

Powered by  **INNOVASEA**

HydroAI

Real-time, AI-powered Fish Counting and Speciation

November 12 | Massachusetts River Herring Network Annual Meeting



- 300+ employees worldwide
- Head Office in Boston
- Fish Tracking office and production facility in Halifax, Nova Scotia
- 30+ years in fish tracking and monitoring technology (formerly Vemco)



Fish Counting Challenges

- Manual fish counting
- Imprecise sampling and extrapolation
- Tedious reporting
- Shutdowns and restrictions
- Limited data to share with stakeholders





HydroAI

High resolution video cameras with AI-powered, cloud-based software that provides accurate real-time fish counts and species identification.



Key Components

- **High-Resolution Camera(s)** capture 24/7 footage
- **Camera Mount** houses camera and integrates with fish passage structure
- **Edge Device** sends footage to the cloud
- **AI Model** counts/identifies fish
- **Reports** that are easily exportable for stakeholders

Pair with



5

1

Acoustic telemetry

For further validation and fine-scale positioning

2

ARIS Sonar

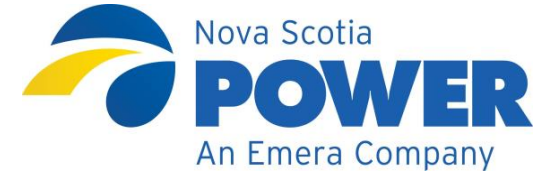
To understand large-scale movement



HydroAI Testing and Validation



HydroAI Validation Using Manual Fish Count



- River Herring at White Rock Dam, Nova Scotia
- 178 random samples between April 28 – June 28, 2022

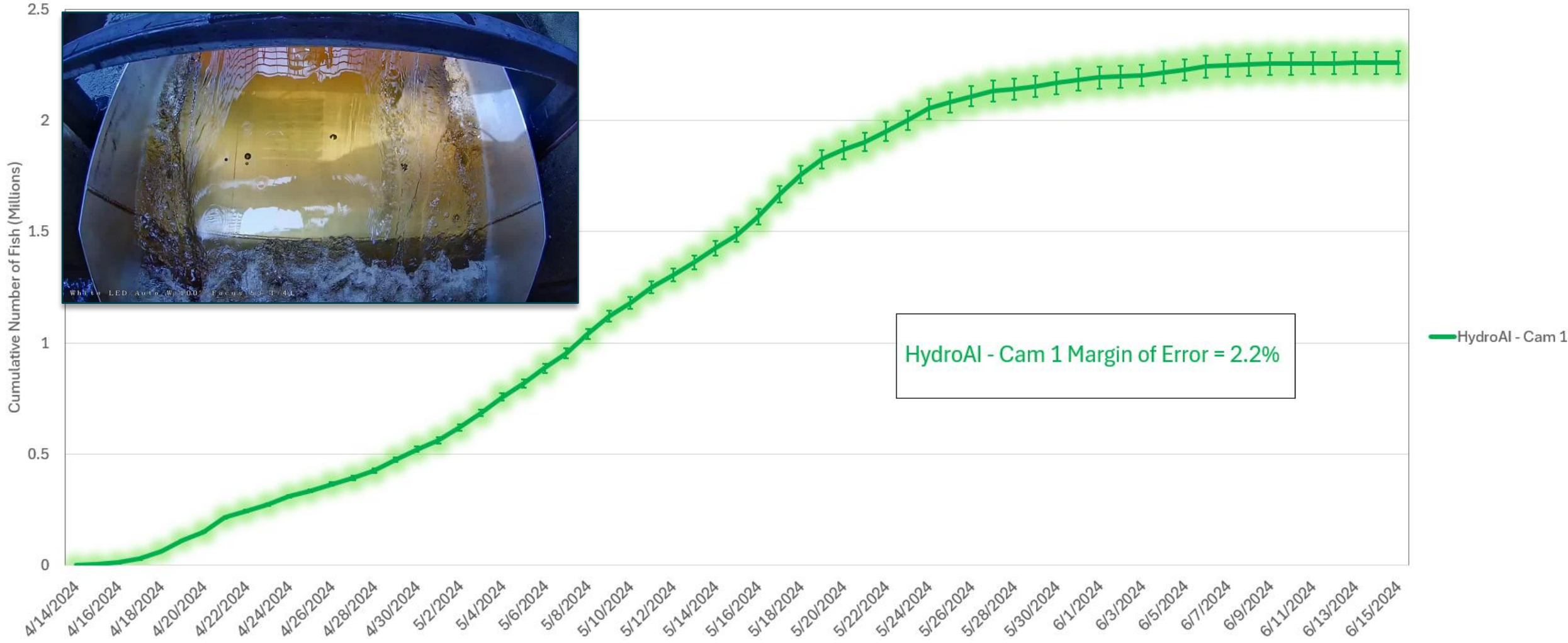
Human (Manual) Count	HydroAI Count
2,564 fish	2,681 fish

