

Telemetry Methods for Evaluating Surface Collectors for Fish Passage



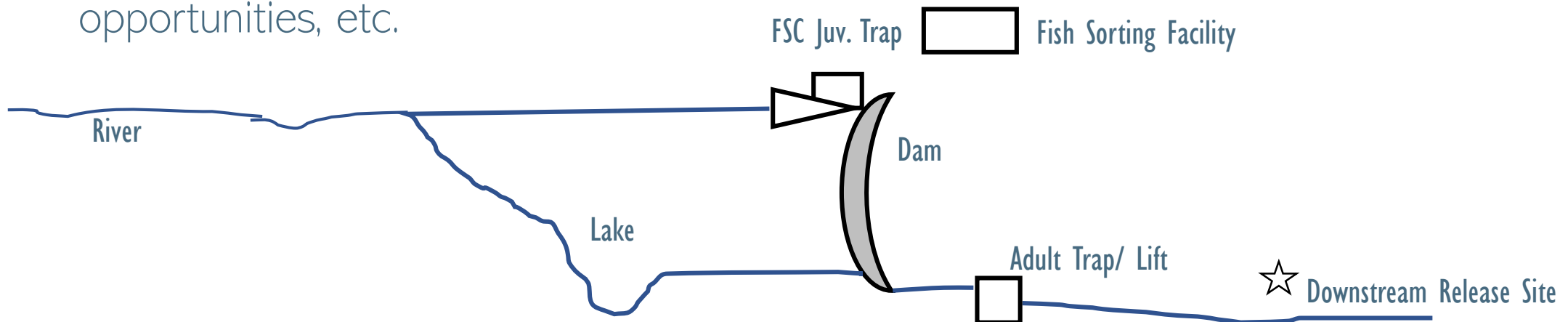
The Adipose Group

Audrey Thompson

April 9, 2012

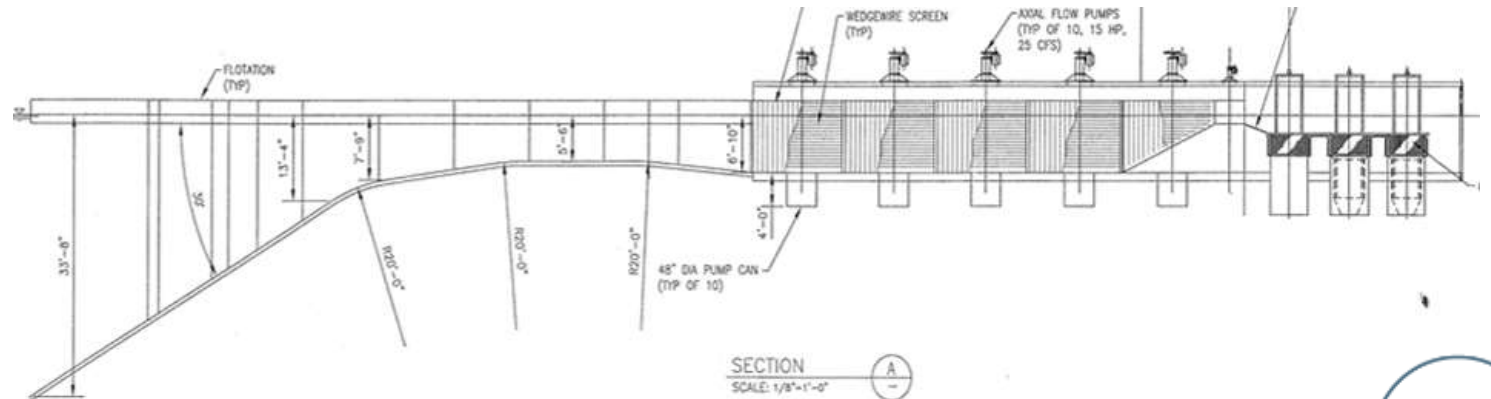
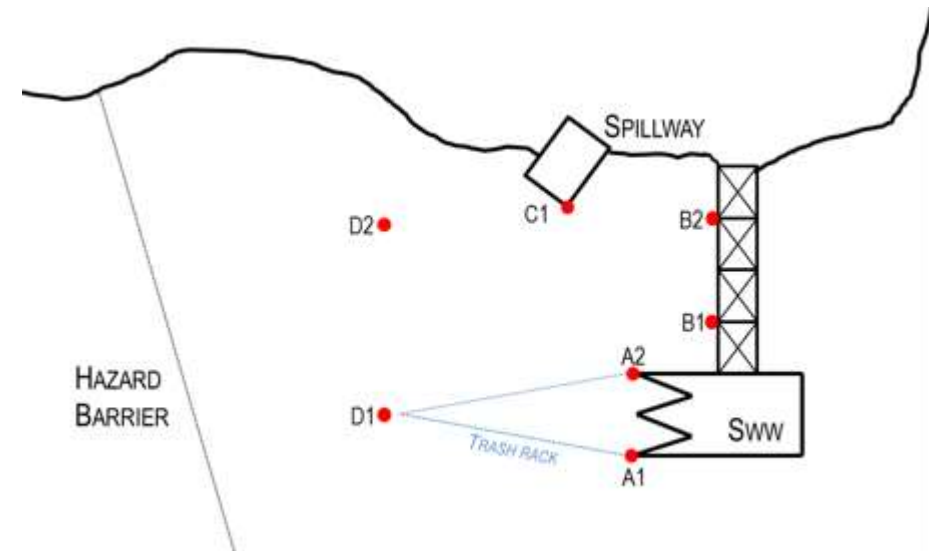
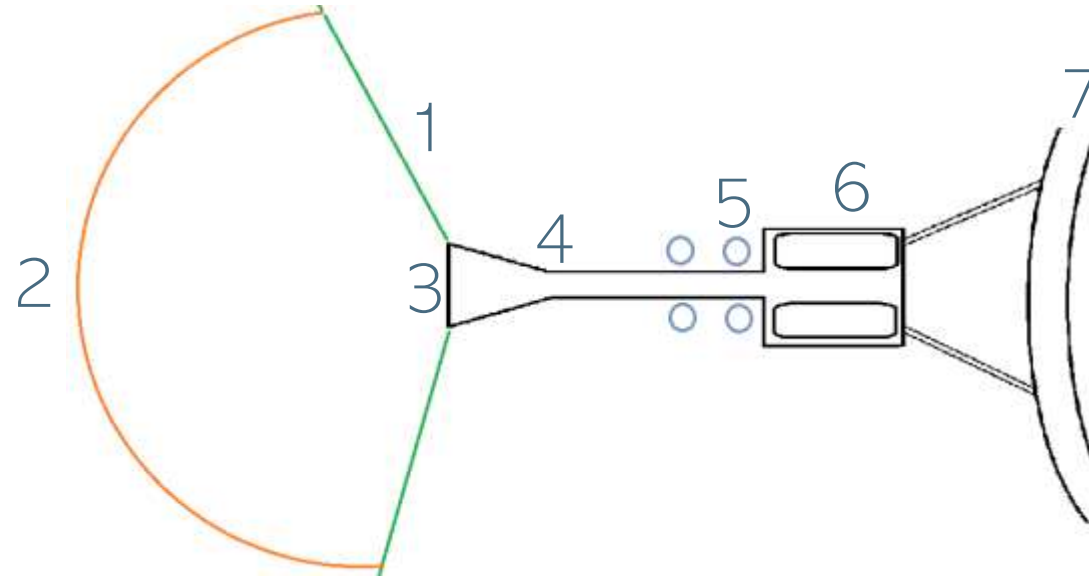
Regulatory Context

- 1) High head dams built in Washington/ Oregon between 1920 and 1964 to provide power/ water to urban areas.
- 2) To retrofit high head dams with fish passage structures is a challenge, mostly achieved by some version of a Trap and Haul system
 - At time of building, Fish Passage was not a consideration
 - Fish ladders are ineffective for such vertical distance.
 - People are now interested not only in providing passage for historically extirpated stocks, but also providing passage for new populations being introduced for a variety of reasons from mitigation for other losses to providing public fishing opportunities, etc.



