinook, Clear Lake hitch)
  - Adult Lost River suckers up to 730 mm in length



Examples of Predation Rate Results



Predation Rates – Columbia River Basin



Hostetter et al. 2023

Predation rates vary by fish species, fish population, and colony

Predation Rates – Upper Klamath Basin

Location	Sucker Group	Annual Average	Annual Range
Upper Klamath Lake	Adult LRS	0.5% (0.2–1.1)	0.1% – 1.1%
Clear Lake Reservoir	Adult LRS	2.5% (0.6–5.5)	0.4% – 7.2%
Upper Klamath Lake	Adult SNS	1.8% (0.5–4.0)	0.4% – 3.7%
Clear Lake Reservoir	Adult SNS/KLS	2.8% (0.9–4.0)	0.6% – 6.2%
Upper Klamath Lake	Juvenile (wild)	10.1% (4.8–19.0)	10.0% – 10.1%
Upper Klamath Lake	Juvenile (SARP)	4.9% (3.9–8.2)	4.3% – 8.5%
Clear Lake Reservoir	Juvenile (wild)	6.8% (2.1–15.2)	4.3% – 10.5%

Evans et al. 2022

What factors influence avian predation on juvenile salmonids?

Prey availability

Fish species and ESU/DPS

Fish size and condition

Environmental factors (e.g., flow)

Colony location and size

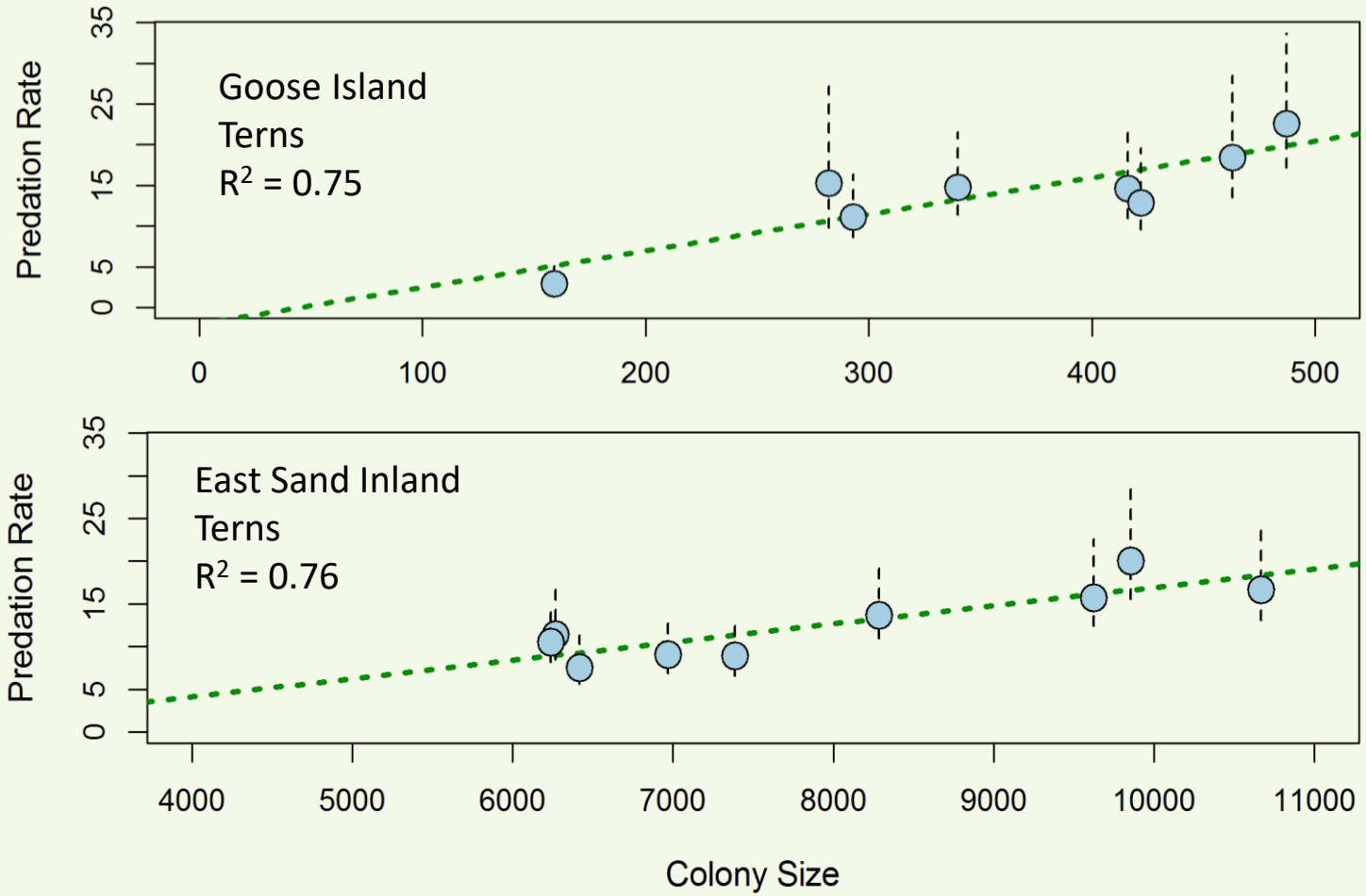
Fish rear-type

Fish run-timing

Other factors

Colony Location and Size

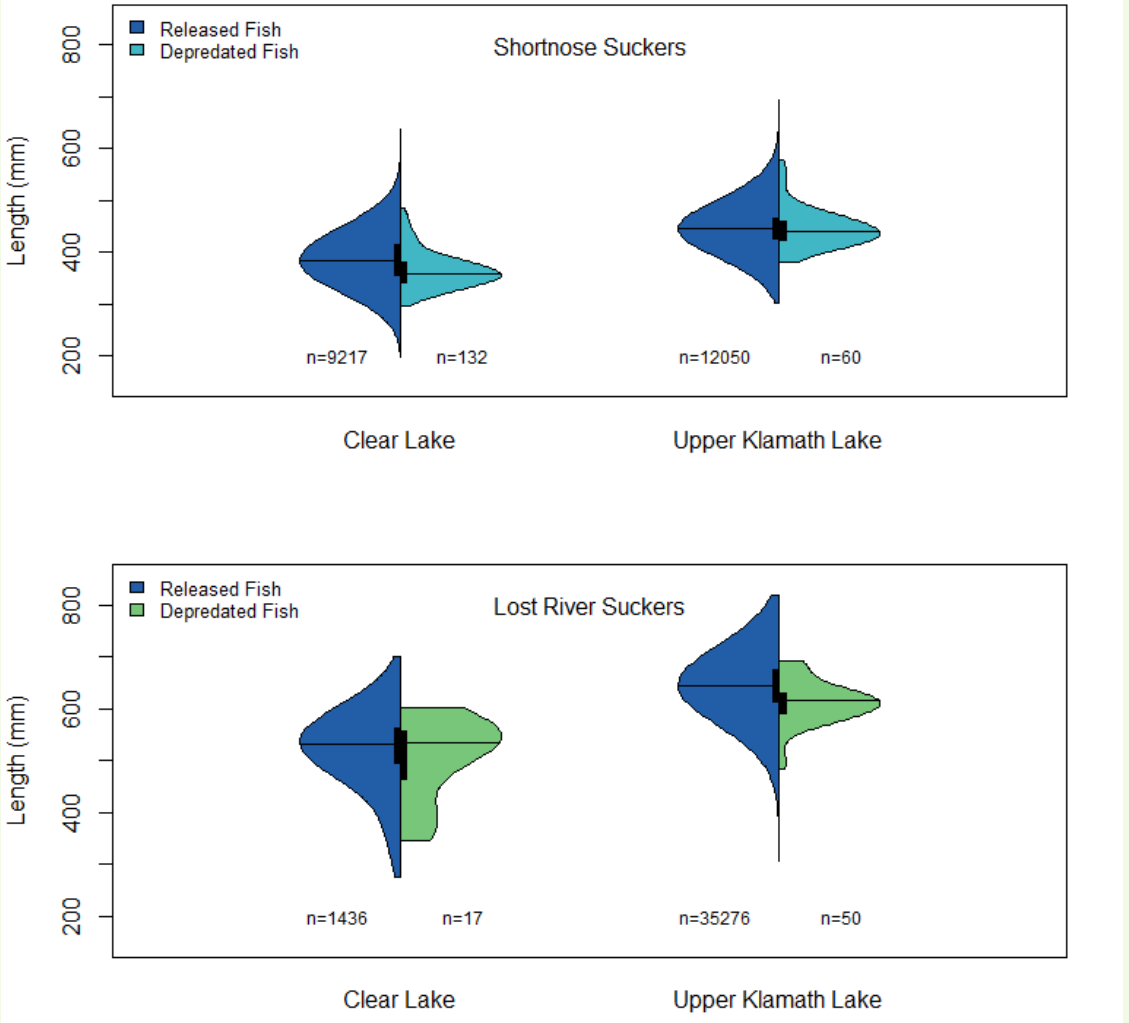
PIT-tagged Upper Columbia Steelhead, 2007-2015



