

# ***Where There's a Will but Not a Way:*** Behavior of American Shad Approaching the Brunswick Dam Fishway on the Androscoggin River, Maine

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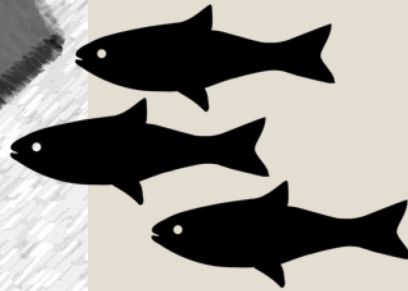
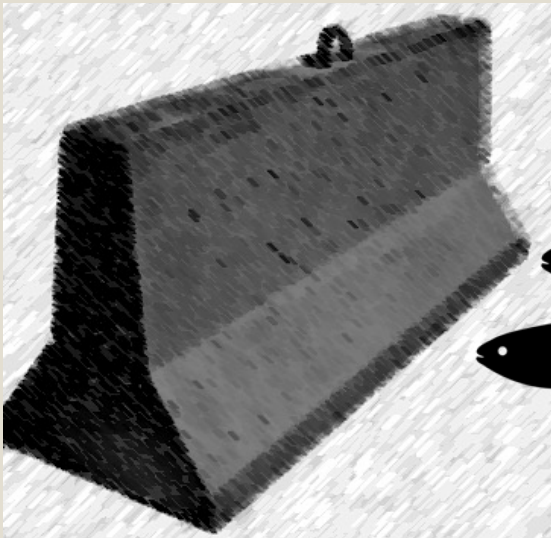
# American Shad Life History & Migration

- Iteroparous species
- Migrate in spring
- Migration driven by environmental conditions
  - Flow
  - Temperature
  - Prey / predators



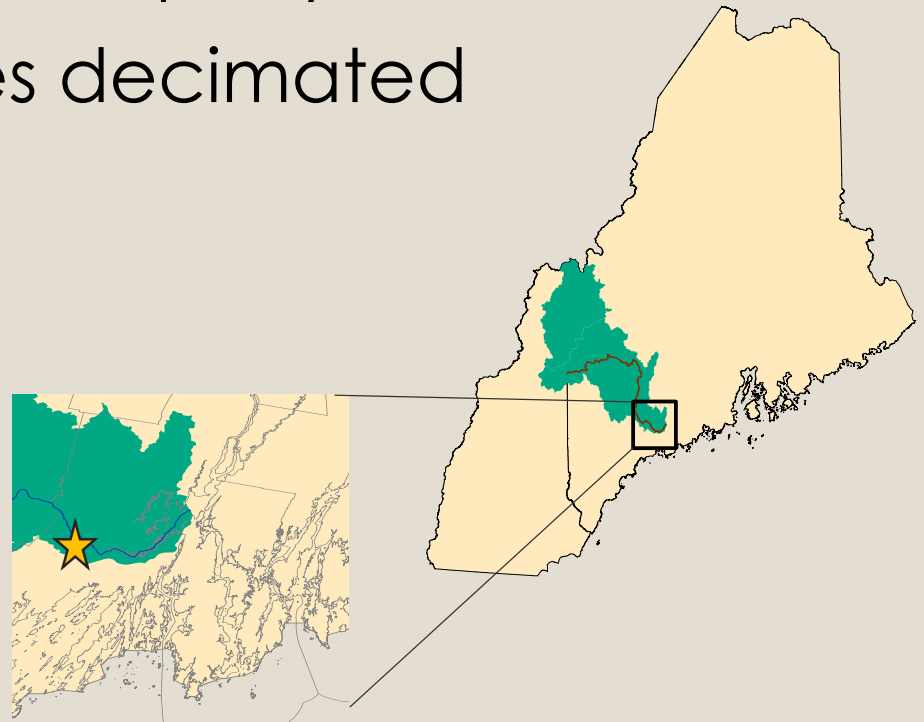
# Barriers to Migration

- Fishways intended to mitigate obstruction
- Essential to have information on fish behavior approaching variable flows



# Androscoggin River

- Historic abundant diadromous fish populations
- 235,000 adult shad returns per year
- 1930s – sea-run fisheries decimated