<5% difference between manual counts and HydroAI system counts

Human (Manual) Count (Fish/Min)

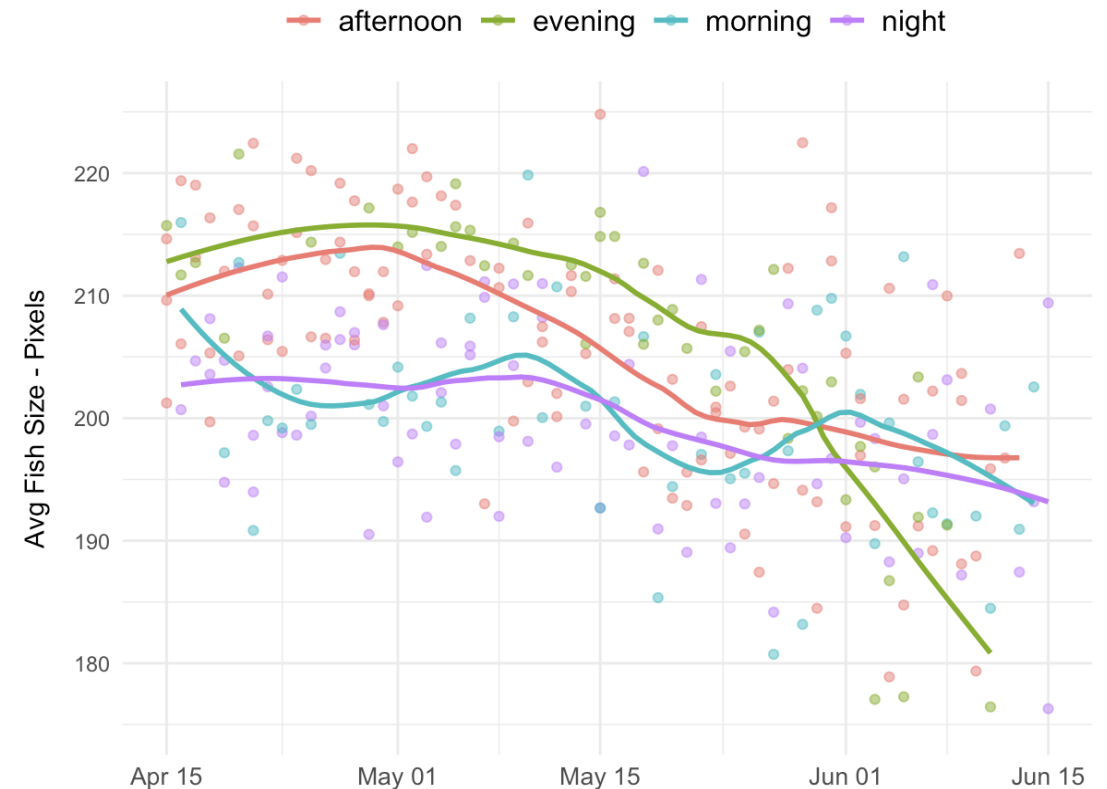
Error Distribution (Fish/Min)