Key Components of Surface Collectors

1. Guide nets
2. Zone of Flow Influence
3. Collector Flume Opening
4. Flow Entrainment area
5. Pumps (sometimes variable)
6. Collection Chambers
7. Dam



Objectives in Collector Evaluations

- 1) Vectors of initial distribution
- 2) Discovery Efficiency
- 3) Collection Efficiency
- 4) 2D and 3D behavior (accept/ reject/ nearest approach)
- 5) Diel collection behavior.
- 6) Thermal and flow model overlay on behavioral vector analysis
- 7) Predator disturbance.
- 8) Within-collector behavior.



Objectives in Collector Evaluations

1) Vectors of initial distribution

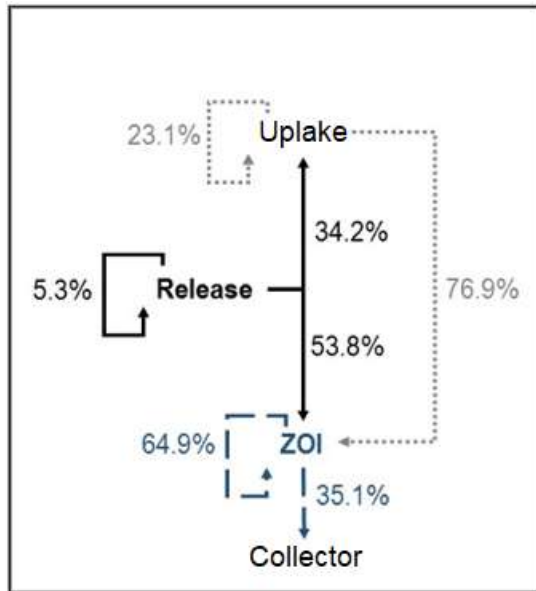
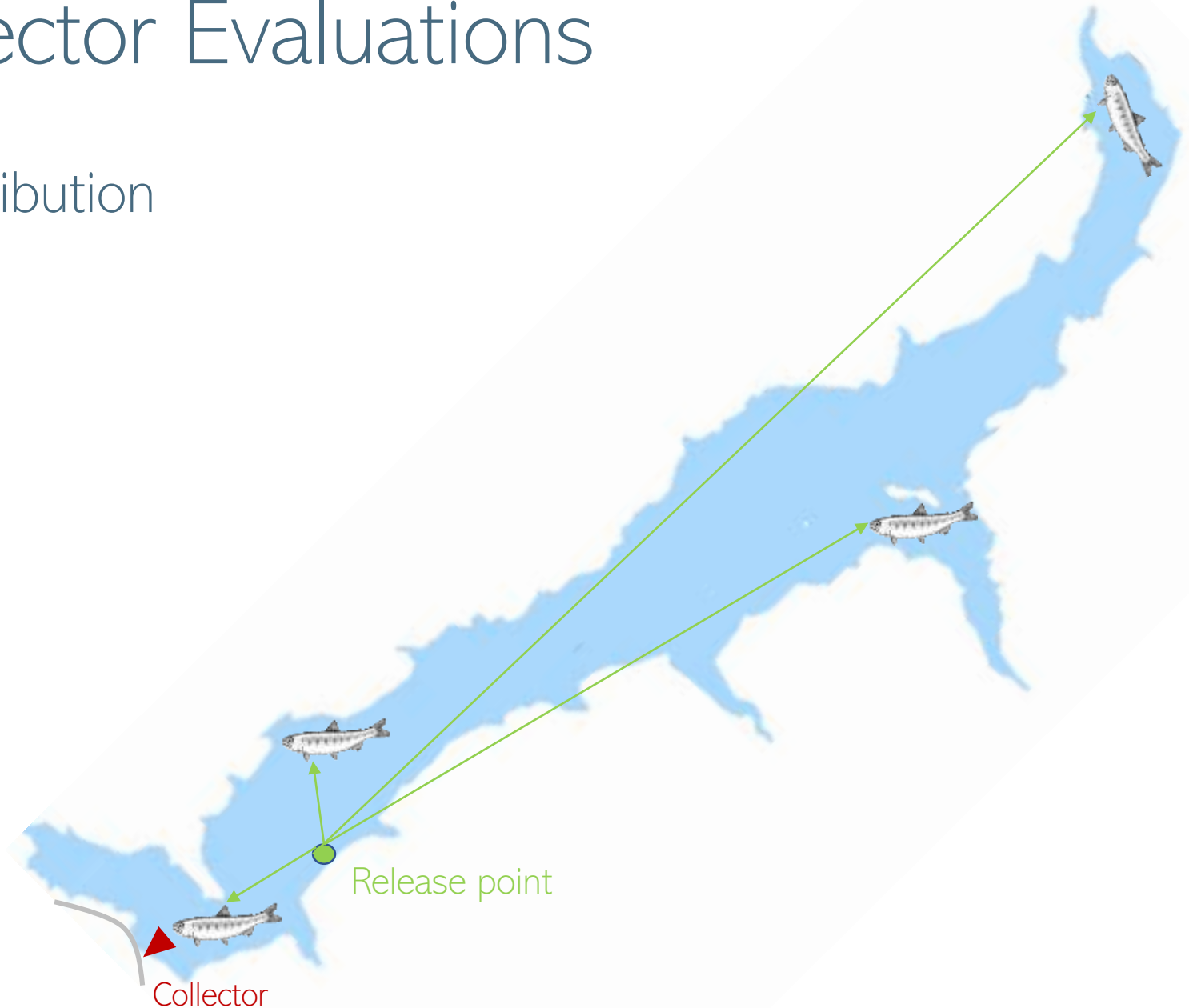


Figure Legend

- All released fish
-→ All released fish detected 1° at DBRS
- - - -> All released fish detected 1° at ZOI



Objectives in Collector Evaluations

1) Vectors of initial distribution

Methodology: Acoustic, Radio provide reservoir coverage following release

-Static or Mobile arrays ●

- PIT tag double-tagging can provide fine scale detail to answer more specific behavior questions in Collector.