# Brunswick Dam

- Constructed in 1982
- Tidal influence
- FERC re-licensing 2024





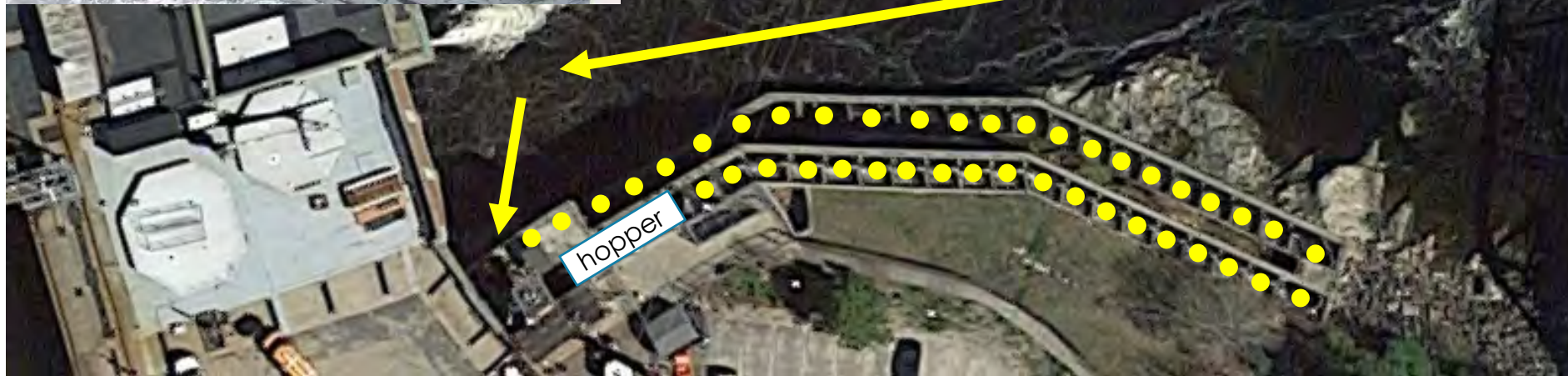
# Brunswick Dam Fishway



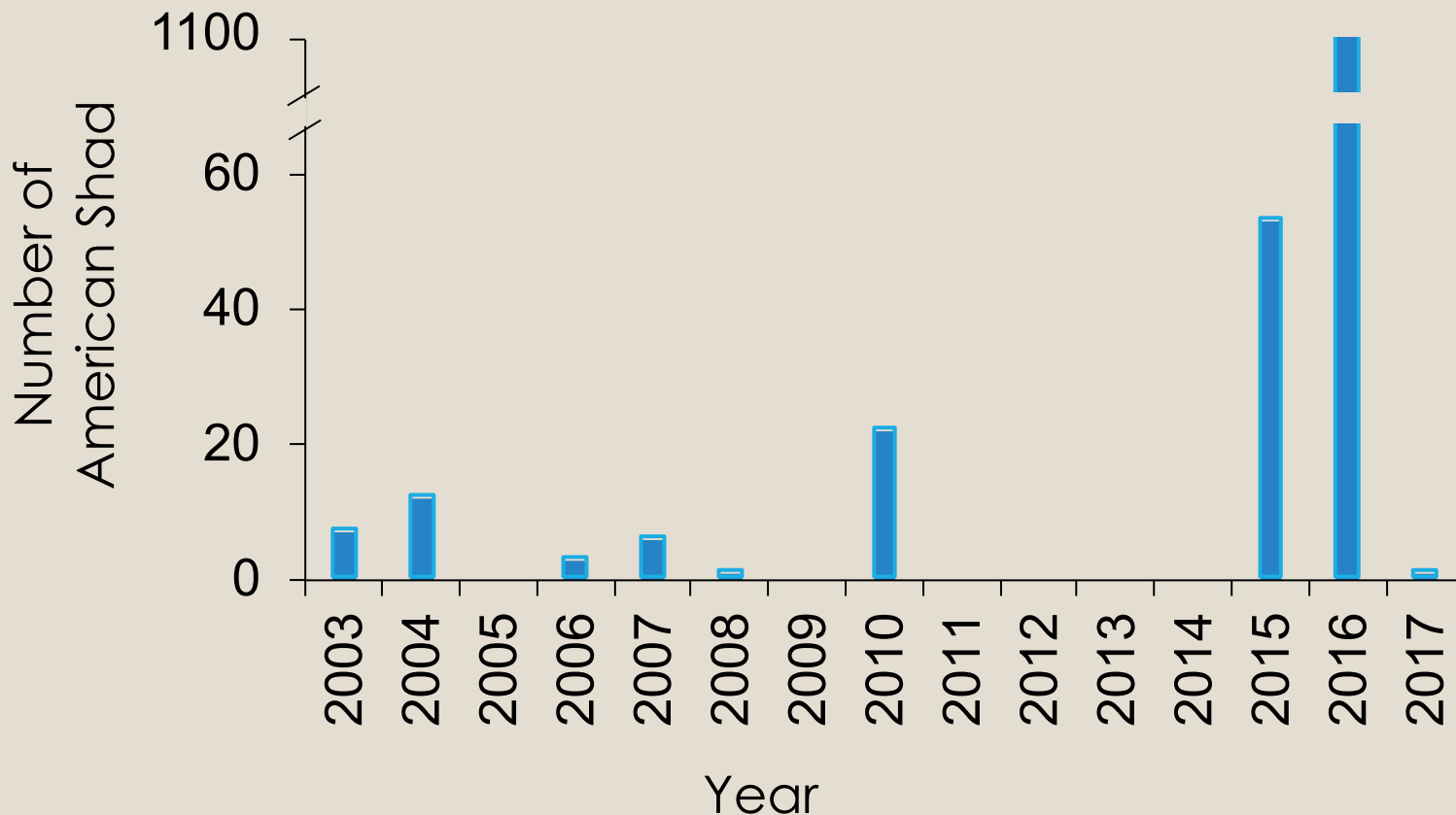
Maine DMR

- Vertical slot
- 173 m long
- 42 pools (one switchback)
- 20 cm slot
- $2.8 \text{ m}^3 \cdot \text{s}^{-1}$  attraction flow

# Brunswick Dam Fishway



# American Shad Passage Counts Brunswick Fishway (2003 – 2017)





# Objective

Describe the behavior of migrating American Shad approaching the Brunswick Dam and using the fishway

## Data

- I. Video observation & turbine operation (approaching dam)
- II. Telemetry study (using fishway)