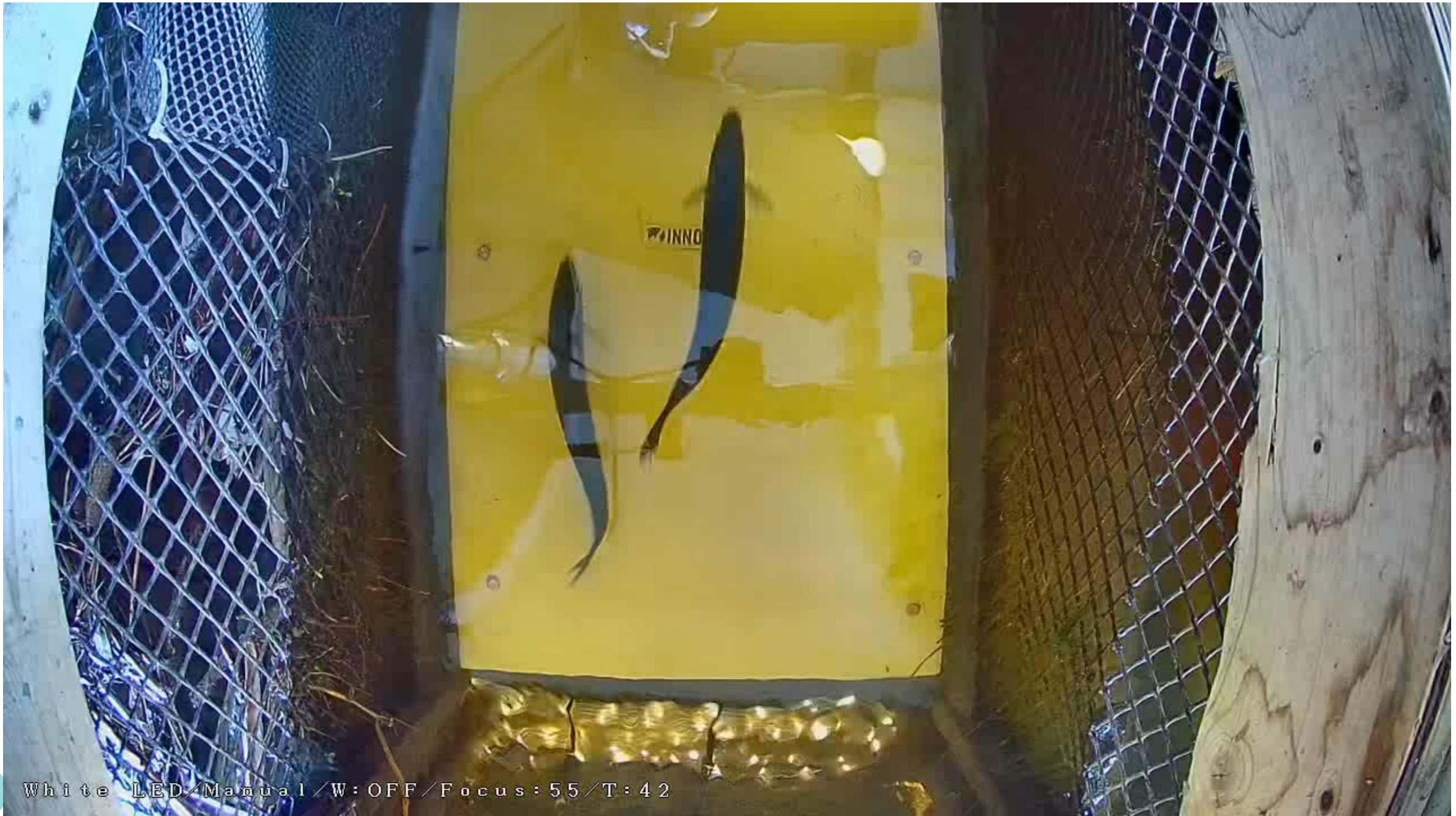
2024 Spring Migration

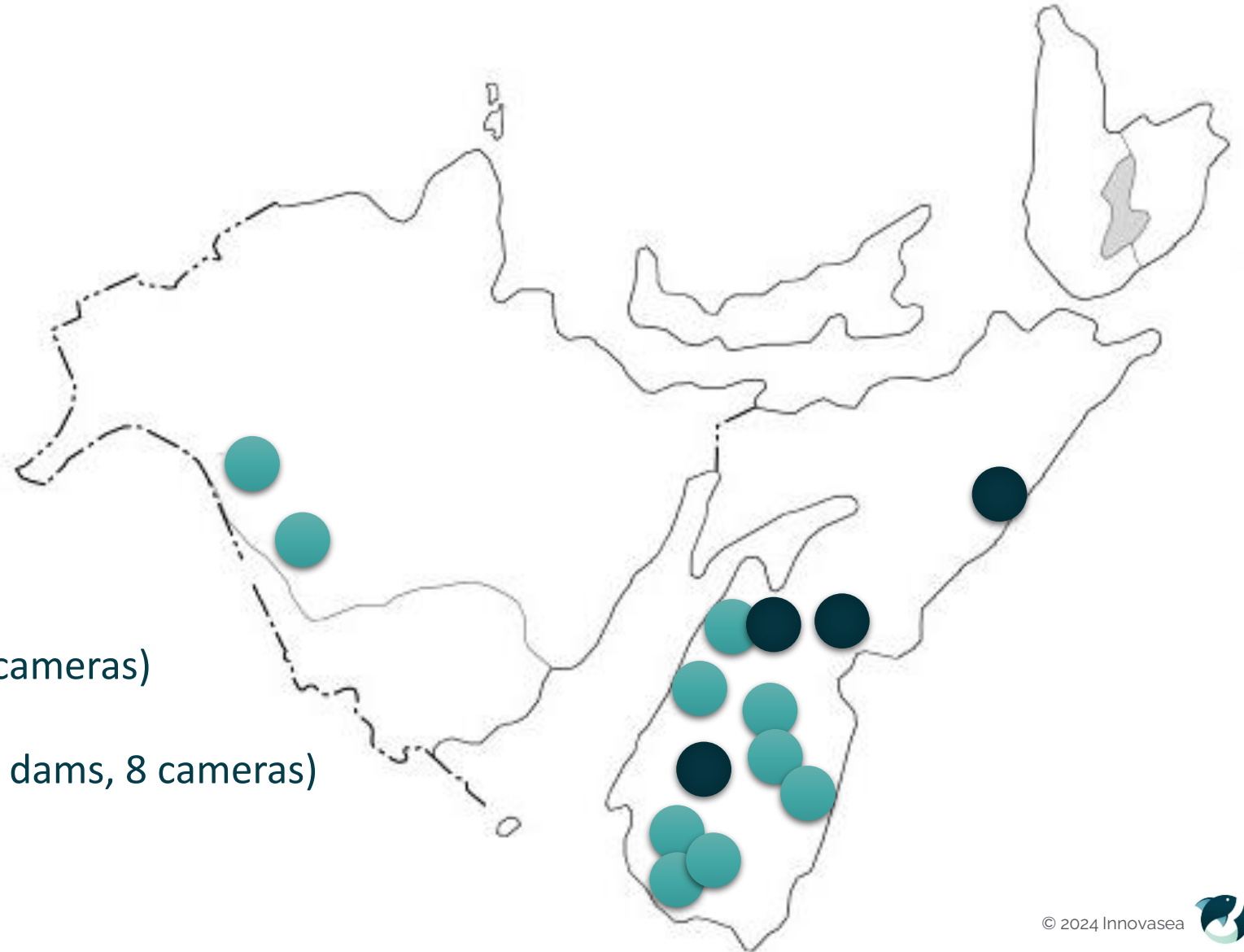


Examples of Insights from 24/7 Counting

- Fish per minute/minute level granularity
 - Day/night distribution
 - Peak travel times, days, weeks
- First/last fish of season
- Ladder efficiency
- Season-over-season comparison