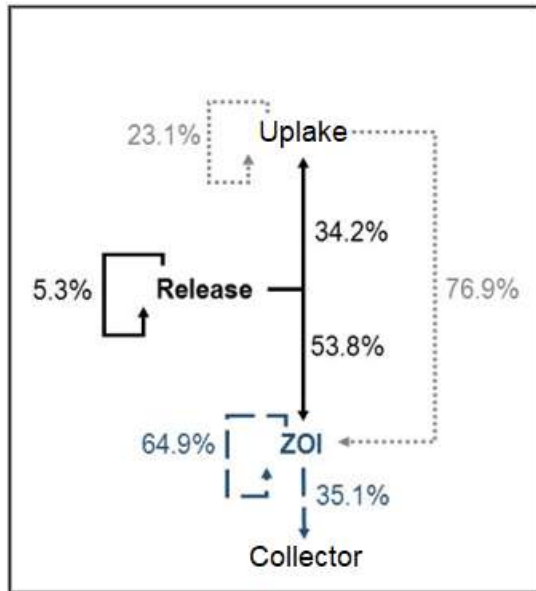
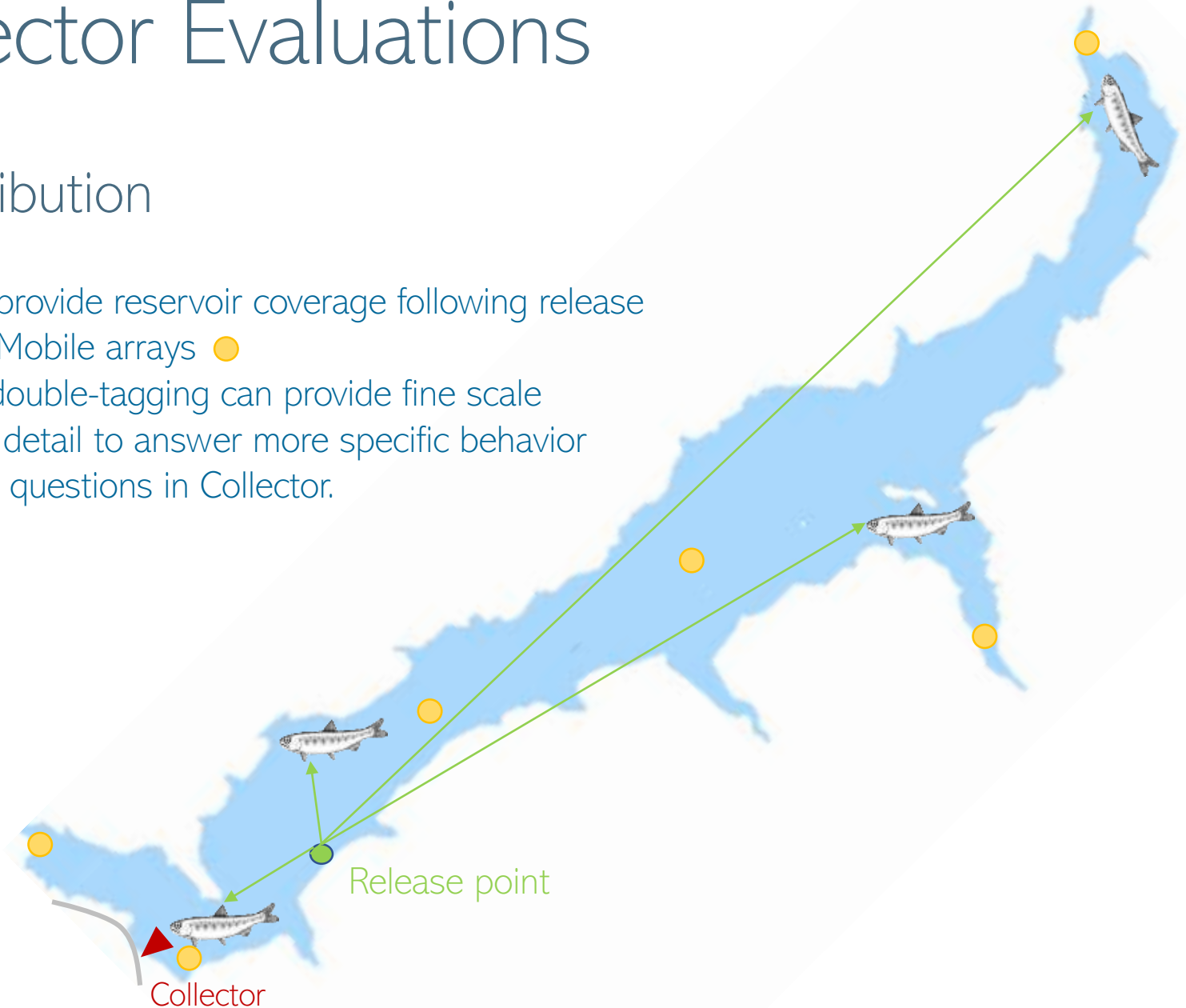


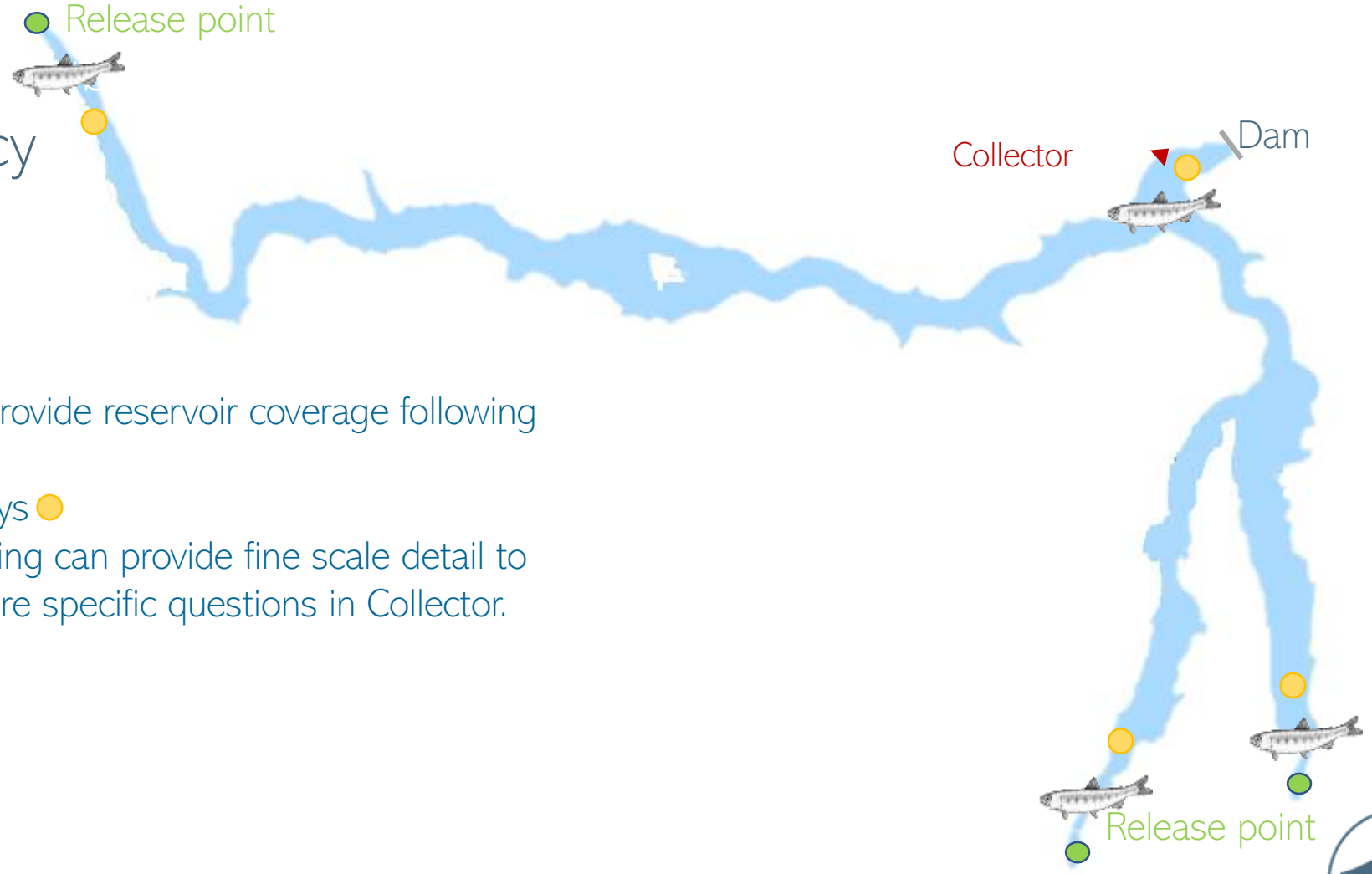
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Objectives in Collector Evaluations

2) Discovery Efficiency



Methodology: Acoustic, Radio provide reservoir coverage following release

- Static or Mobile arrays ●
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Objectives in Collector Evaluations

2) Discovery Efficiency

● Release point



Collector



Dam



● Release point



Area	N	Number of of Visits		Residence Times Flow Zone (minutes)	
		Median	Maximum	Median	Maximum
Up-lake array	177	4	15	126	5,053
Near Collector	204	4	21	255	52,299
Inside Flow Zone	187	5	114	6	46
Fish collected	68	5	61	6	46
Fish not collected	119	5	114	6	37