BRNW (2015); *Evans et al. (2016a)*

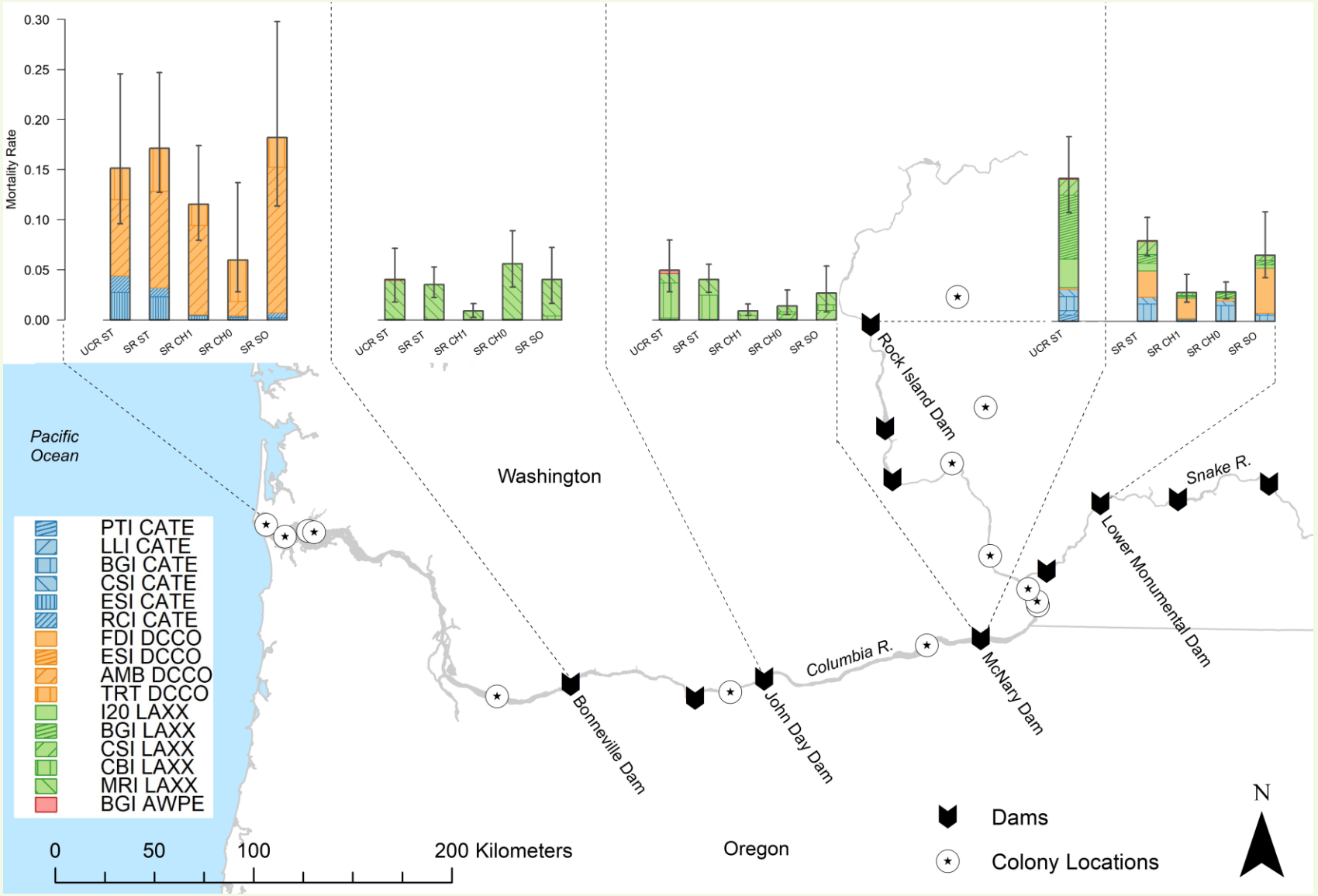
Predation based on sucker length

Adult LRS ~ 300 to 800 mm
Adult SNS ~ 250 to 600 mm
Juveniles < 250 to 300 mm



Evans et al. (2016)

Hotspots of Predation – CRB



Evans et al. 2024

Hotspots of Predation – UKB

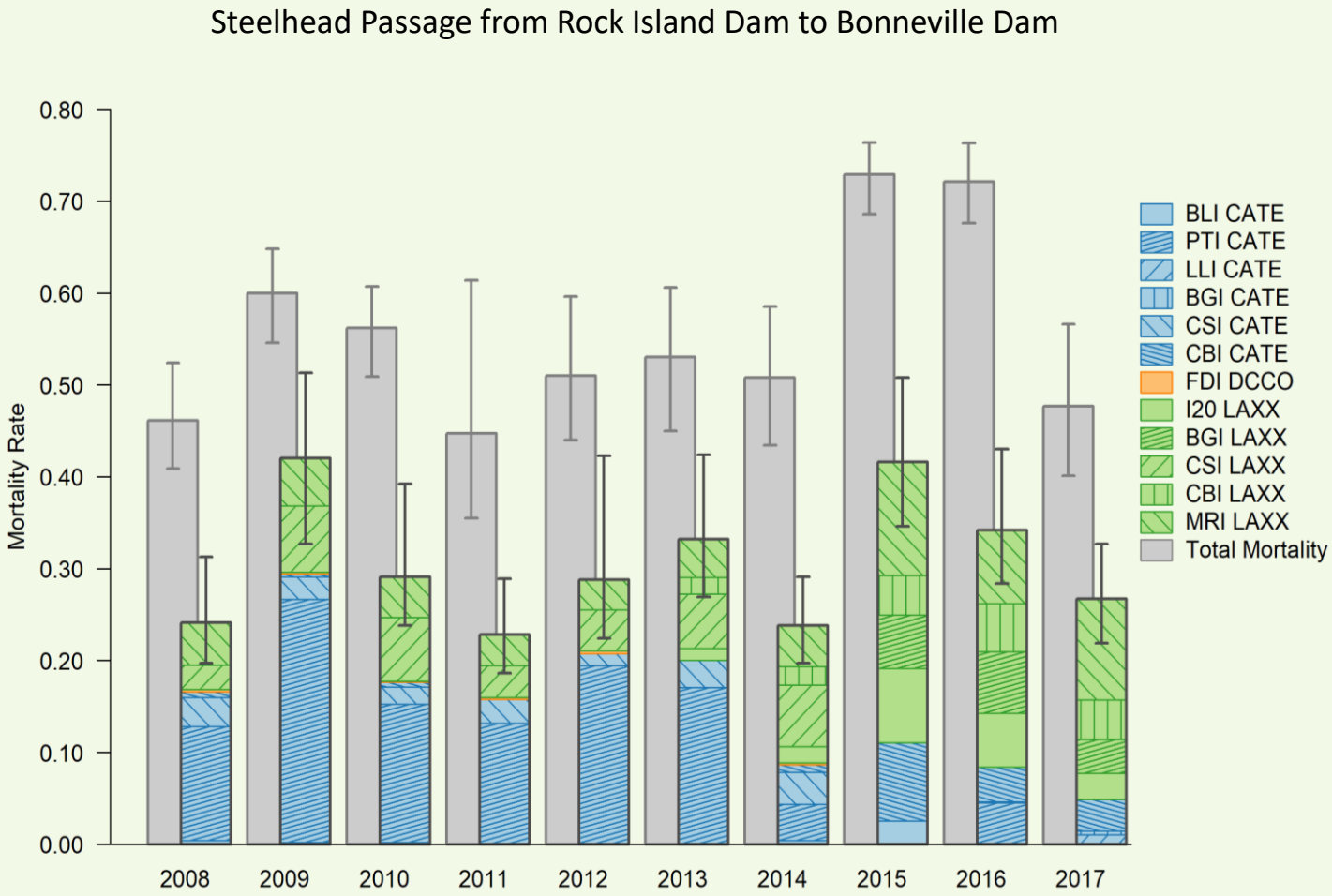
- New groups of SARP suckers are being released in new locations such as Sheepy Lake in 2023
- Emerging predation hotspots on different release groups can be identified with consistent PIT-tag recovery efforts

Sheepy Lake Island – May 28, 2024

How do measures of avian predation relate to fish survival?

- Cumulative mortality relative to mortality due to avian predation
- Spatially-explicit (e.g., river reach) and temporally-explicit (e.g., week) total mortality and mortality due to avian predation
- Relationship between avian predation and survival (e.g., additive versus compensatory)

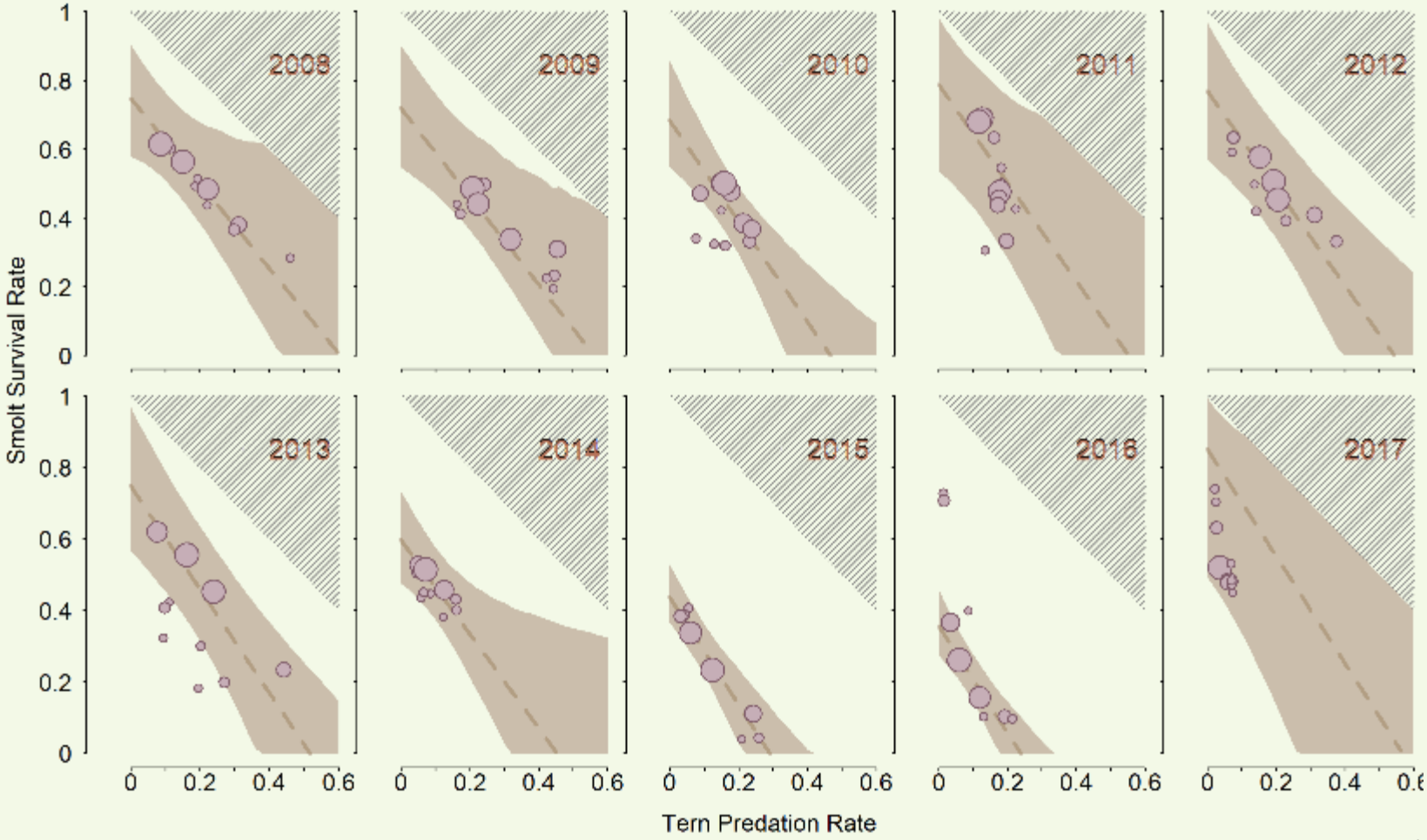
Total Mortality and Mortality Due to Avian Predation - CRB