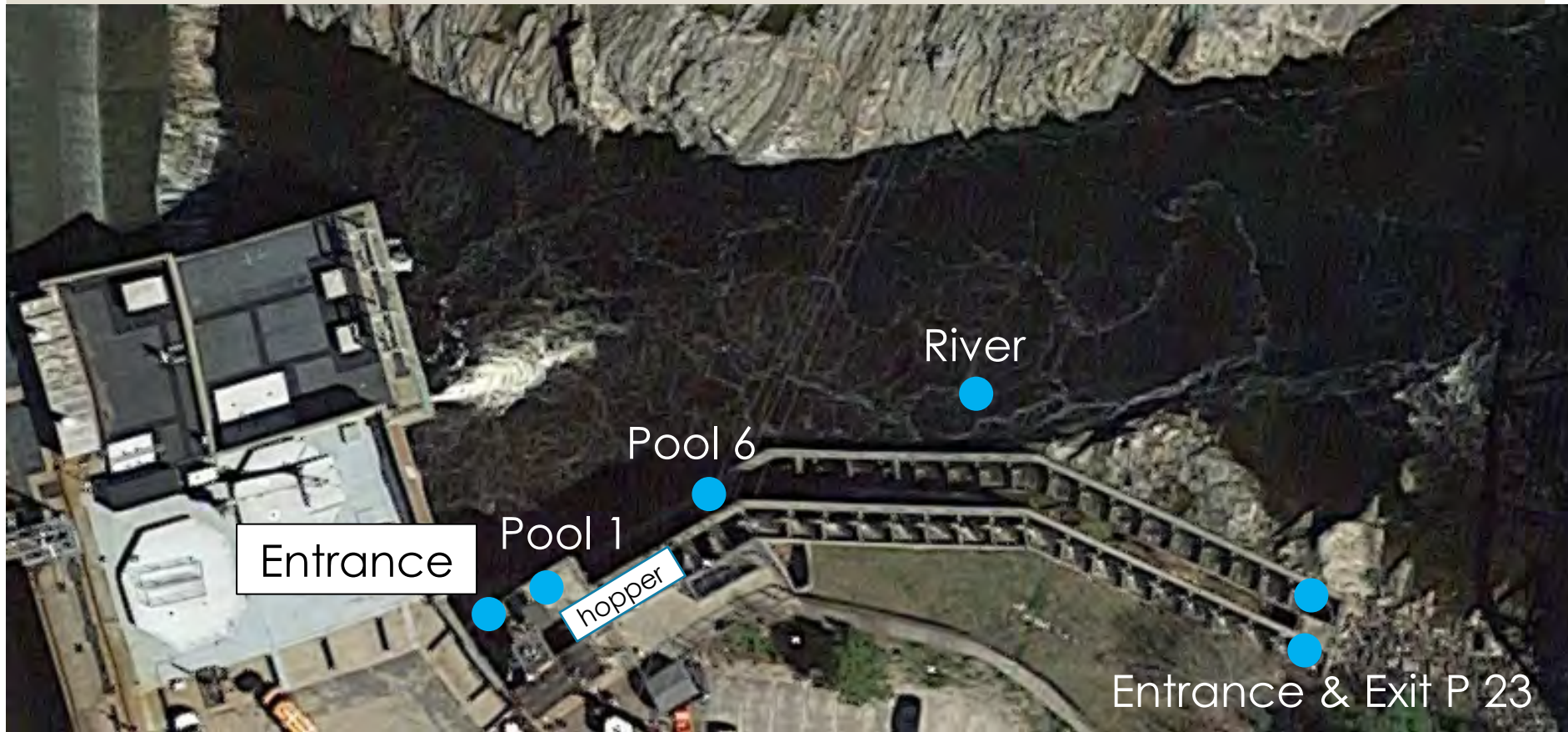
# Visual Confirmation

## Are Shad in the River?

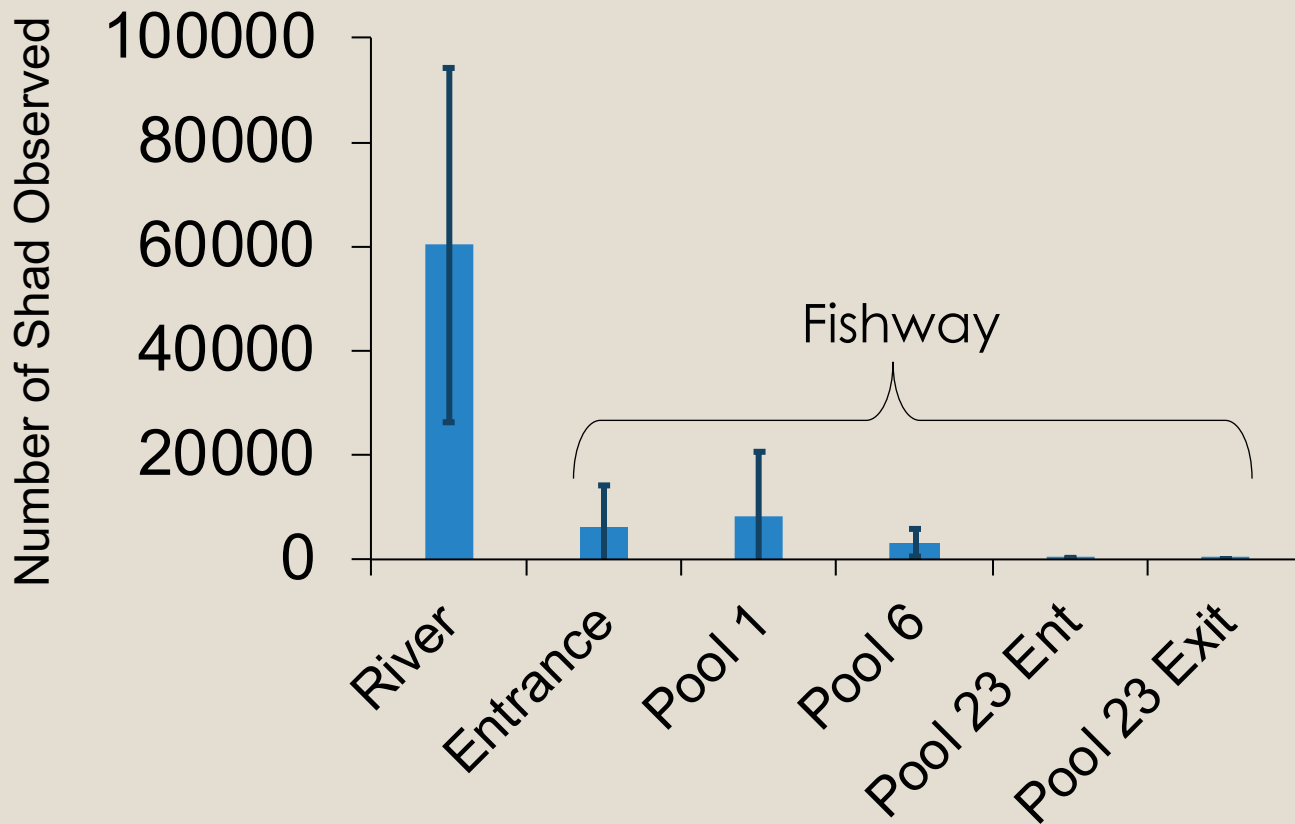
- Underwater cameras deployed 2002–2004, May–July
- Continuous recordings from 0600 – 1800 h
- Reviewed first 3 min. of every 10 min. video segment