Objectives in Collector Evaluations

3) Collection Efficiency

Specifically defined variable dependent on FERC requirements to designate the proportion of fish that are collected relative to the total number of fish that arrive within the zone of flow influence (also specifically defined)



Dam

Collector

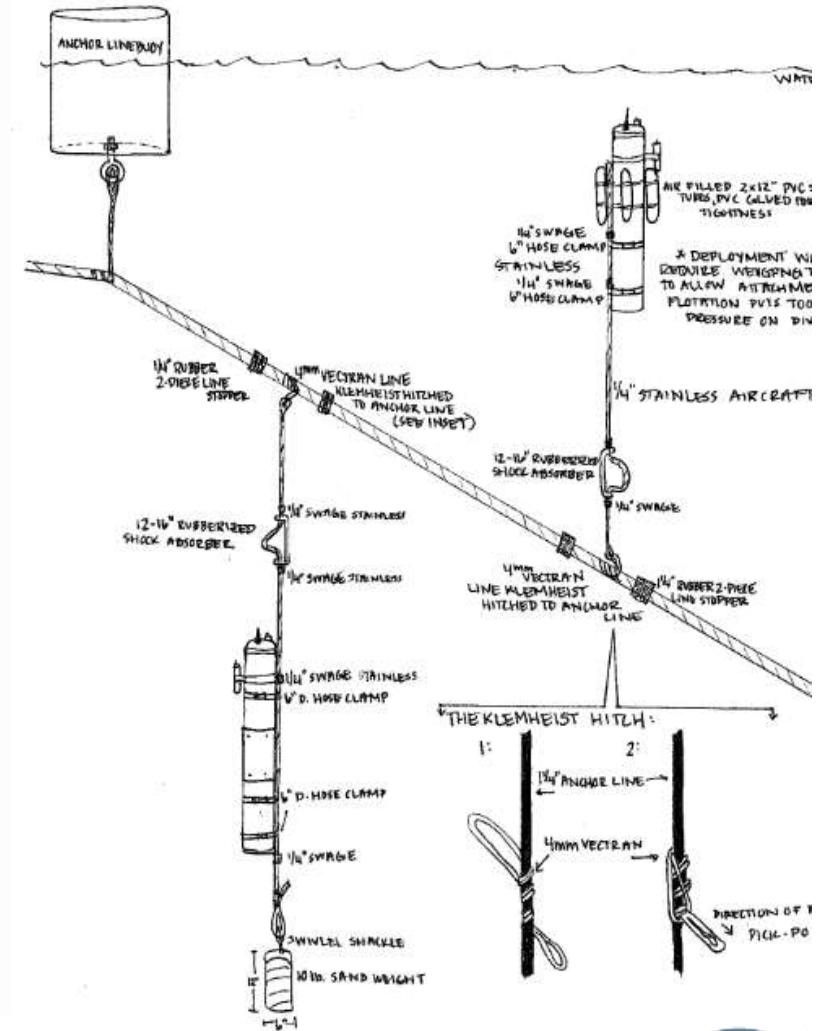
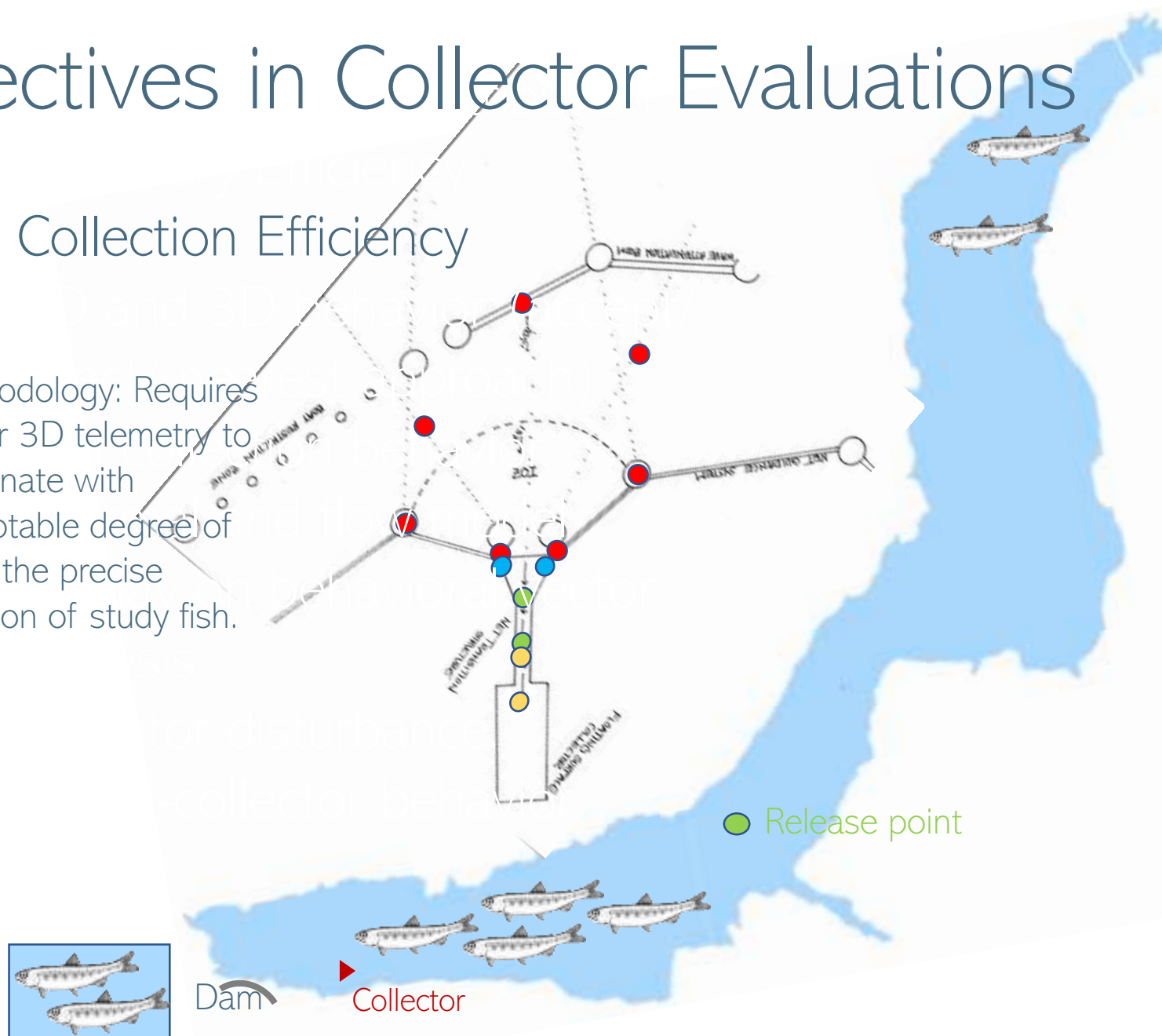
● Release point



Objectives in Collector Evaluations

3) Collection Efficiency

Methodology: Requires 2D or 3D telemetry to designate with acceptable degree of error the precise position of study fish.