Evans et al. 2022

Relationship Between Avian Predation and Survival

Steelhead Passage from Rock Island Dam to Bonneville Dam

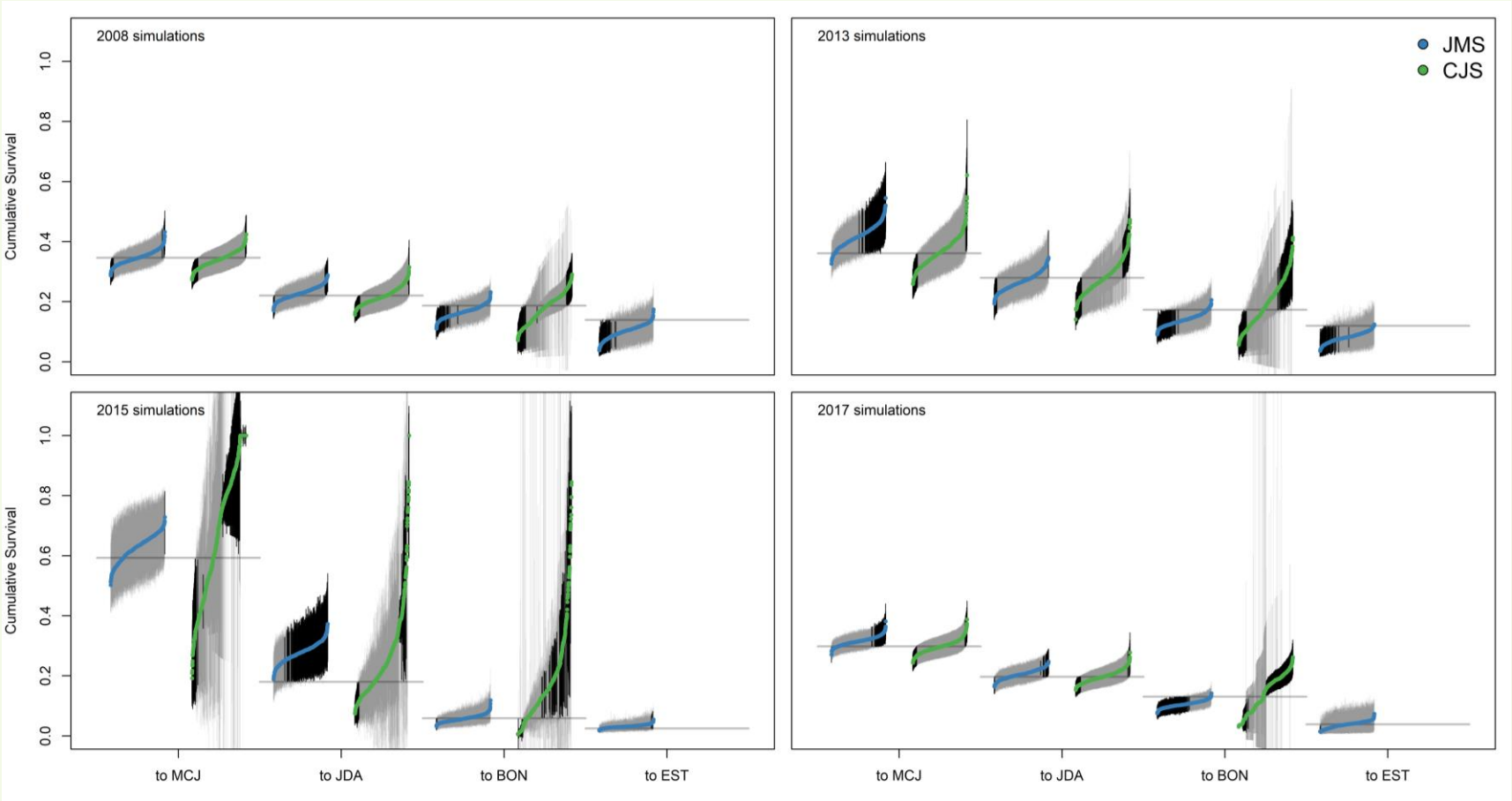


Payton et al. 2020

- Statistically significant relationship within and across years
- Years with more variation in levels of predation among weeks are associated with better fits

Mark-Recapture-Recovery: Survival Studies

- PIT tag recovery data on bird colonies is an under-utilized source of information that can increase the precision and accuracy of fish survival estimates

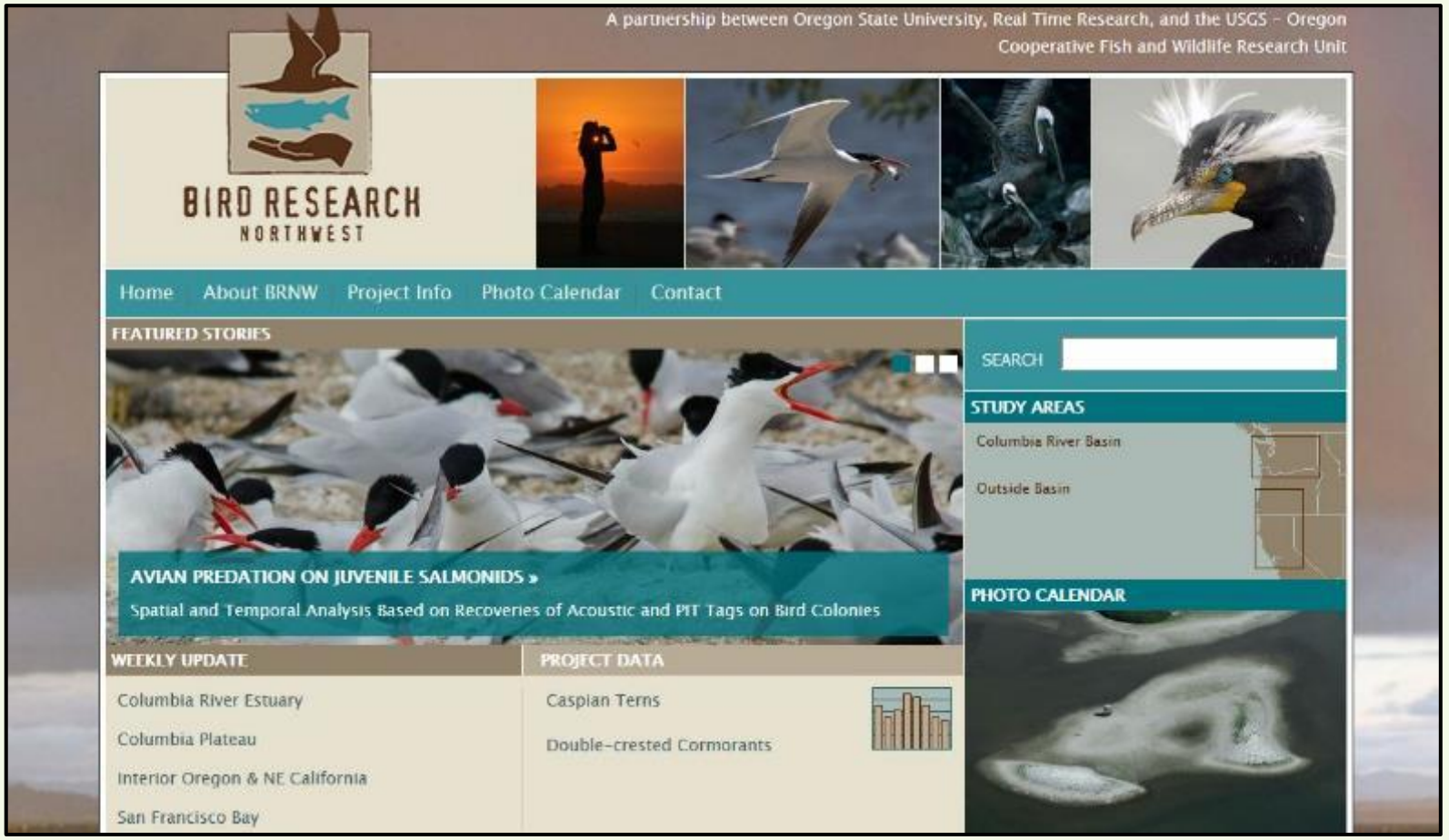


Payton et al. (2023)

Summary

- Recoveries of PIT tags on bird colonies can provide valuable information on where, when, and how many fish die in space and time.
- Predation by colonial waterbirds, although not the original cause of salmonid and sucker declines, can be a substantial source of mortality in some years.
- Recoveries of PIT tags on bird colonies can be used to investigate factors that influence the susceptibly of fish to predation.
- Recoveries of PIT tags on bird colonies can be used to increase the precision and accuracy of survival estimates by increases sample sizes of tagged fish with known fates.

Bird Research Northwest



nate.banet@realtimeresearch.com
allen@realtimeresearch.com

www.birdresearchnw.org

Interactive Discussion – Project Design

Jacob Krause- USGS
Brian Hayes- USGS

5 Components of a Successful PIT Tag Study

Please contact Jacob Krause (jrkrause@usgs.gov)
for more information about this presentation.

5 components of a successful PIT tag study

Jacob Krause and Brian Hayes

USGS Western Fisheries Research Center

Klamath Falls Field Station

U.S. Department of the Interior
U.S. Geological Survey

USGS
science for a changing world

Break

10 minutes

Research and monitoring of Suckers- PIT and telemetry tagging

Shelley Johnson- USGS

Seasonal detections of PIT-tagged suckers in Pelican Bay, Upper Klamath Lake, OR

Please contact Rachelle Johnson (rachellejohnson@usgs.gov) for more information about this presentation.