- Total counts were recorded



# Video Recorded Observations



# Video Observations American Shad Counts (2002 – 2004)





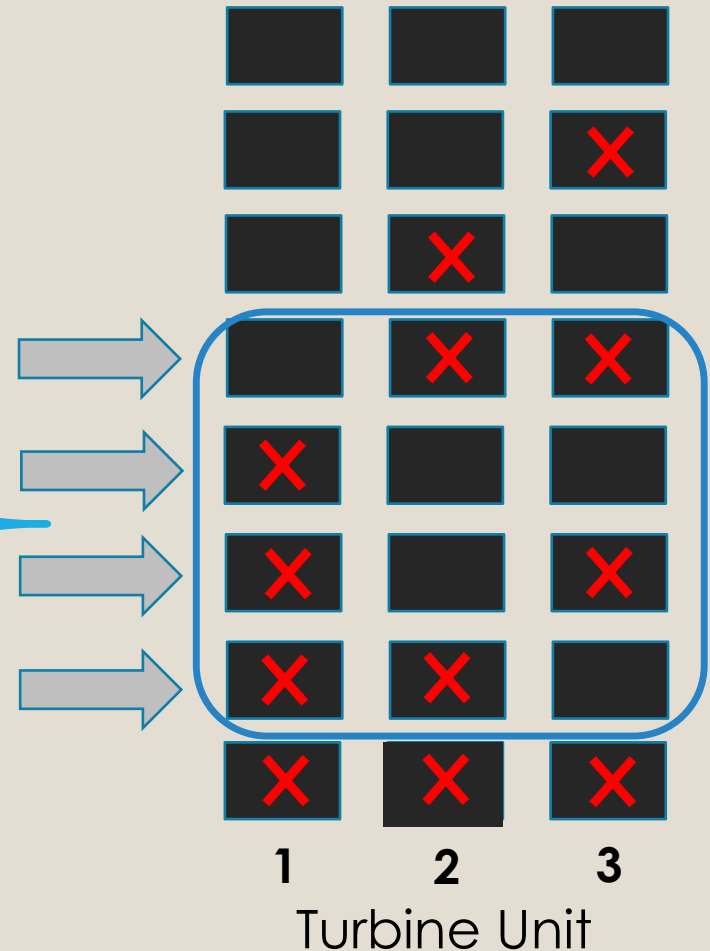
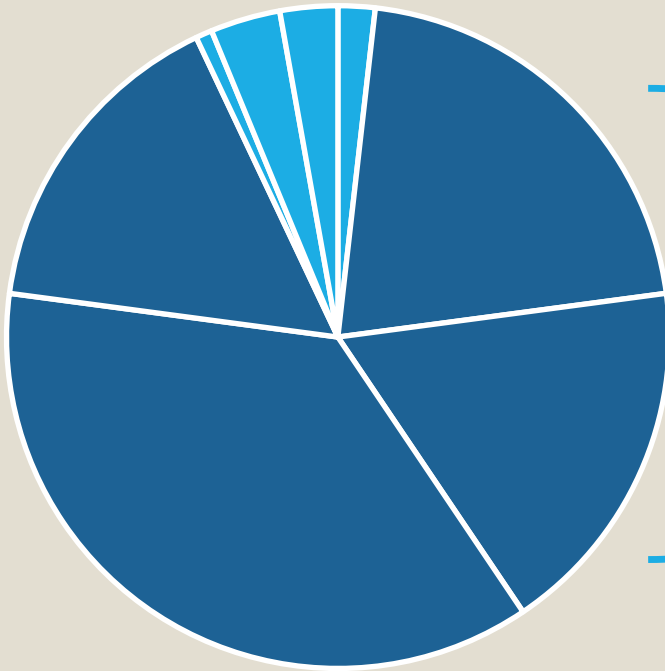
# Turbine Operation and Shad Behavior