- HydroAI online now (10 dams, 18 cameras)
- HydroAI coming online for 2025 (4 dams, 8 cameras)

2024 Herring Run: Plimoth Grist Mill



Innovasea-Plymouth Partnership

- Innovasea processed footage from 2022 & 2024 runs with HydroAI
- Benefits to Innovasea
 - Sideview camera dataset to learn, train our model
 - Partner to learn about local, state counting priorities
 - Build awareness for new technology
- Benefits to Plymouth
 - Increased efficiency, accuracy
 - Full-season fish count
 - Comparison for crowd-sourced counts
 - Richer data before/after restoration
 - Fine-tune volunteer counting window



2024 Plimoth Grist Mill Counts

- 2024 Herring Run
- Side-view camera
- Crowd-sourced online
- 10-second clips

- 175 hours of video
 - 100% of video counted using HydroAI
 - 15 % of video had manual counting



Count Herring

WELCOME

INSTRUCTIONS

CURRENT DATA

START COUNTING

2024 Estimated Total Run (so far): 227,720 +/- 6,378 ⓘ

Video Recorded: 4/22/2024, 3:59:41 PM

FPS: 9.24 4/22/2024 2:59:43 PM



Enter Count

Jenney Grist Mill 2024 – HydroAI vs. Manual Counts

COUNTING SOURCE	COUNTED FISH IN SUBSET (5,306 VIDEOS)	COUNTED FISH TOTAL (36,684 VIDEOS)
Human/Manual	27,342 fish	-
HydroAI	29,525 fish	218,757 fish

The HydroAI counts are within the 95% Confidence Interval of the manual counts

Plymouth - 2024 Grist Mill – Speciation

- Fish-size algorithm detects 1,000 largest fish
- Biologist manual check of largest candidates
- Multi-species examples found on first pass

- Further AI-based speciation could be done based on physical traits
 - Colour
 - Patterns
 - Body/fin shape