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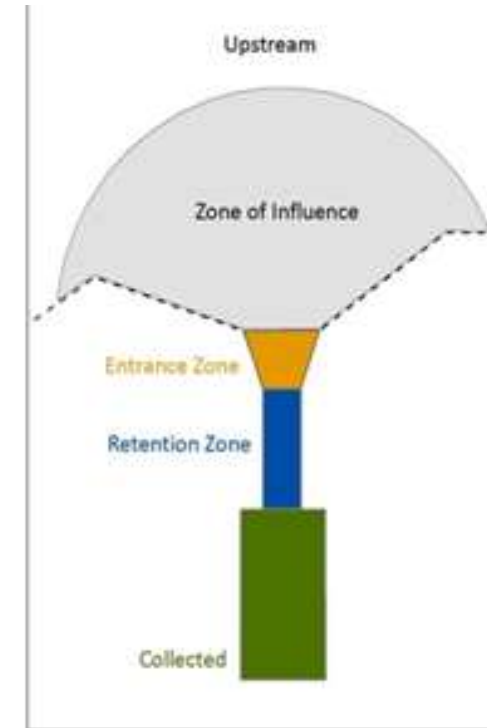
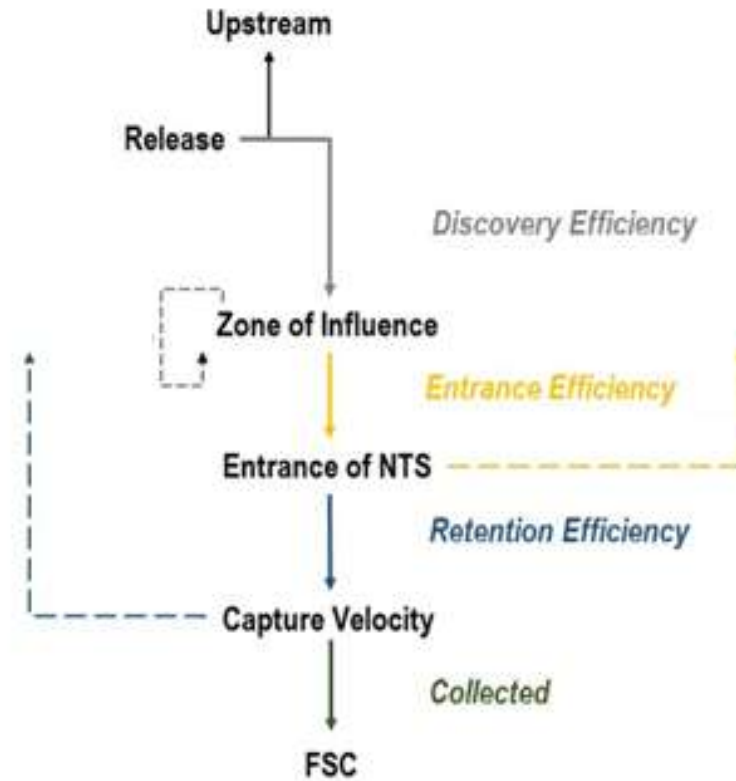


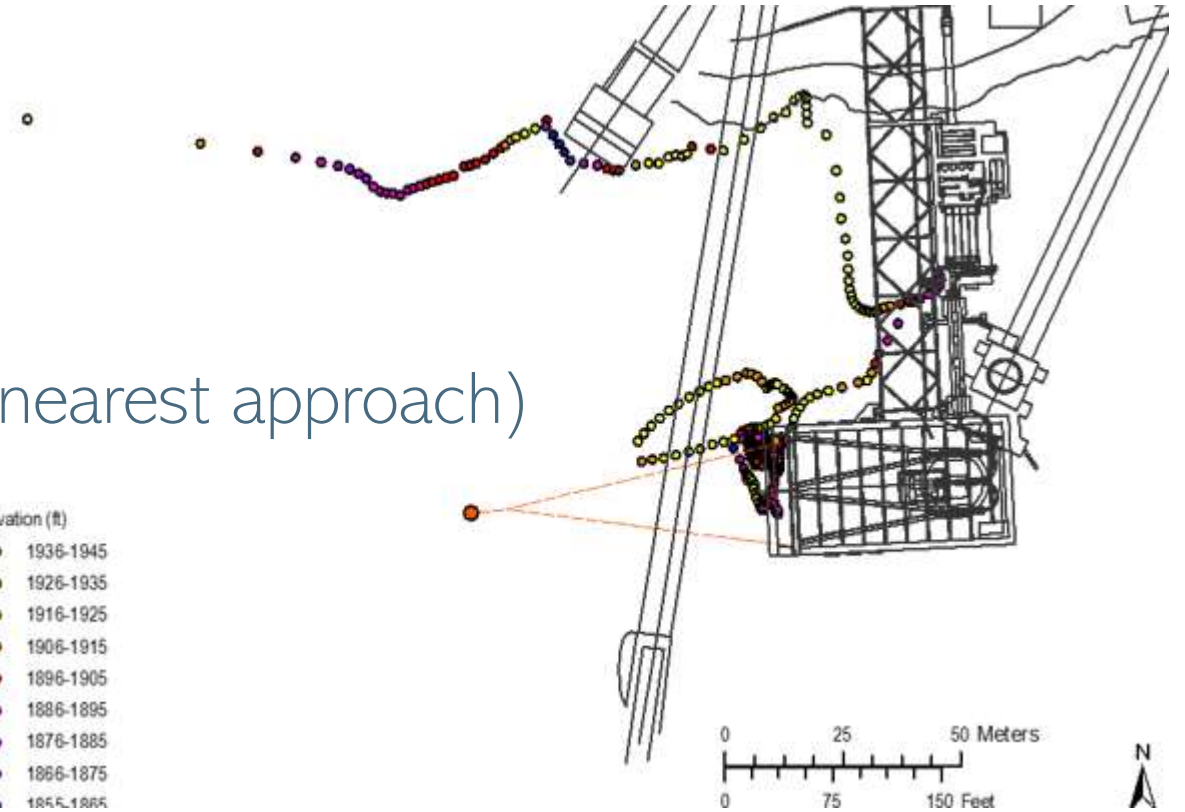
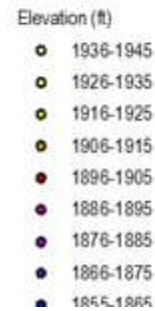
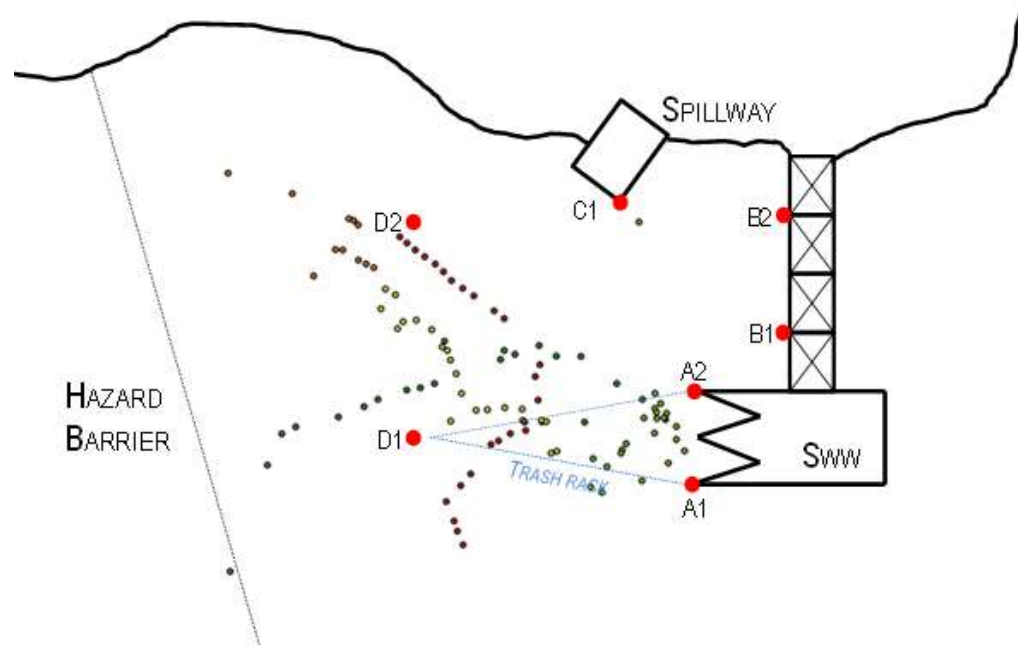
Figure Legend