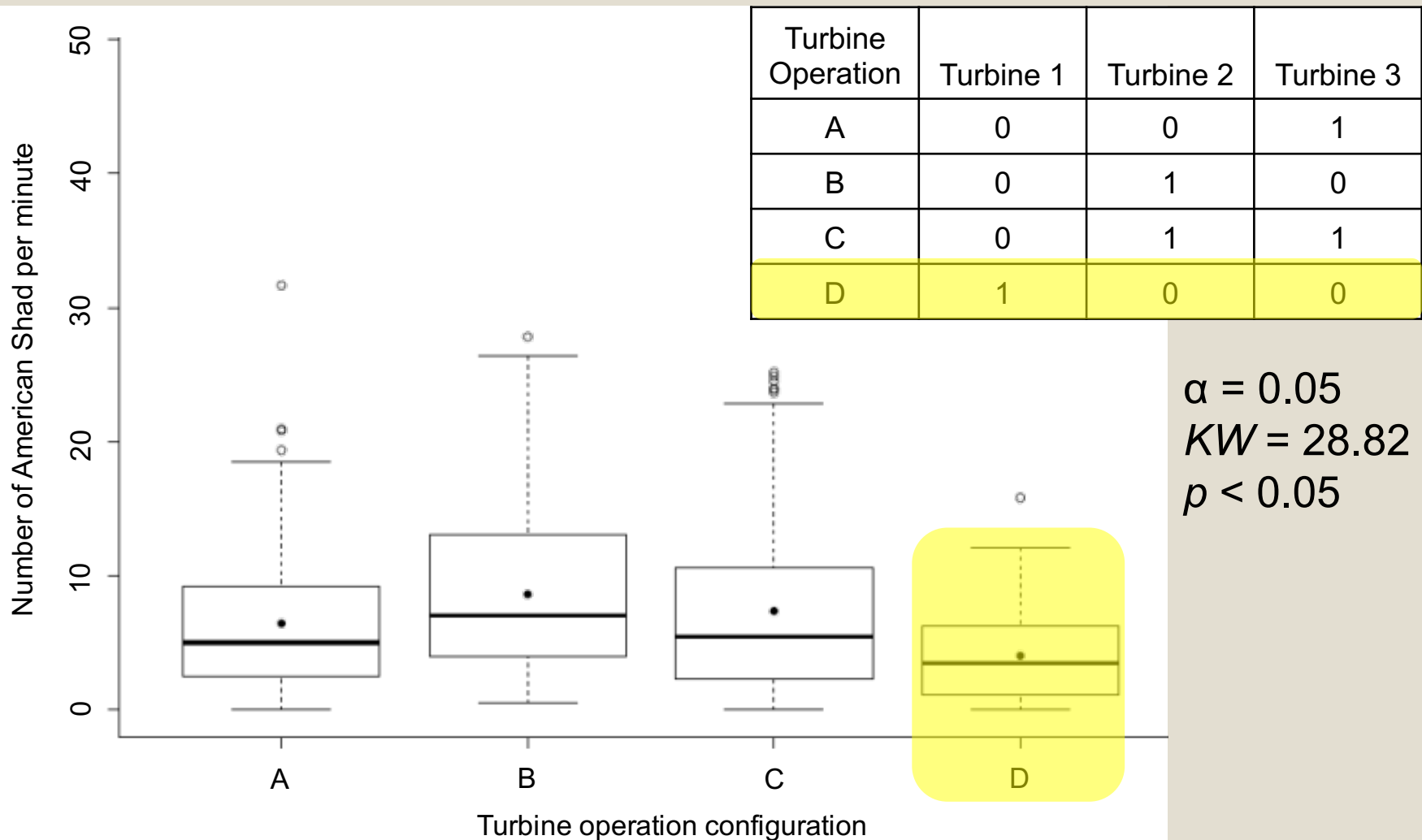


# Most Frequent Turbine Operation Configuration

4 configurations  
90%



# Shad Observed in the River under Different Turbine Operations



# Shad Observed in the River under Different Turbine Operations



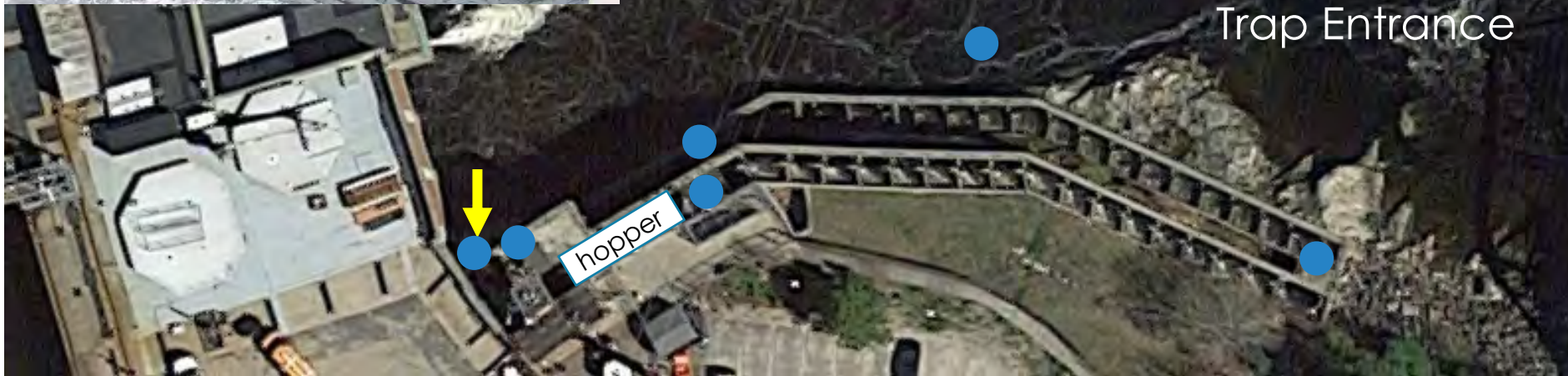