Bluegil or Pumpkinseed



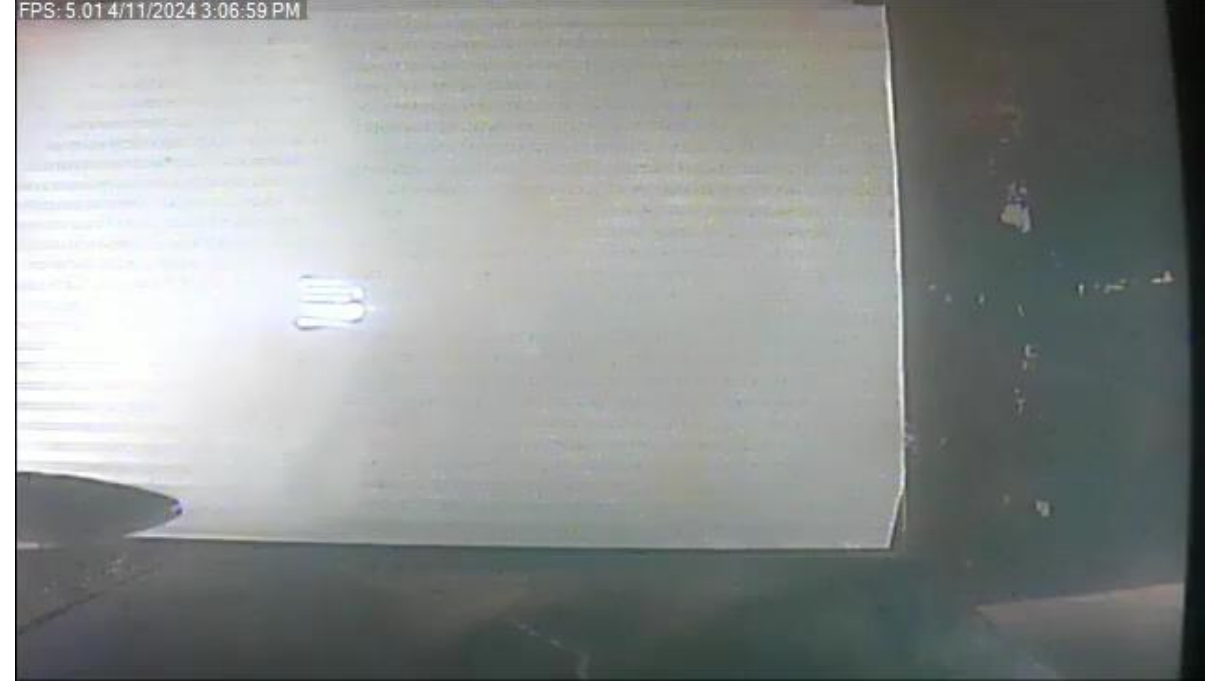
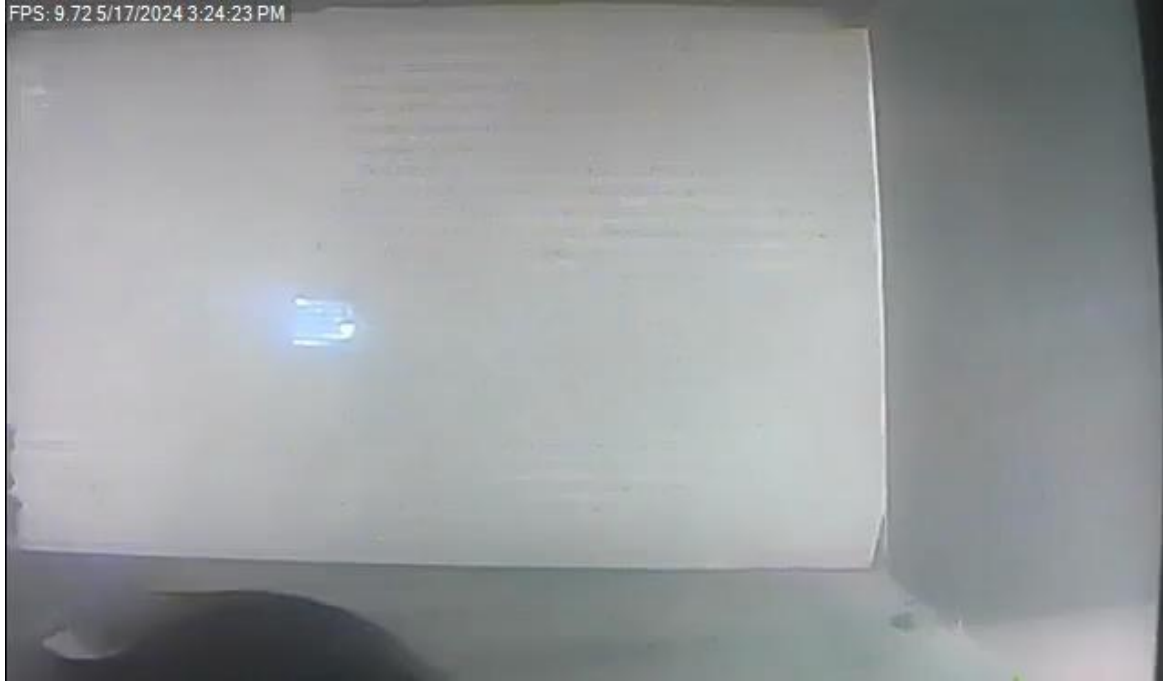
Salmonoid