- Fish detected in Zone of Influence (ZOI)
- Fish detected in Entrance Zone
- Fish detected in Retention Zone
- Fish collected by FSC



Objectives in Collector Evaluations

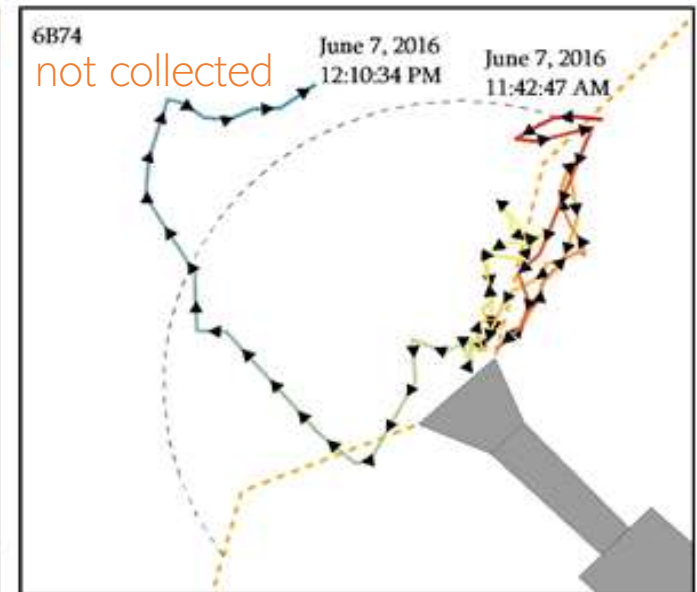
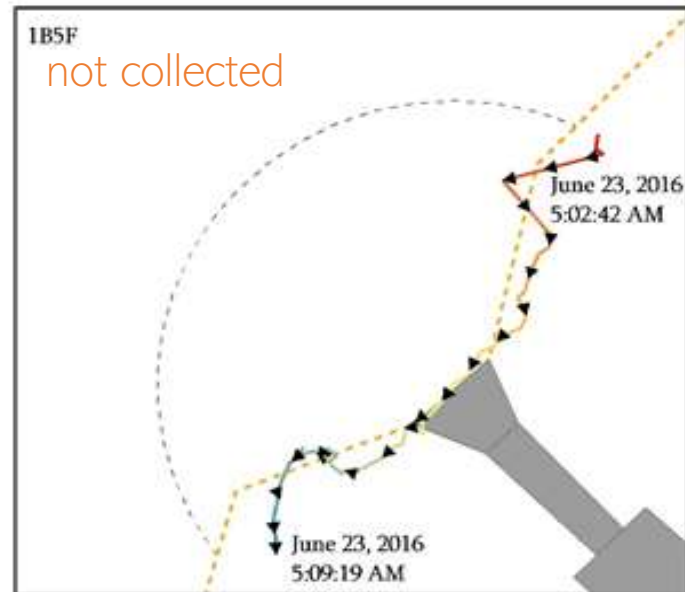
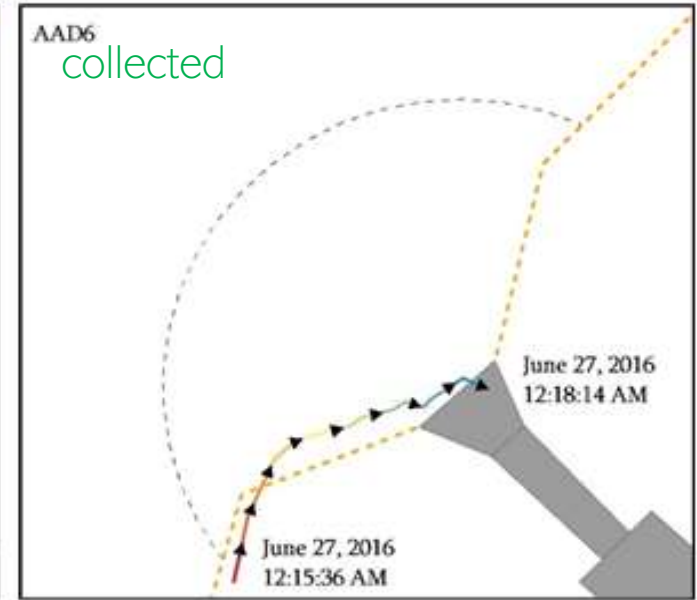
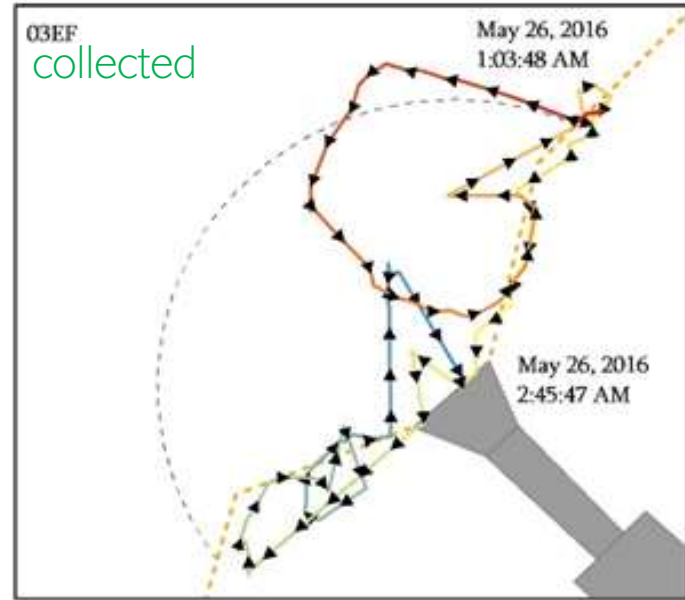
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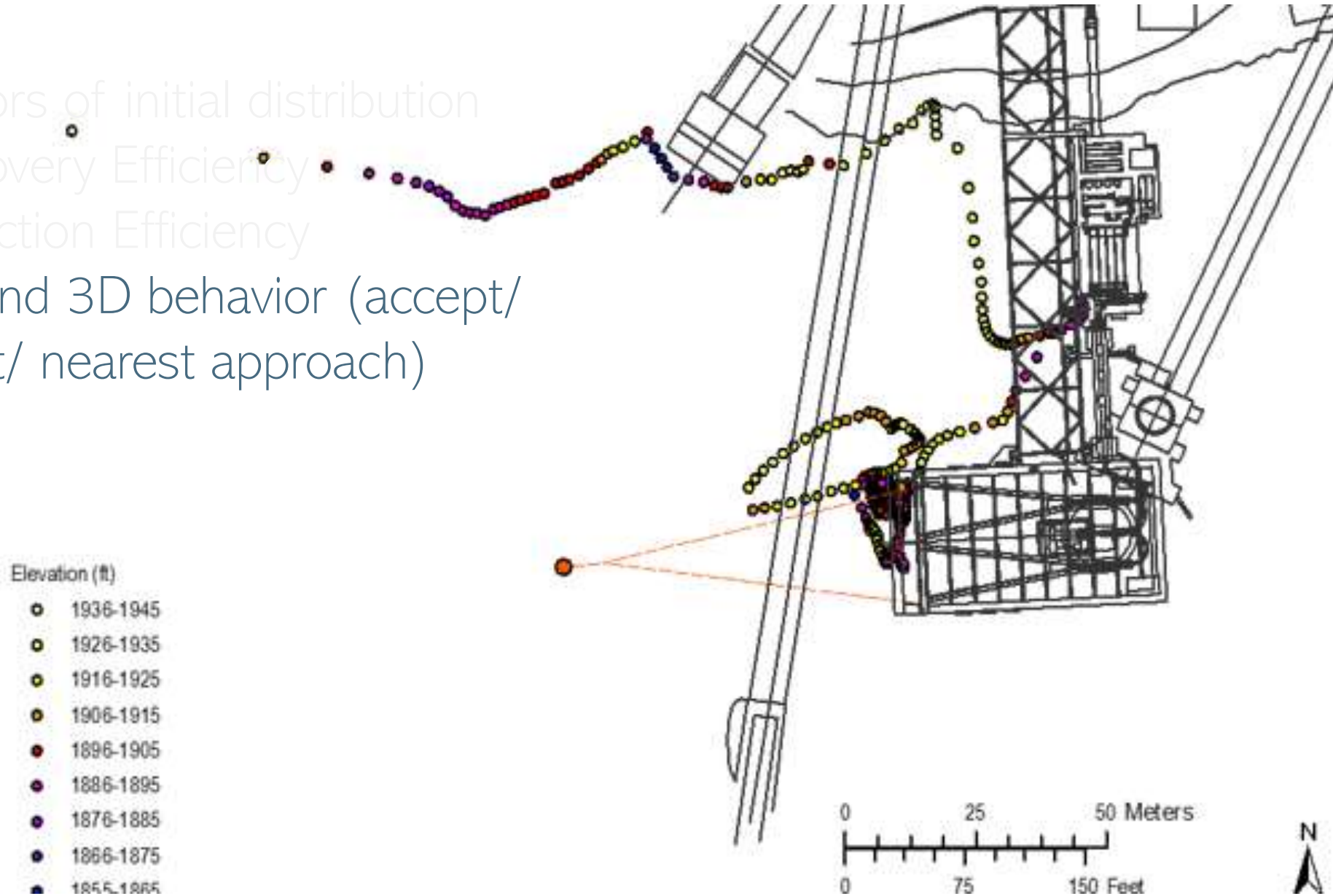