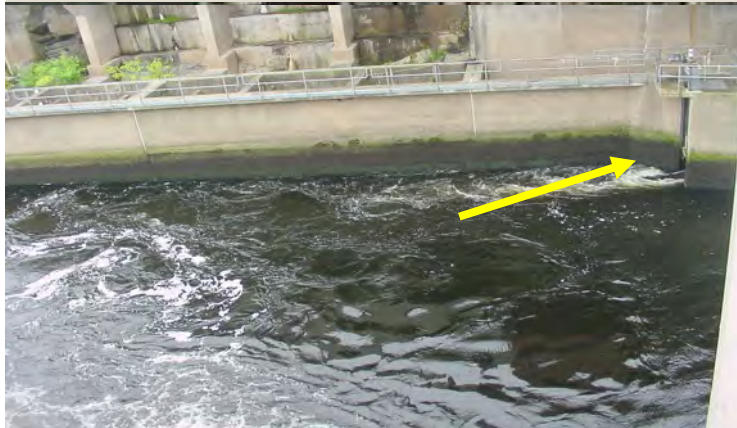
# Telemetry Study

- 2002 – 2005 shad angled below dam
- Received internal gastric tags
- Characterize movement and behavior of Shad approaching and using the fishway



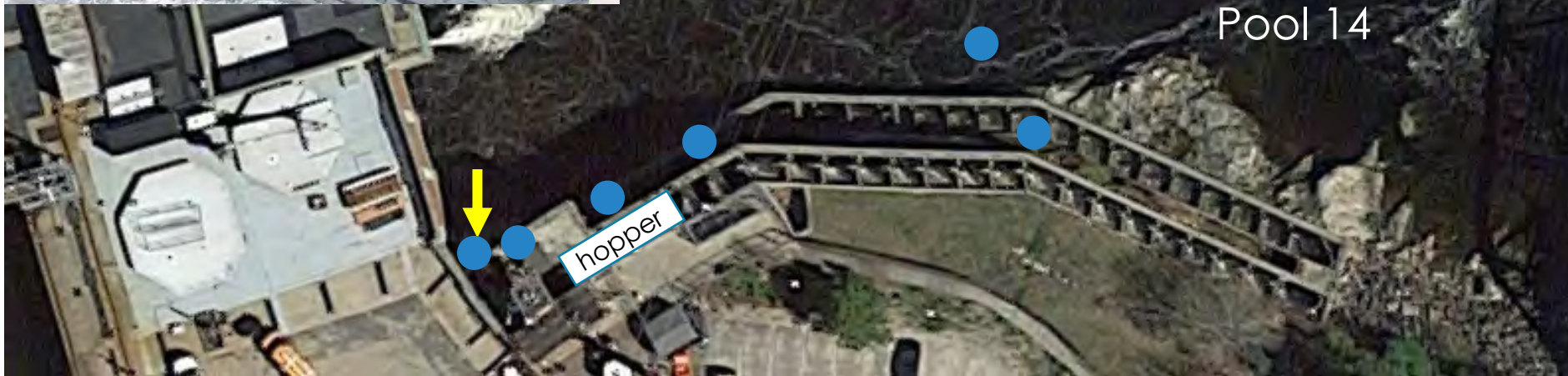
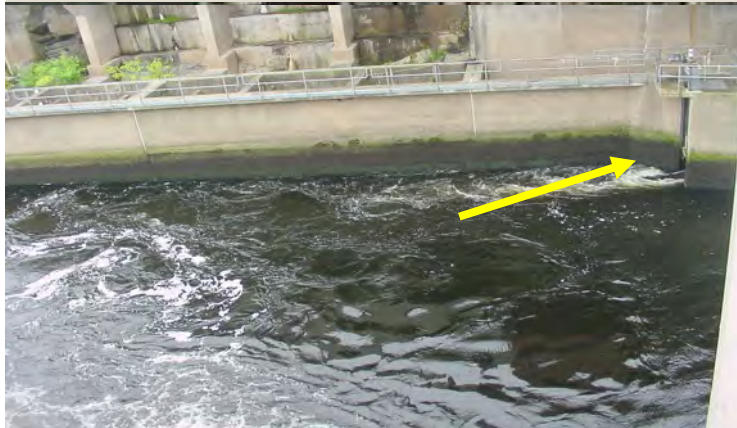