Seasonal detections of PIT-tagged suckers in Pelican Bay, Upper Klamath Lake, OR

Rachelle C. Johnson[1], Jacob Krause[1], Brian Hayes[1], and Mark Hereford[2]

Klamath Basin Fisheries Collaborative Annual Meeting, Klamath Falls, OR
June 13, 2024

[1]US Geological Survey, Western Fisheries Research Center
[2]Oregon Department of Fish and Wildlife

U.S. Department of the Interior
U.S. Geological Survey

Ryan Bart- The Klamath Tribes

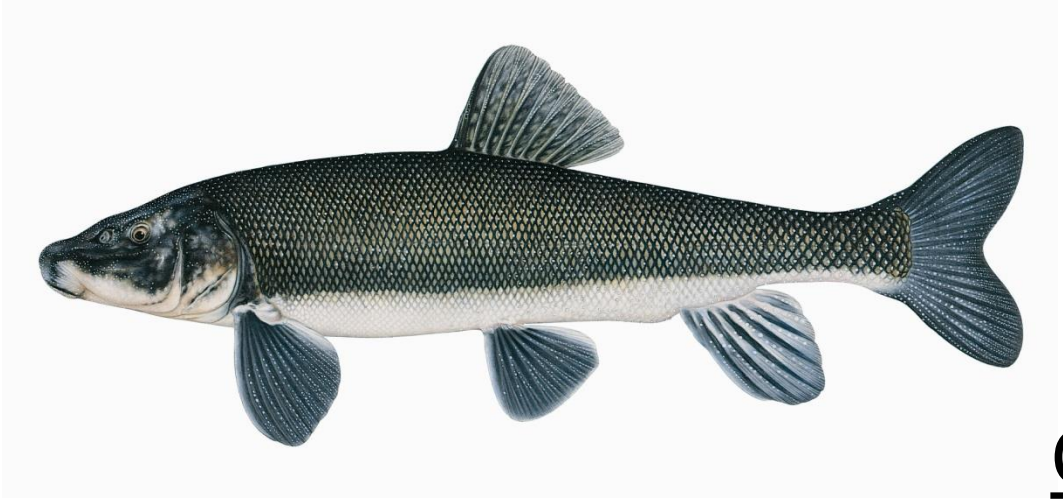
Ambodat Sucker Rearing Strategy

Ambodat Sucker Rearing Strategy

Ryan Bart

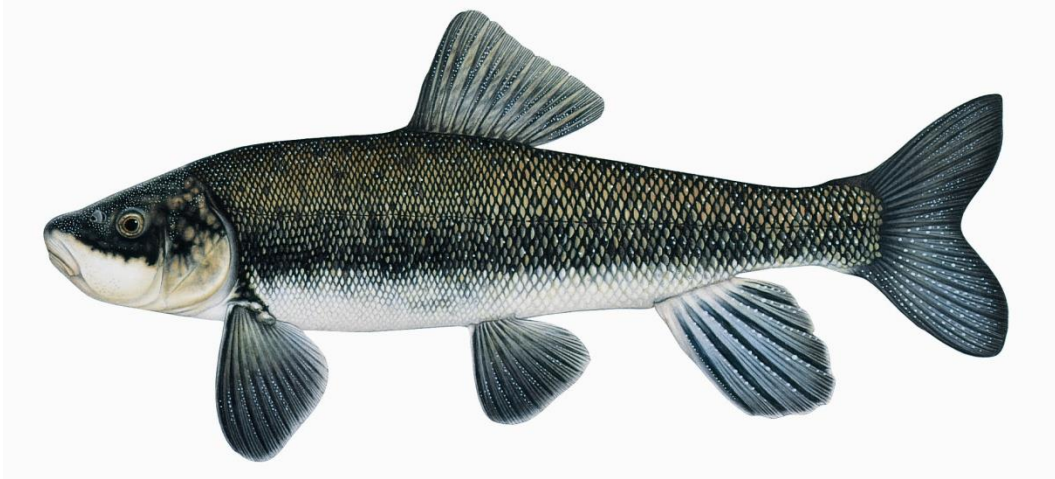
Ambodat Fish Biologist

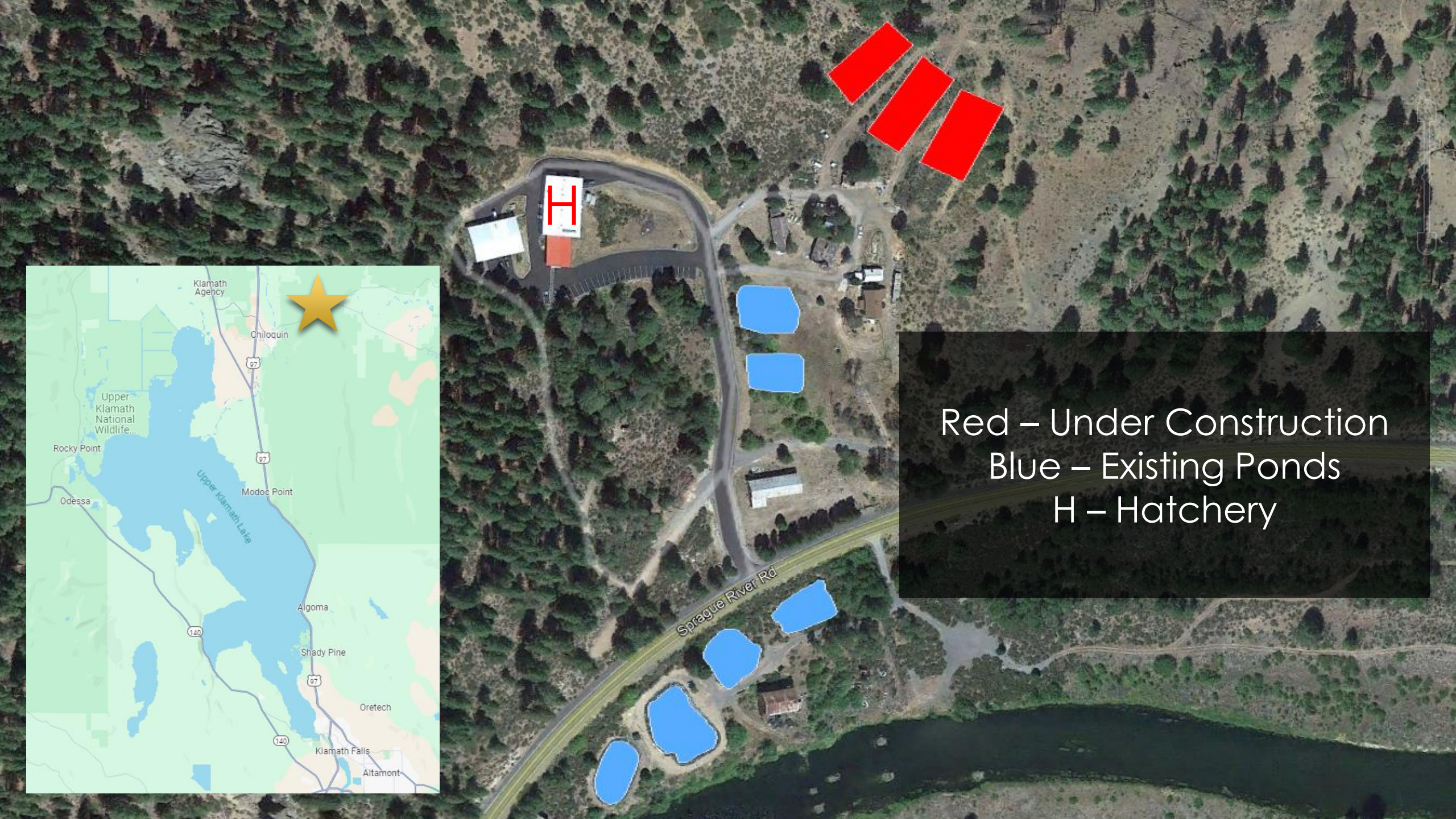
ryan.bart@klamathtribes.com



C’waam-Lost River Sucker

Koptu-Shortnose Sucker




H
Red – Under Construction
Blue – Existing Ponds
H – Hatchery
Sprague River Rd
Klamath Agency
Chiloquin
Upper Klamath National Wildlife...
Rocky Point
Odessa
Upper Klamath Lake
Modoc Point
Algoma
Shady Pine
Oretech
Klamath Falls
Altamont
97
140