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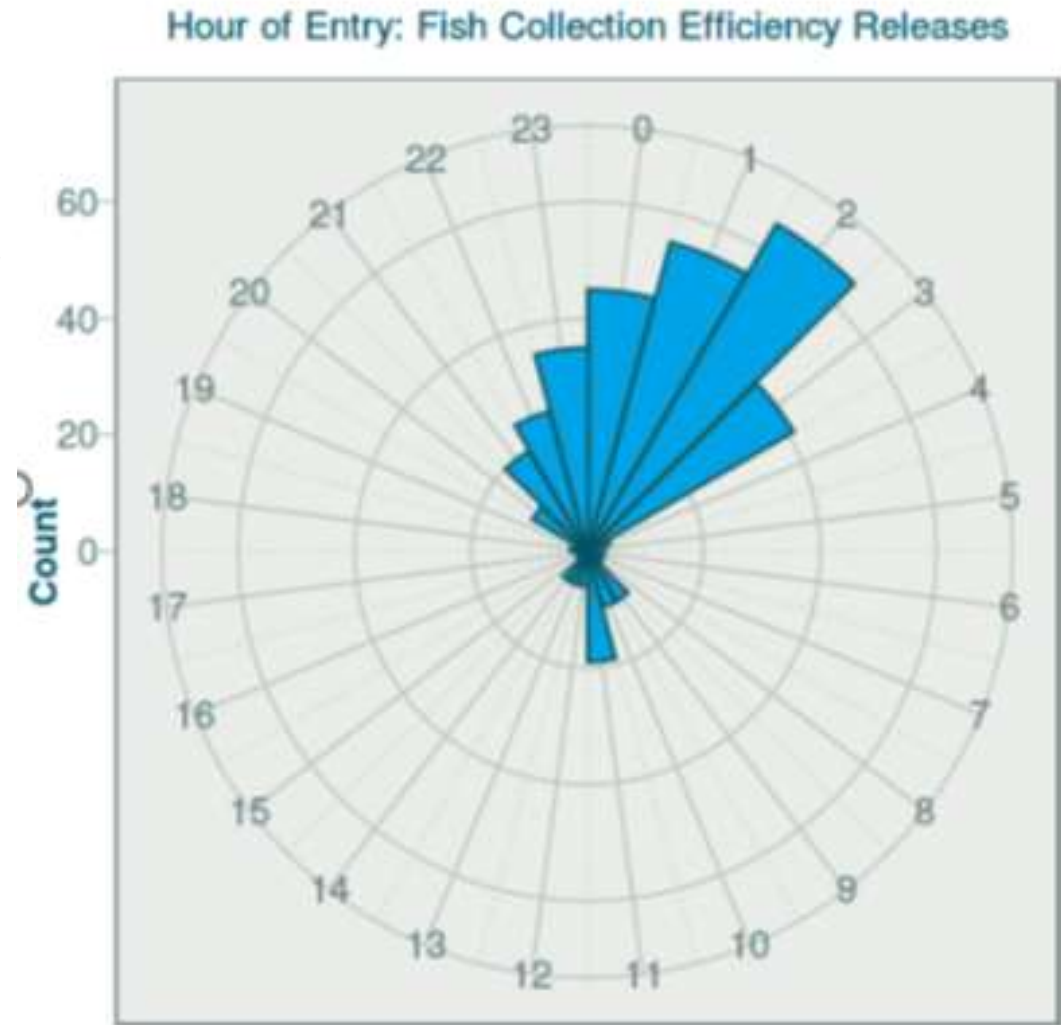
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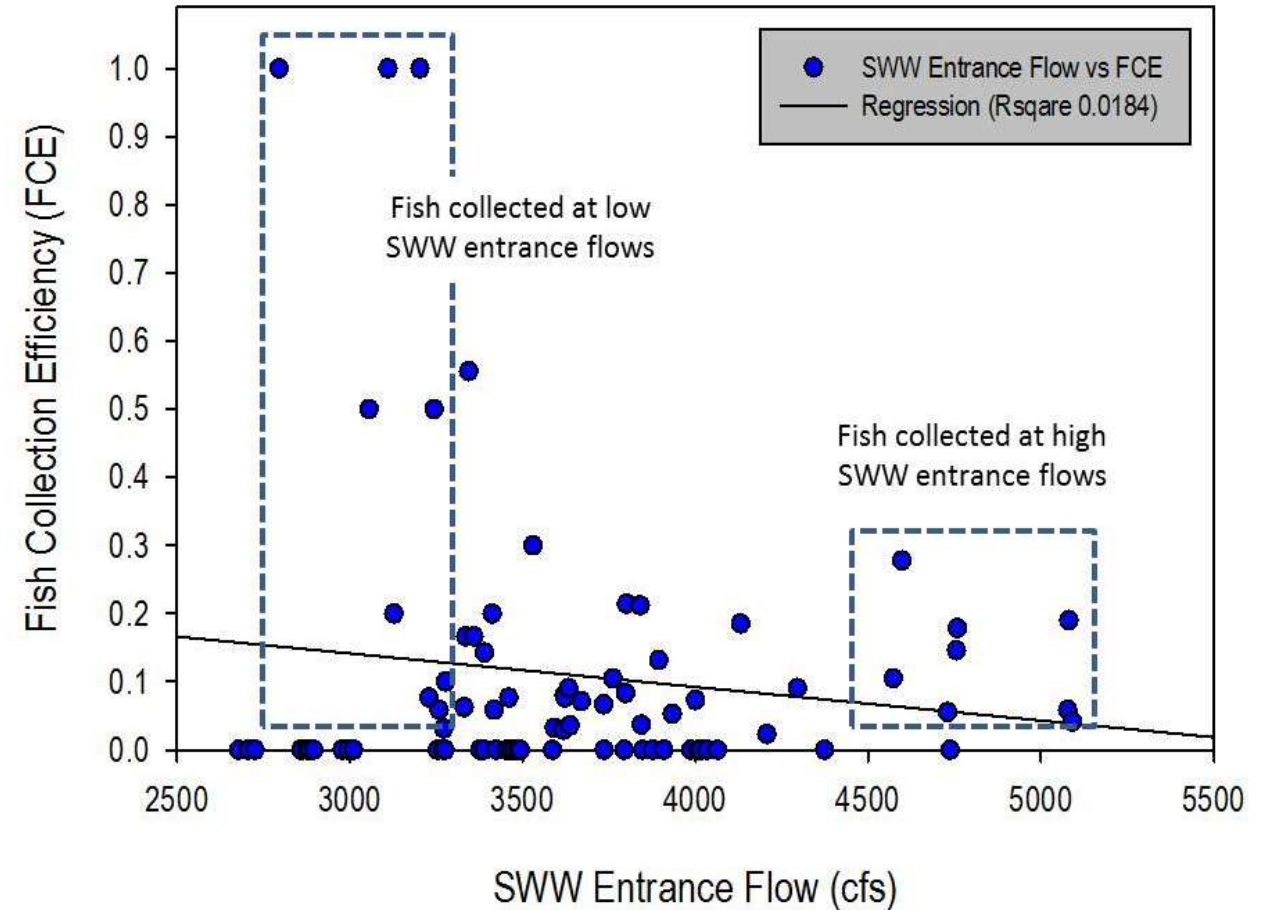
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Methodology: Can be addressed with only PIT tags when there is a PIT reader at the threshold of the Collection chamber