# Telemetry Antennas (2002 – 2004)



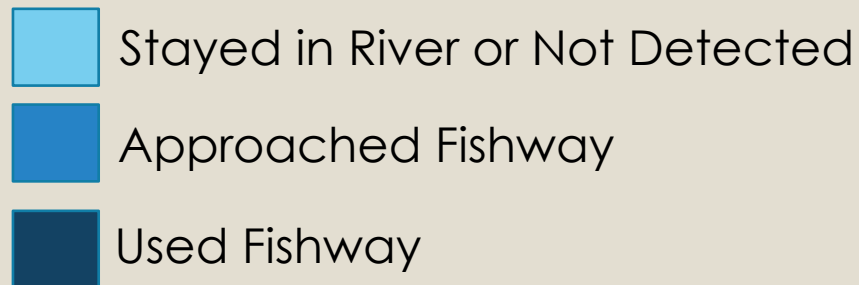


# Telemetry Antennas (2005)

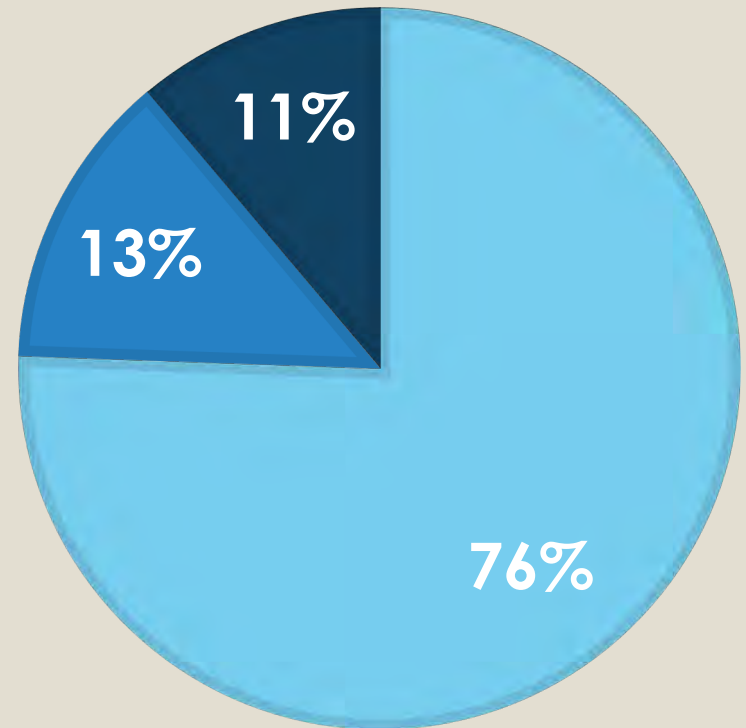


# Telemetry Results

Year	Tagged Fish
2002	10
2003	10
2004	20
2005	20



ALL YEARS (2002 – 2005)