Capacity 1000lbs/AF

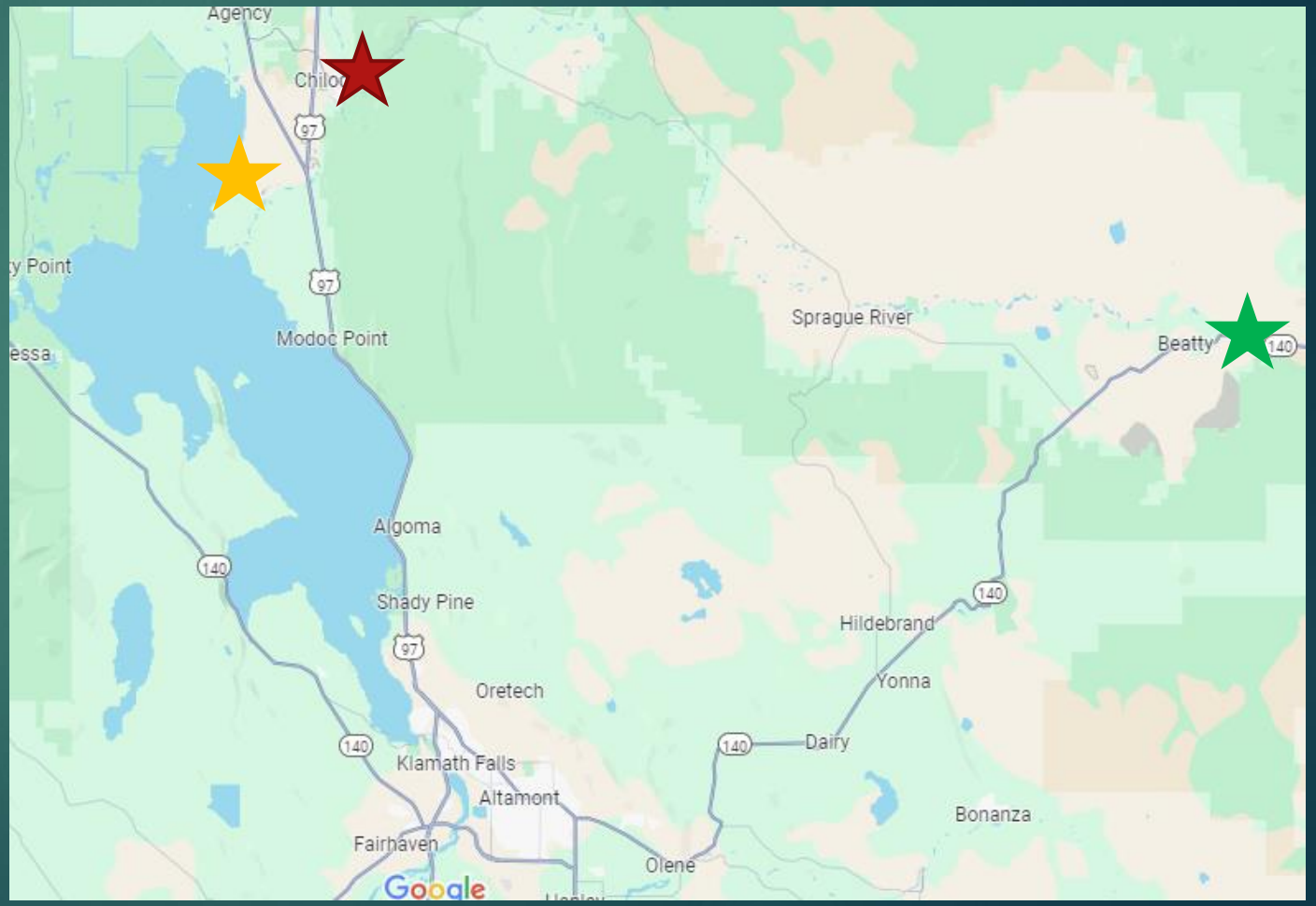
Pond	Volume	150 mm Capacity	300 mm Capacity
L1	0.75 AF	9,937	1,239
L2	1.44 AF	19,014	2,371
L3	0.36 AF	4,788	597
L4	0.25 AF	3,297	411
U1	0.50 AF	6,566	819
U2	0.45 AF	6,012	750
N1	0.75 AF	9,937	1,239
N2	0.75 AF	9,937	1,239
N3	0.75 AF	9,937	1,239
Total	**6.75 AF**	**59,551/89,362**	**7,426/11,143**

Collection

- Gamete Collection
  - East Side Springs (Cwaam)
  - Williamson River (Koptu)
- Fry Collection
  - Williamson River (Cwaam and Koptu)

Released

- 2023 Release Events 10/20 – 10/31
  - **Chiloquin Dam**
    - n = 116
    - Ave TL = 227 mm (SD = 44.45)
  - **Henzel Park**
    - n = 563
    - Ave TL = 92 mm (SD = 28.25)
  - **Beatty Gap**
    - n = 279
    - Ave TL =161 mm (SD = 12.51)



Data Collected

- Release Date
- PIT Tag
- Fin Clip ID
- Total Length
- Weight
- Release Location
- Harvest Date
- Harvest Pond
- Notes (Afflictions, Deformities, ect…)

Strategy

- Focus on rearing suckers to 300 mm or greater to increase survival
  - Adapt based on best available science
- Explore release methods
- Safeguard Species
  - Identify locations and start auxiliary populations
  - Redundant captive populations

Questions?

Ryan Bart

Ambodat Fish Biologist

ryan.bart@klamathtribes.com

McKenzie Wasley

USFWS Sucker Assisted Rearing Program Post Stocking Monitoring

USFWS Sucker Assisted Rearing Program: Post Stocking Monitoring

Klamath Falls National Fish Hatchery

Klamath Falls Fish and Wildlife Office

Josh Gondek – Fish Biologist

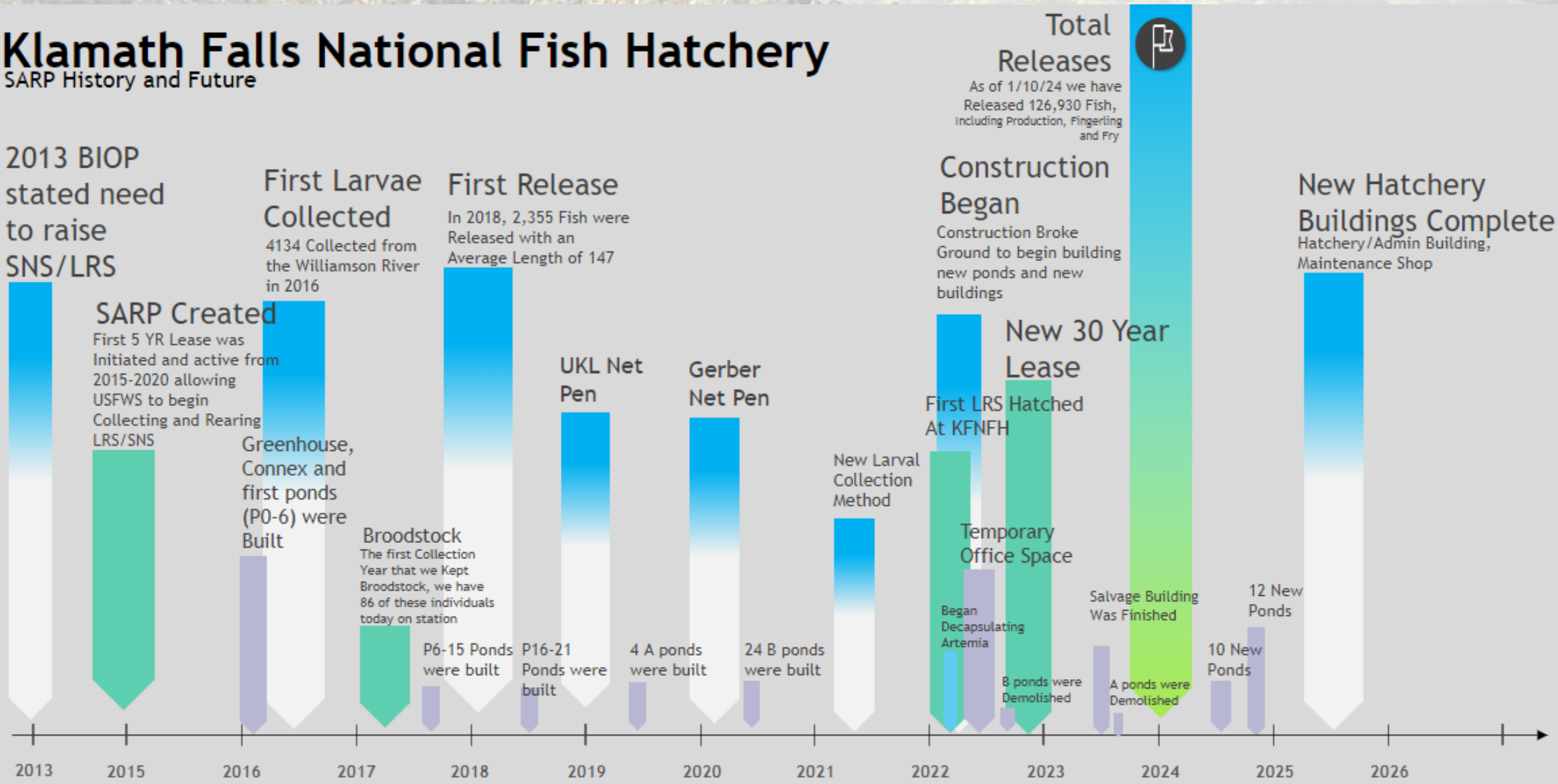
McKenzie Wasley – Biological Science Technician

SARP Background

- Rear endangered/Upper Klamath Basin endemic species
  - Shortnose Sucker (koptu)
  - Lost River Sucker (c'waam)
- Cultural significance to The Klamath Tribes
- Long lived species (~25-40 years)
- Reach sexual maturity at 5-9 years
- Current adult population was born in early to mid 90's
- Low to zero survival of juvenile suckers
- Annual goal of releasing 60,000 fish @ 200 mm to stabilize the population

Klamath Falls National Fish Hatchery

SARP History and Future



SARP Stocking

- Collect suckers in larval stage
  - Treat with formalin and salt for four days
  - Intensive rearing for 30 days or directly into pond
  - Raised in ponds for 16-22 months
- Release in the fall and spring
  - Before release scan PIT tag, record total length, weight, and stock location
- Assist BOR with canal salvage operations

SARP Stocking

Fiscal Year	Larvae Collected	SARP Release	TL (mm)	Salvage Release
2016	4,134	*	*	*
2017	8,730	*	*	*
2018	9,544	2,355	147	784
2019	24,426	4,497	189	1,586
2020	40,603	11,774	223	1,928
2021	106,710	13,394	208	1,689
2022	51,929	12,768	193	*
2023	6,036	17,783	199	436
2024	~20,000	9,134	222	613 (188)
Total	**~272,112**	**71,705**		**7,224**

Post Stock Monitoring

- Where are SARP fish between stocking and when they reach the spawning grounds??