River Herring



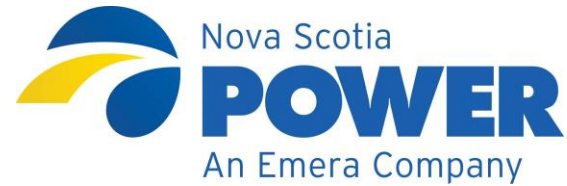
Video Clips



Other Applications



Eel Passage



- Nova Scotia Power Imaging Sonar Project
 - ARIS component will investigate the ability to detect eel presence
 - Paired with acoustic telemetry project
- Ontario Power Generation Eel Passage Trial
 - Optical cameras
 - Low water levels simplifies sizing for aging
 - Using infrared lights to count at night



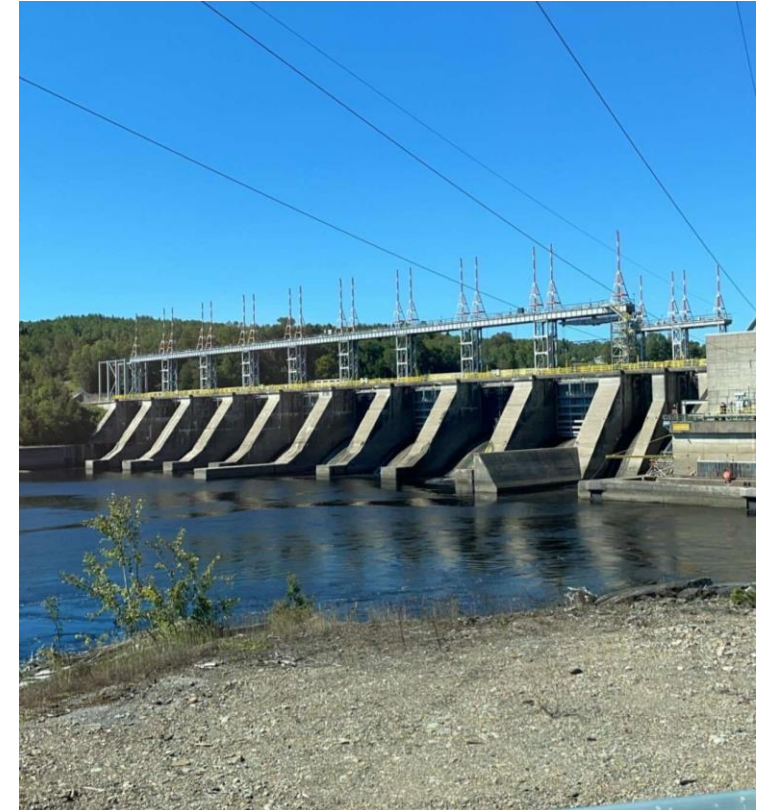
NB Power Dams



Énergie NB Power

Counting salmon using different types of bypasses

- Beechwood Dam
 - 113 MW capacity
 - Upstream Fish lift/Elevator
- Tobique Narrows Dam
 - 20 MW capacity
 - Downstream bypass via collection tank
 - In water and out-of-water cameras



Beechwood Dam



Remote Sites



HydroAI is currently deployed at several remote sites with no power access.

- **Starlink internet** used for all HydroAI applications
- **Solar power** installations used by NSP
 - Future improvements for solar efficiency coming



Benefits of HydroAI



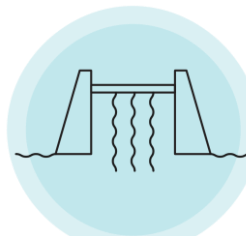
Save Manual Counting Time
24/7 counting and new insights



Improve Regulatory Compliance
Real-time data and reporting



Simple Integration
Easy install with minimal footprint



Increase Green Power Generation
Prevent unnecessary shutdowns

Questions?

Peter MacLeod

Peter.MacLeod@innovasea.com



Acknowledgements



Community Impacts of HydroAI

- Recreational and commercial fisheries
- Fish population and ecosystem health
- Stocking programs
- Invasive species monitoring

Collaboration with partners and stakeholders is key to success.

We are all about saving more fish!