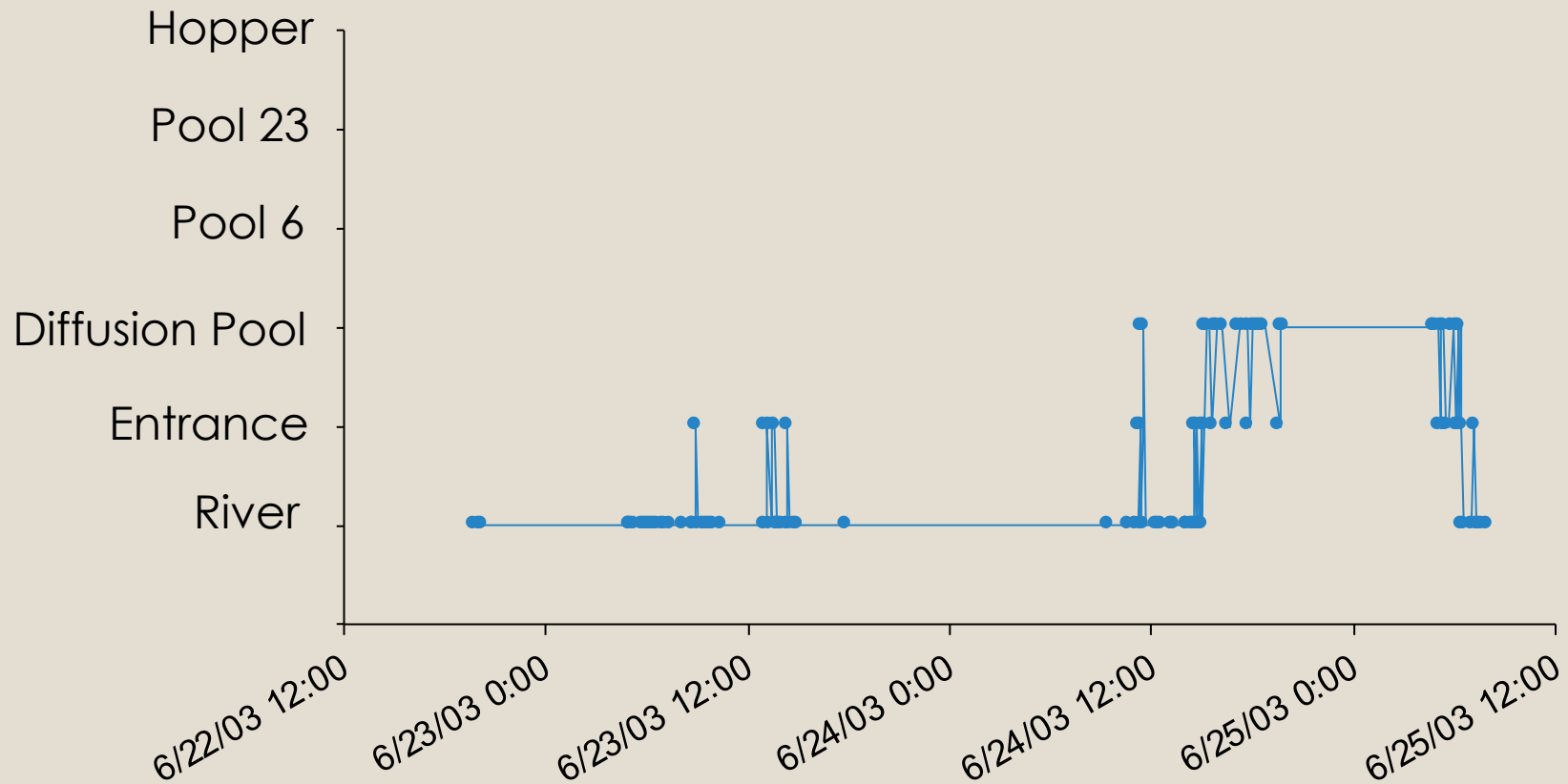
# Telemetry Results

Year: 2003

Fish 97

3 day period

Mean Temp: 18.9°C



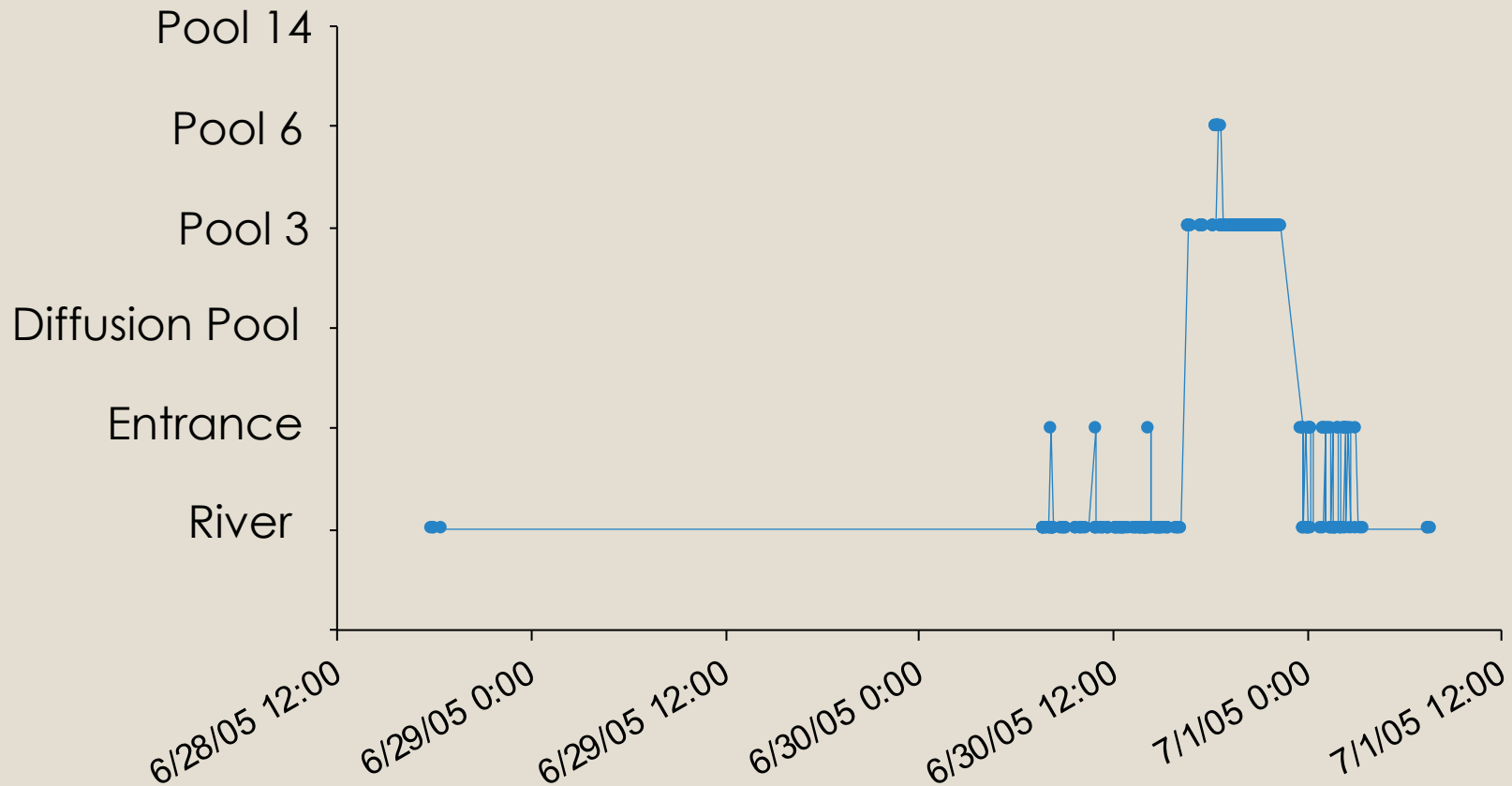
# Telemetry Results

Year: 2005

Fish 140

4 day period

Mean Temp: 18.4°C



# Summary of Video and Telemetry Studies

- American Shad are in the river!
- Hydropower operations influence ability to locate the fishway
- Movement observations restricted to river and lower fishway, no movement observed in elevated sections



# Take-Away Messages

- **Brunswick dam fishway does not attract or pass American Shad well  
(design originally meant for salmon)**
- **Conditions and fish passage have stayed the same  
(32 shad in 2018)**
- **FERC re-licensing in 2024  
(inform future studies)**