- USGS PIT arrays- refugial habitat, spawning grounds, tributaries, Link River exiting the lake
- USFWS- Supplemental submersible antennas at stocking locations
- USFWS- Raft antennas to active search wetland habitat
- USFWS - Radio Telemetry

USFWS Radio Telemetry

- Investigate post-stocking survival and inform recovery efforts
- 2018 and 2019 Project
  - Tags active Tues./Thurs.
  - Mortality signals in tags
  - Shoreline tracking, transects across lake, aerial surveys
- Current Project 2021-2026
  - 24/7 tag activation
  - No mortality feature
  - Remote stations and aerial surveys

Tagging History

- Total fish tagged
  - 928
- Number currently detectable
  - 401
- Lotek Freshwater Nanotags

Activation Date	Tag Type	Quantity	Ping Interval (sec)	Battery Life (days)	Expiration
Mar-22	NTF-5-1	147	10	357	Mar-23
Oct-22	NTF-6-1	269	10	525	Oct-23
Apr-23	NTF-5-2	111	10	357	Apr-24
	NTF-6-1	151	10	525	Sep-24
Oct-23	NTF-5-2	117	10	357	Oct-24
	NTF-6-1	114	10	525	Mar-25
	J-CART-14-12	19	10	497	

Tagging Demographics – koptu (SNS)

- Total SNS tagged
  - 533 → Juvenile = 339, Sub-Adult = 159, Adult = 35

USFWS Radio Telemetry Release Location and Fish Demographic Summary - SNS										
Date	**Time**	**Location Name**	**Location Coordinates**	**Number of Radio Tagged Fish Released**		**Capture Year**	**Average Length (mm)**	**Length (mm) Range**	**Average Weight (g)**	**Weight (g) Range**	**Age Class at Stocking**
3/16/2022	18:00	TNC Boat Ramp	42.493934, -121.936597	71		2020	195	162-226	92	55-152	juvenile
3/18/2022	19:30	Henzel Park Boat Ramp	42.529530, -121.92951	46		2020	195	164-234	90	59-140	juvenile
10/28/2022		Henzel Park Boat Ramp	42.529530, -121.92951	22	11	2021	196	190-212	69	60-80	juvenile
					11	2019	302	272-337	282	220-396	sub-adult
11/2/2022		TNC Boat Ramp	42.493934, -121.936597	44	24	2021	197	188-223	76	57-107	juvenile
					20	2019	302	260-356	284	200-378	sub-adult
4/28/2023	13:18	Mid-Lake	42.400350, -121.921236	182	124	2021	209	132-255	94	66-145	juvenile
					58	2020	227	205-263	120	82-184	juvenile
10/27/2023	12:30	Mid-Lake	42.400350, -121.921236	168	5	2021	305	275-326	311	216-399	juvenile
					128	2020	312	275-343	332	222-462	sub-adult
					34	2019	338	286-393	420	255-640	adult
					1	2018	405	-	601	-	adult

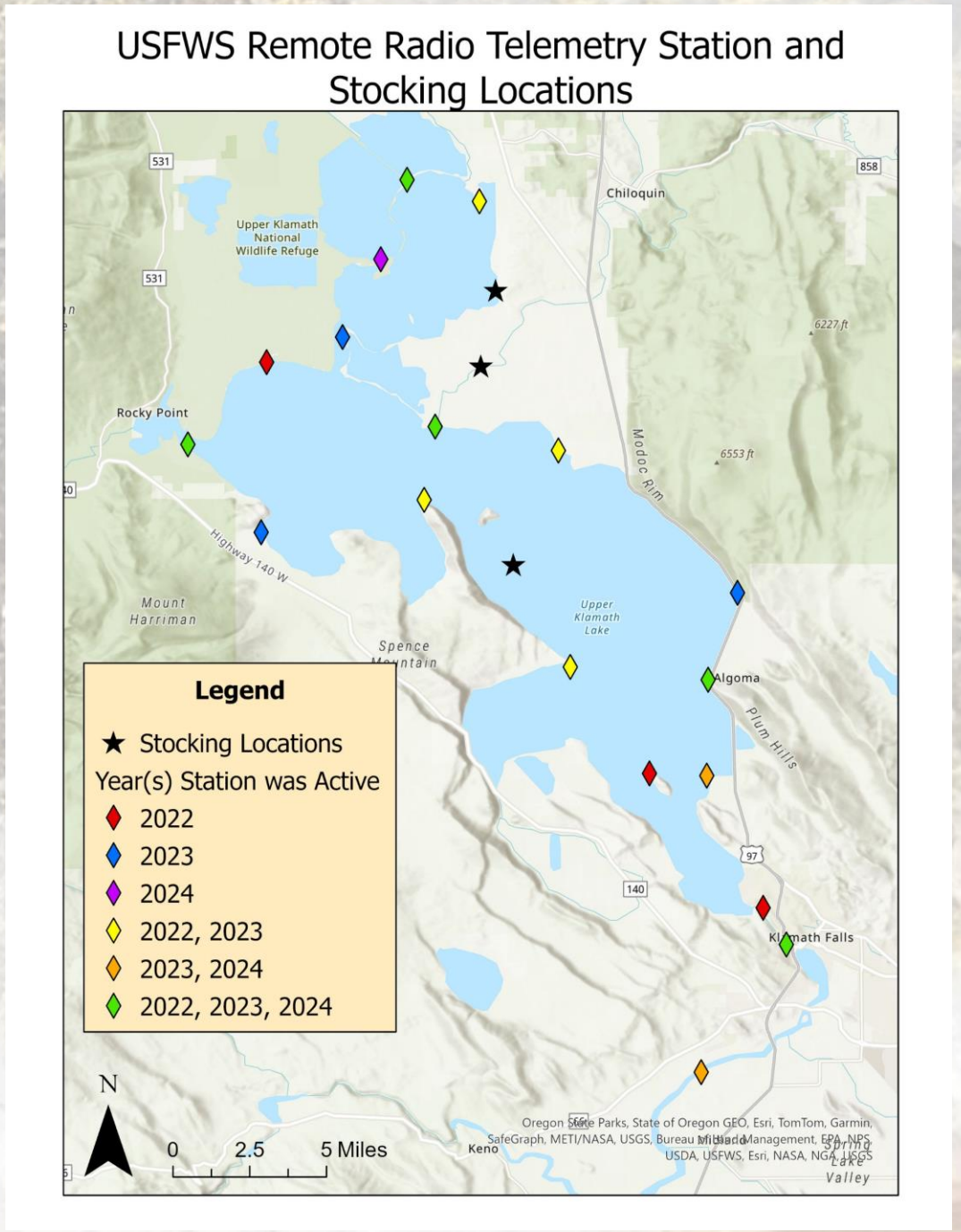
Tagging Demographics – c'waam (LRS)

- Total LRS tagged
  - 392 → Juvenile = 388, Sub-Adult = 4

USFWS Radio Telemetry Release Location and Fish Demographic Summary - LRS										
Date	**Time**	**Location Name**	**Location Coordinates**	**Number of Radio Tagged Fish Released**		**Capture Year**	**Average Length (mm)**	**Length (mm) Range**	**Average Weight (g)**	**Weight (g) Range**	**Age Class at Stocking**
3/16/2022	18:00	TNC Boat Ramp	42.493934, -121.936597	17		2020	192	175-221	80	57-108	juvenile
3/18/2022	19:30	Henzel Park Boat Ramp	42.529530, -121.92951	13		2020	196	182-236	90	72-140	juvenile
10/28/2022		Henzel Park Boat Ramp	42.529530, -121.92951	95	76	2021	197	180-215	64	55-89	juvenile
					19	2019	310	268-346	257	166-417	juvenile
11/2/2022		TNC Boat Ramp	42.493934, -121.936597	108	84	2021	200	188-226	68	51-106	juvenile
					24	2019	317	275-362	280	155-418	juvenile
4/28/2023	13:18	Mid-Lake	42.400350, -121.921236	80	76	2021	213	190-249	85	63-137	juvenile
					4	2020	225	215-235	102	79-122	juvenile
10/27/2023	12:30	Mid-Lake	42.400350, -121.921236	79	52	2021	297	265-315	236	236-398	juvenile
					23	2020	321	279-379	309	174-478	juvenile
					3	2019	353	300-387	423	234-536	sub-adult
					1	2018	402	-	607	-	sub-adult

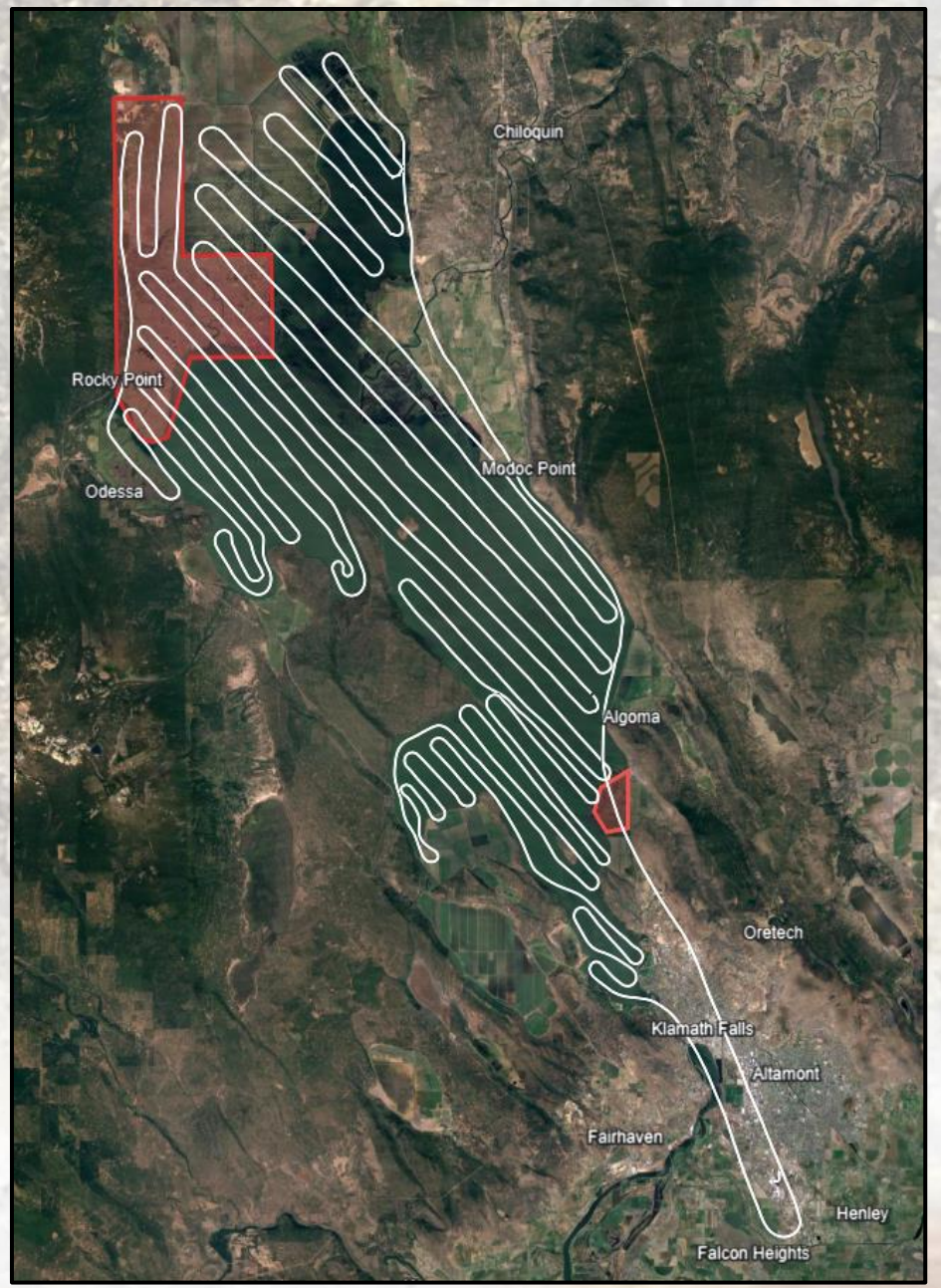
Data Collection

- Remote Stations



Data Collection

- Aerial Surveys
- Four flights per month
- Expanded 2024-2026 flight path



What's Next

- Detection efficiency and tag deposition studies
- Continue work with RTR to streamline QAQC and produce final data set for analysis
  - Results anticipated in fall 2024
- No additional tagging
  - Limited availability of taggable fish
  - Post-stocking survival concerns
  - Investigating cost benefit of transitioning to acoustic tags

Acknowledgements

BUREAU OF RECLAMATION

RTR
REAL TIME RESEARCH

USGS
science for a changing world

g Consulting
innovation. collaboration. solutions.