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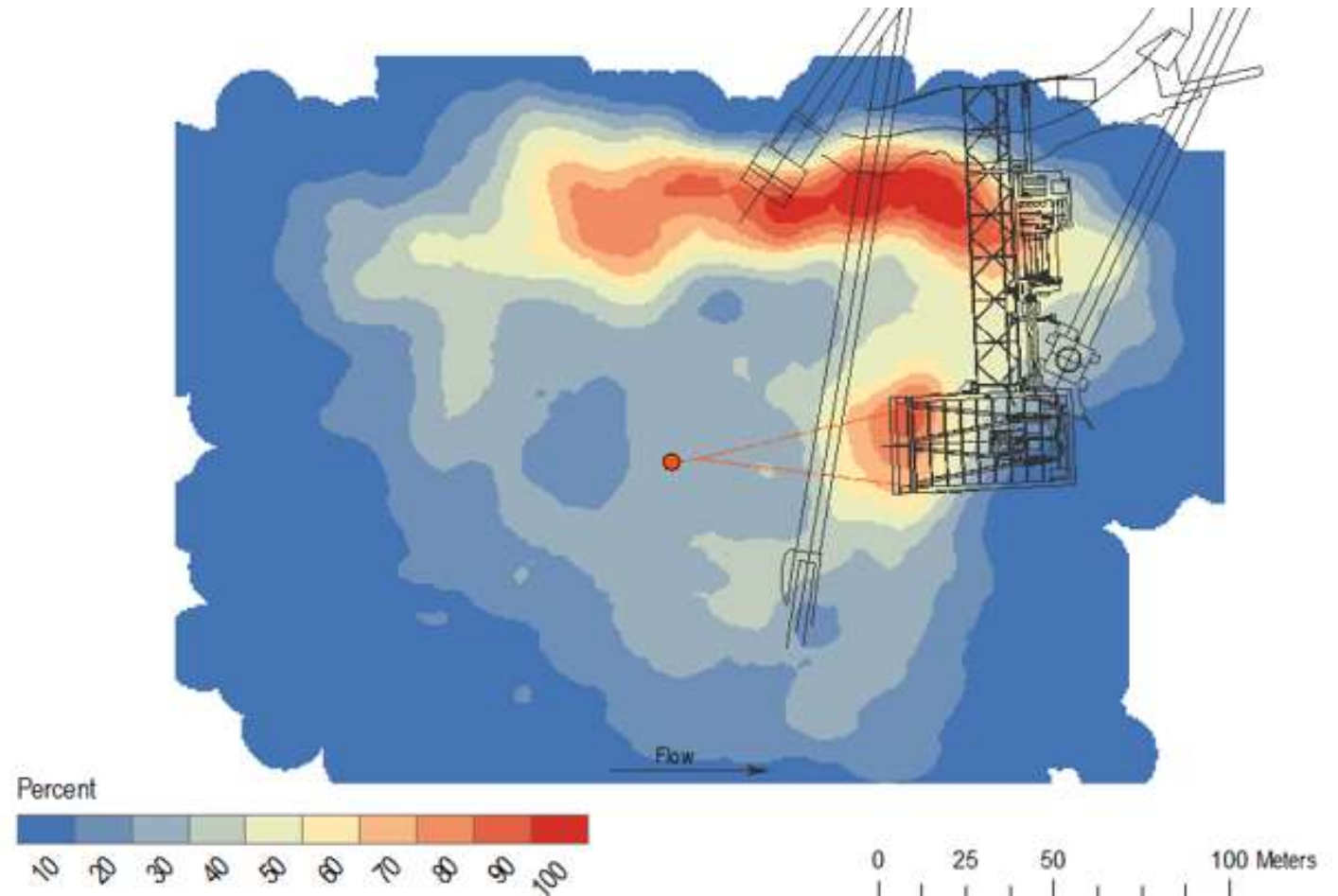
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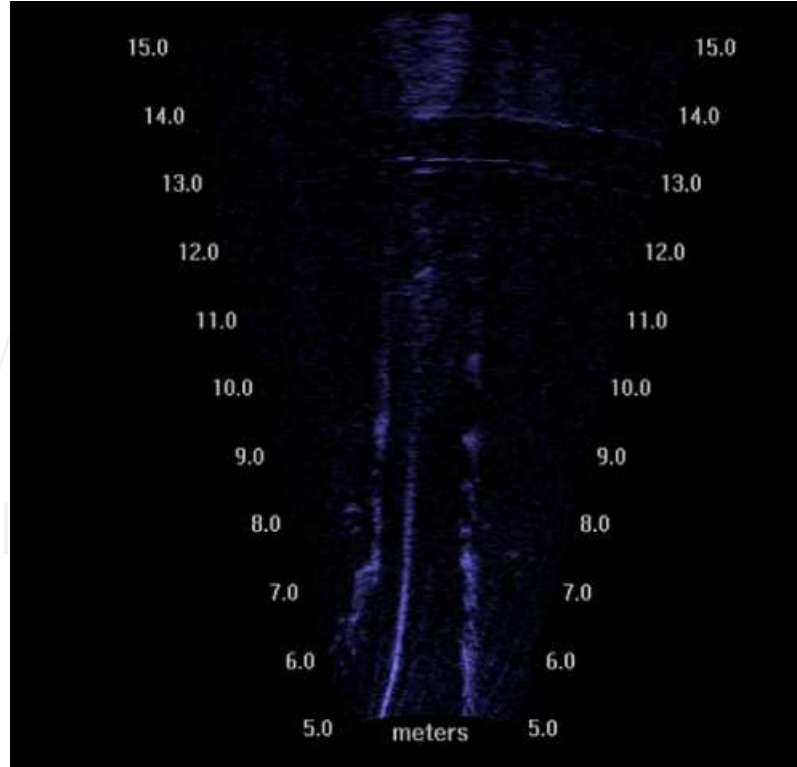
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Methodology: Challenging to accurately document behavior within collectors due to swift water conditions and rapid rate of travel. Requires 2D or 3D telemetry to designate with acceptable degree of error the precise position of study fish. Video/ Sonar imaging techniques can provide examples of behavior.



Considerations for Collector Evaluations

- I. Thermocline establishment mid-summer may exclude fish from the water column above 13oC, prohibiting access to the Collector
- II. The actual attraction flow in the Zone of Influence/ Flow Zone may be below what is required for attraction/ capture.
- III. Predator behavior (both avian and piscivorous may deter fish from the entrance).
- IV. Guide net structures are insufficient to direct fish into the Collector to the point of capture.
- V. Hatchery reared smolts introduced to the reservoir for purposes of the study may not adequately represent a naturalized population of true smolts.



Questions?