SKINNER Aviation INC.

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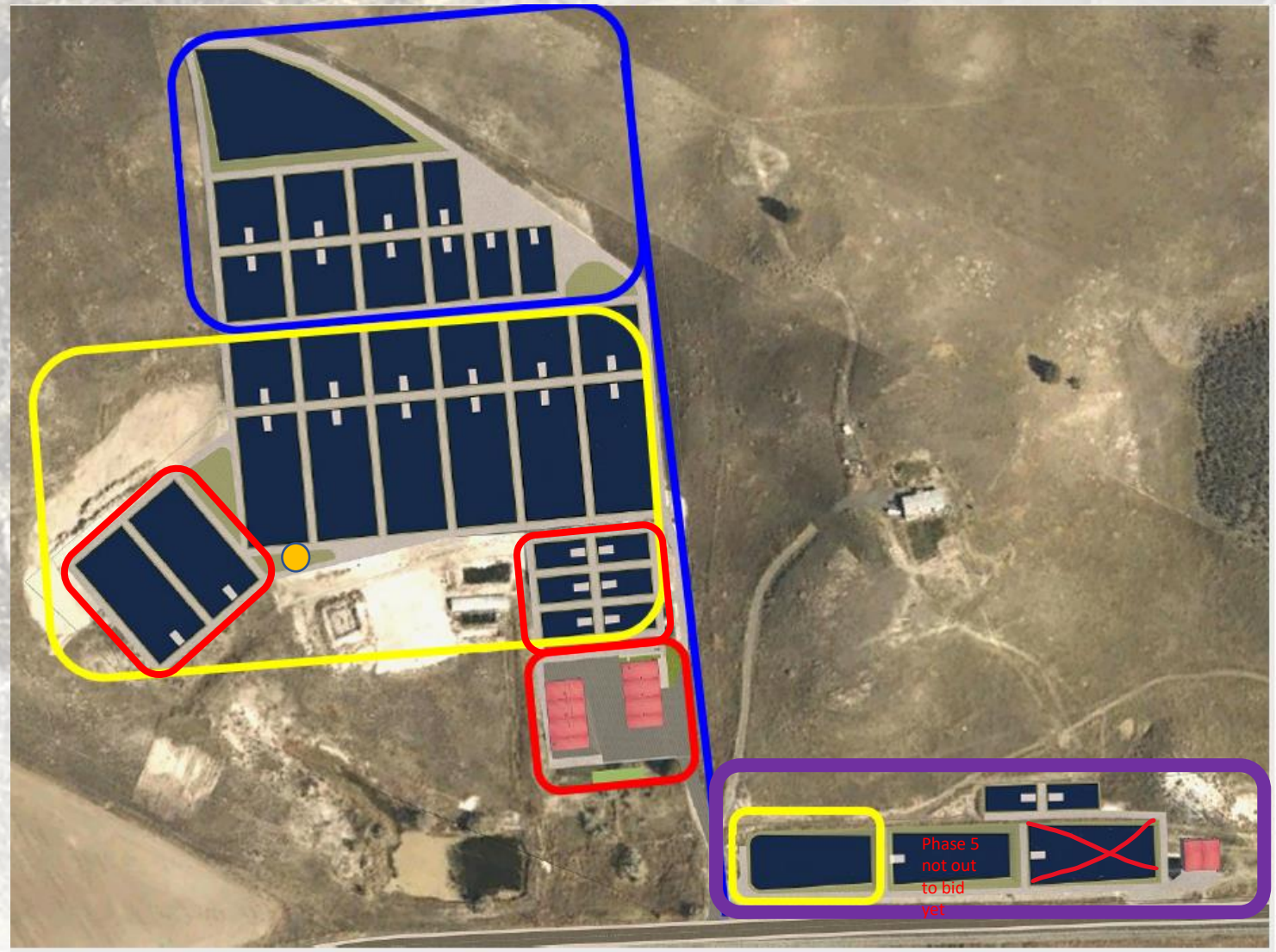
Supplemental Slides

Construction Updates

- Current Pond Space- 22 Ponds
  - 0.705 Surface Acres
- Spring 2024- 10 new ponds online
  - 4- 1/8 Surface Acres
  - 6- 1/4 Surface Acres
- Fall 2024- 12 new ponds online
  - 6- 1/4 Surface Acres
  - 7- 1/2 Surface Acres
  - Well Drilled
- 2025- Building Should be Finished
  - 2- 1/2 Surface Acre
  - 6- 1/12 Surface Acre
  - Maintenance Building
  - Admin/Hatchery Building



Data Summary – Remote Stations

Detection History for 2022 Releases (SNS & LRS)					
Release Date	**Location**	**Detected at Least Once**	**Redetected**	**Never Detected**	**Total**
3/16/2022	TNC Boat Ramp (Williamson)	85	81	3	88
3/18/2022	Henzel Boat Ramp (Agency)	44	41	6	50
10/28/2022	Henzel Boat Ramp (Agency)	93	83	24	117
11/2/2022	TNC Boat Ramp (Williamson)	106	95	46	152

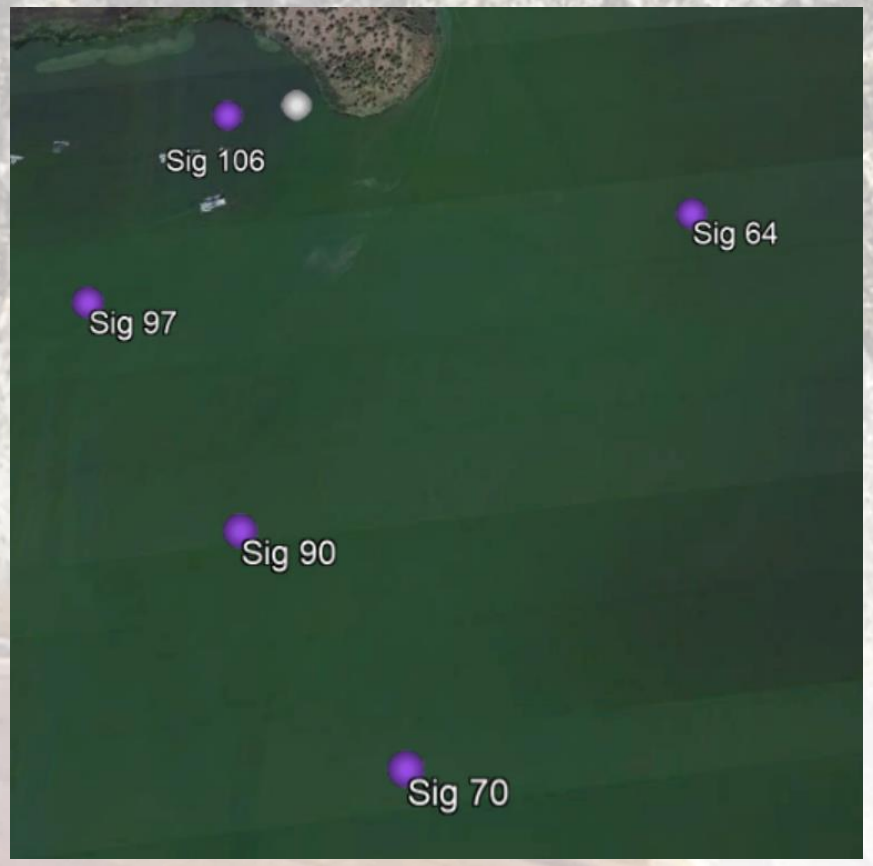
Detection history from all sources (plane, station, boat, truck) for 2022 releases.

Detection History for 2023 Releases (SNS & LRS)					
Release Date	**Location**	**Detected at Least Once**	**Redetected**	**Not Yet Detected**	**Total**
4/28/2023	Mid-Lake	148	115	118	266
10/27/2023	Mid-Lake	145	75	105	250

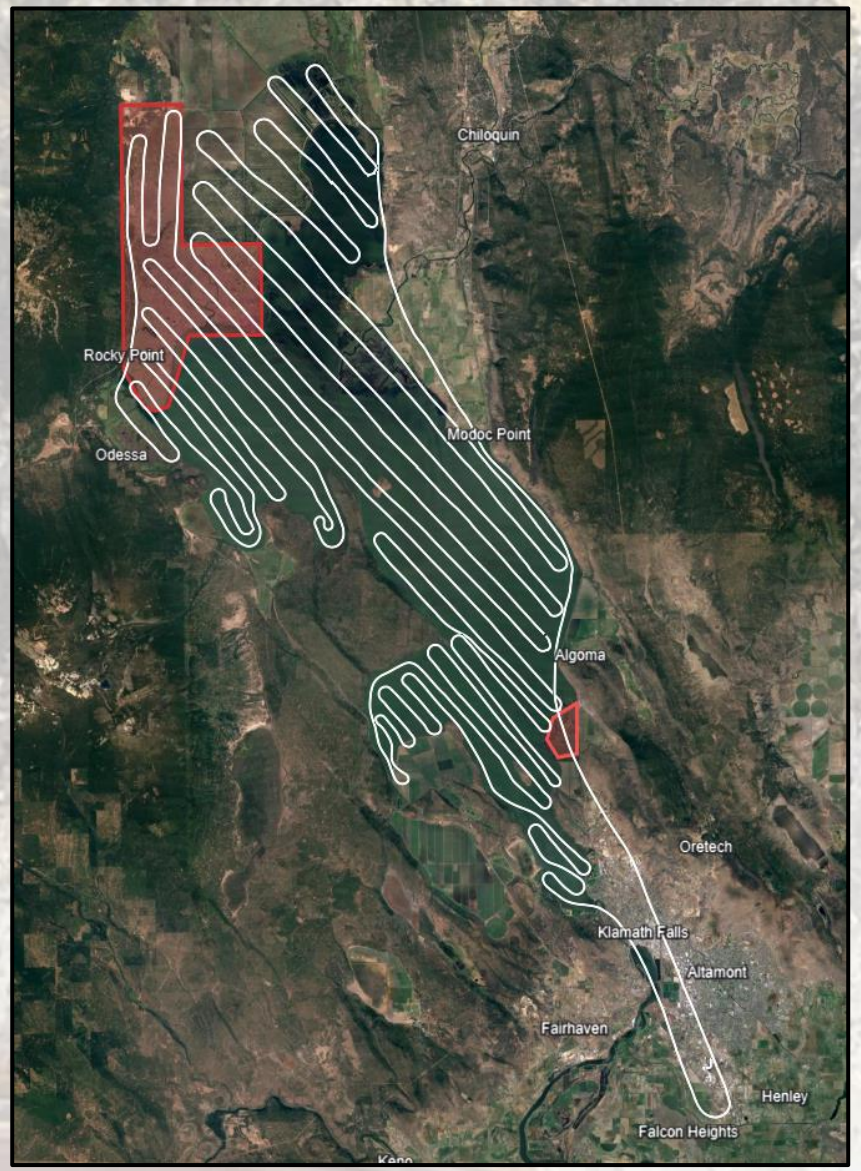
Detection history from all sources (plane, station, boat, truck) for 2023 releases.

Data Collection – Aerial Survey

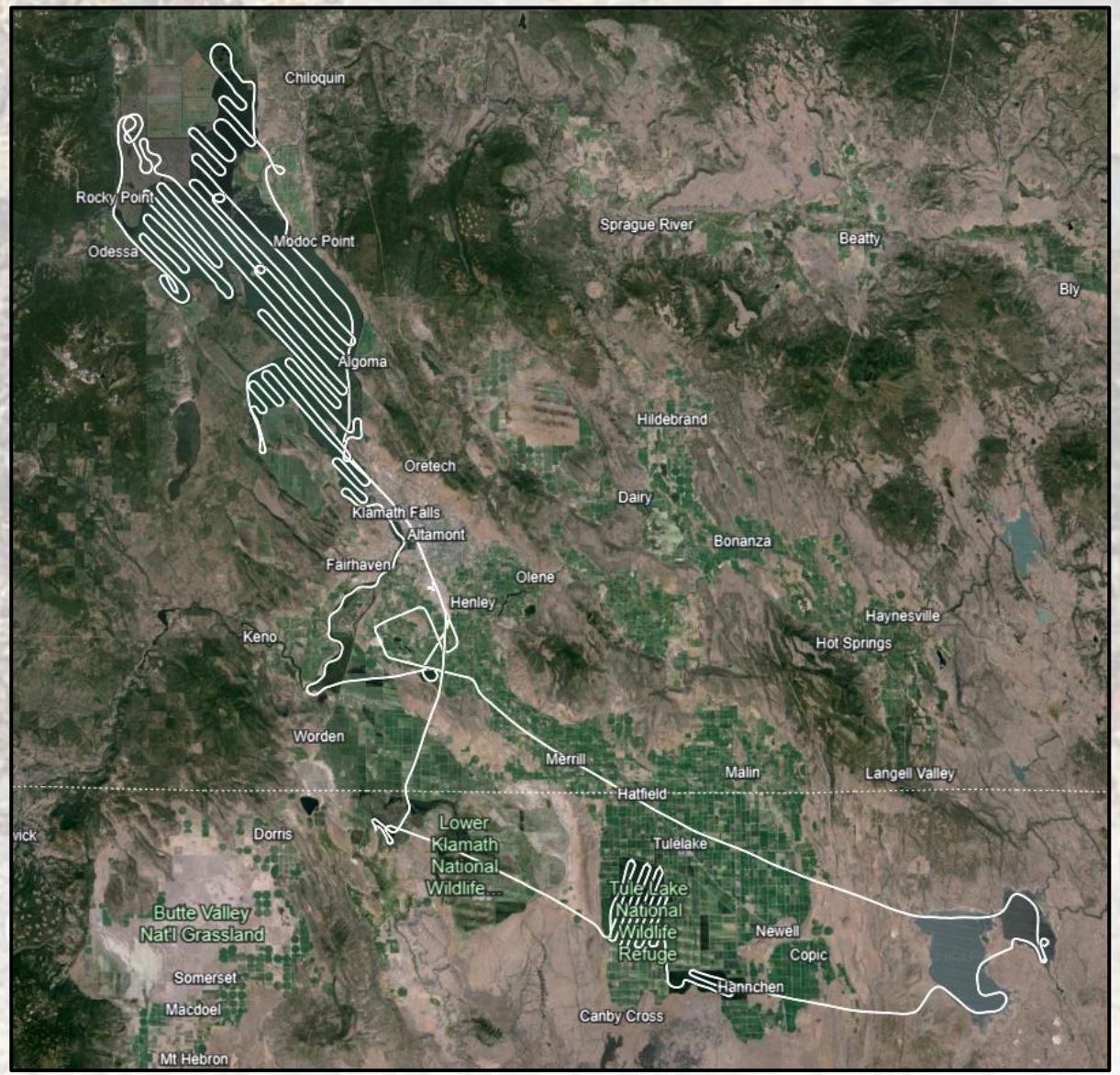
Map of test tag (white) and the plane locations where the test tag was detected (purple), each labeled with the signal strength of the receiver during the given detection.



Signal Strength	Latitude	Longitude	Distance (m)
70	42.34184	-121.892	1167
90	42.34497	-121.895	776
97	42.34843	-121.899	476
106	42.35174	-121.897	116
64	42.35191	-121.888	717



Expanded flight path for 2024-2026.



Full area covered by a routine aerial survey and additional coverage during a bi-annual avian colony surveys.

Data Summary – Aerial Surveys

Month & Year	No. of Flights	Unique SNS Detections	Unique LRS Detections	Total Unique Detections
April 2022	2	63	17	80
May 2022	4	81	18	99
June 2022	4	42	11	53
July 2022	4	40	16	56
August 2022	3	37	11	48
September 2022	4	37	9	46
October 2022	4	33	8	41
November 2022	0	-	-	-
December 2022	2	72	97	169
January 2023	2	41	64	105
February 2023	2	51	83	134
March 2023	4	61	101	162
April 2023	0	-	-	-
May 2023	5	121	140	261
June 2023	1	29	37	66
July 2023	0	-	-	-
August 2023	3	62	88	150
September 2023	5	69	94	163
October 2023	1	33	37	70
November 2023	2	134	94	228
December 2023	2	75	86	161
January 2024	2	71	64	135
February 2024	4	130	86	216
March 2024	3	101	81	182
April 2024	3	137	94	231

Number of flights per month and unique detections for each species per month.

Data Management

	A	B	C	D	E	F	G	H	I	J	K	L
1	FullTagID	DetectionDate	Time	Source	Station	SigStr	Gain	Latitude	Longitude	Freq	Species	PIT
2	320-15	3/16/2022	22:53:21	Station	WilliamsonLat	80	80	42.4652	-121.9581	164.3	SNS	3DD.003D7C3712
3	320-21	3/16/2022	22:52:41	Station	WilliamsonLat	103	80	42.4652	-121.9581	164.3	SNS	3DD.003D7C383C
4	320-58	3/16/2022	22:59:18	Station	WilliamsonLat	103	80	42.4652	-121.9581	164.3	SNS	3DD.003D7C34E2
5	320-88	3/16/2022	12:09:37	Station	WilliamsonLat	208	80	42.4652	-121.9581	164.3	LRS	3DD.003D7C36A3
6	320-95	3/16/2022	23:15:51	Station	WilliamsonLat	118	80	42.4652	-121.9581	164.3	LRS	3DD.003D7C34C9
7	320-104	3/17/2022	21:23:39	Station	WilliamsonLat	72	80	42.4652	-121.9581	164.3	SNS	3DD.003D7C34EB
8	320-108	3/17/2022	3:04:25	Station	WilliamsonLat	122	80	42.4652	-121.9581	164.3	SNS	3DD.003D7C34D0

M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA
StockingLocation	StockingDate	Count	StrongestSig	diffs	PrevTag	FalseDetections	WeightgTOT	LengthmmTOT	Detection	StockingYearMonth	SigStrAbv80	SigStrAbv60	PreStockDetect	
TNCWilliamson	3/16/2022	1	Y	20	58	N	71	183	202203	202203	Y	Y	N	
TNCWilliamson	3/16/2022	7	Y	1	58	N	104	210	202203	202203	Y	Y	N	
TNCWilliamson	3/16/2022	115	Y	20	58	N	91	189	202203	202203	Y	Y	N	
TNCWilliamson	3/16/2022	285	Y	794	88	N	76	191	202203	202203	Y	Y	N	
TNCWilliamson	3/16/2022	2	Y	412	58	N	64	191	202203	202203	Y	Y	N	
TNCWilliamson	3/16/2022	2	Y	329	104	N	114	220	202203	202203	N	Y	N	
TNCWilliamson	3/16/2022	21	Y	20	108	N	152	223	202203	202203	Y	Y	N	
TNCWilliamson	3/16/2022	21	Y	20	122	N	78	173	202203	202203	Y	Y	N	

Meeting Survey

Site Visit

Klamath Basin National Wildlife Refuge and Avian Refuge Tour

Meet outside for charter bus

Lunch provided

Thank you!
Meeting Adjourn