Tracking Eel Movements in the St. Lawrence River – a Collaborative Approach

Scott Schlueter, U.S. Fish and Wildlife Service

Alastair Mathers, Ontario Ministry of Nat. Res. and Forestry

Jean Caumartin, Hydro-Quebec

Daniel Hatin, Quebec Ministry of Forests, Fauna, and Parks

Dr. Thomas Pratt, Fisheries and Oceans – Canada

Dr. David Stanley, Ontario Power Generation

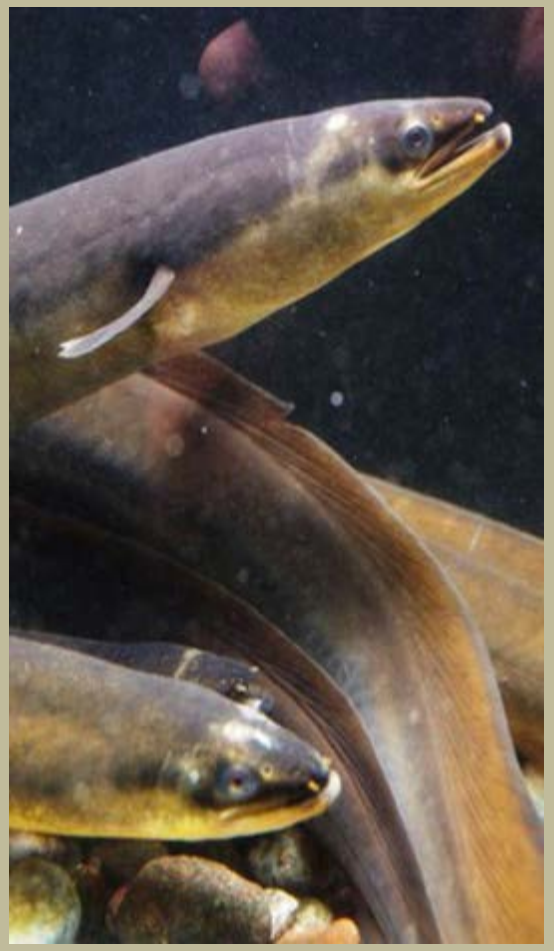
Dr. Dimitry Gorsky, U.S. Fish and Wildlife Service

Justin Ecret, U.S. Fish and Wildlife Service

Dr. Paul Jacobson, Electrical Power Research Institute

Objectives

- Long-term Goal:
  - Increase the number of American Eels outmigrating from Lake Ontario/StLR by reducing turbine mortality (currently ~40%)
- A guide, collect, and bypass solution is being investigated/developed to mitigate turbine mortality
  - 2 collection points considered- Iroquois Water Control Dam and Beauharnois Canal
- To inform the development and placement of experimental guidance structures, we need to understand the migration patterns and timing of outmigrating eels



Objectives

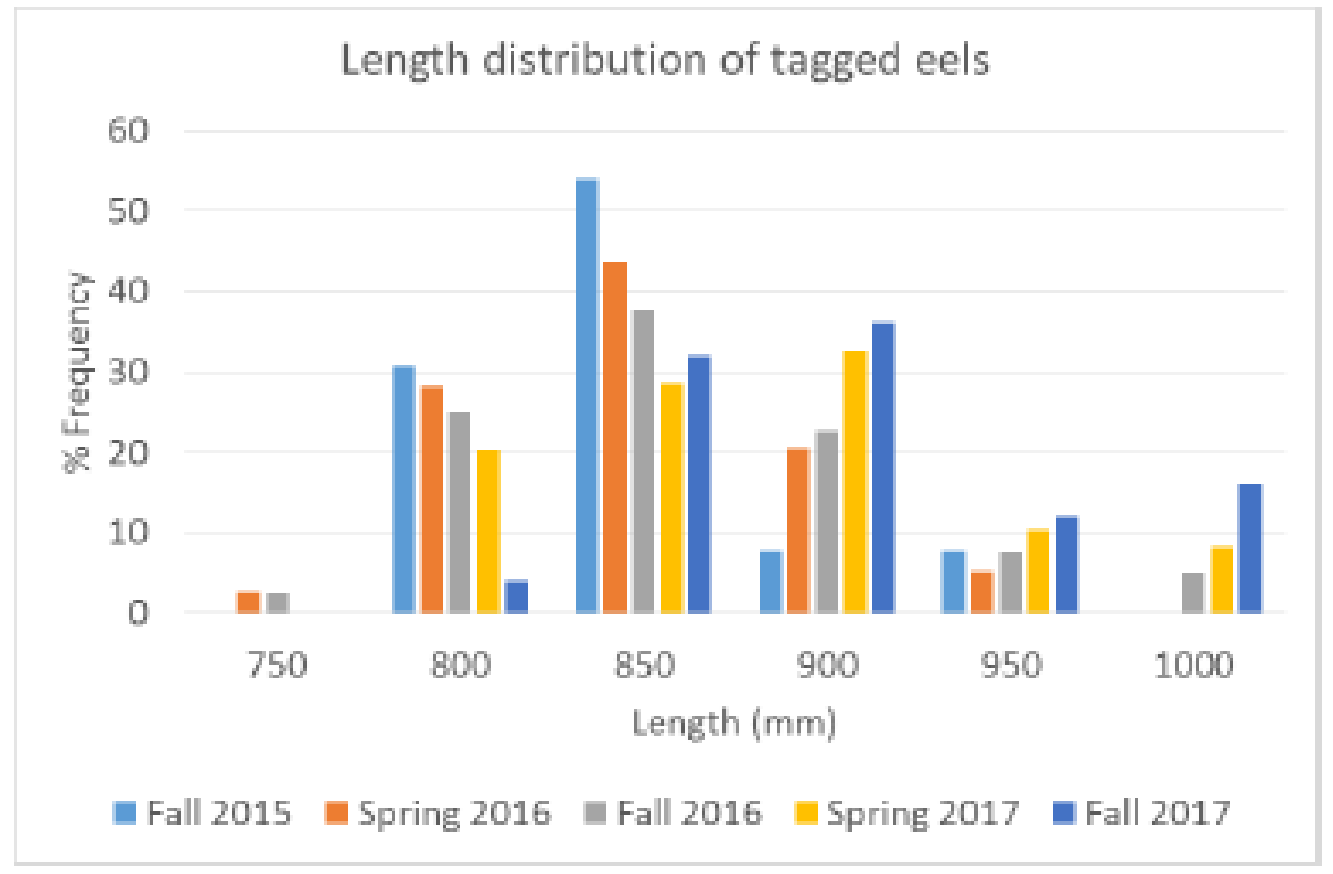
- 2016 Objectives:
  - Can we track eels downstream?
  - If so, can we determine path of migration and timing
- 2017 Objective:
  - Determine fine-scale movements of migration in close proximity to the Iroquois and Beauharnois Dams
- Ongoing 2018…discuss later…

Methods

- Eels were captured in the Bay of Quinte by commercial fisherman as part of Ontario Power Generation's Trap and Transport Program
- Eels in BQ are primarily of stocked origin, not wild migrants
- VEMCO V13 acoustic tags were surgically implanted
- Recovered eels were released off the docks at OMNRF – Glenora Fisheries Station in the Bay of Quinte

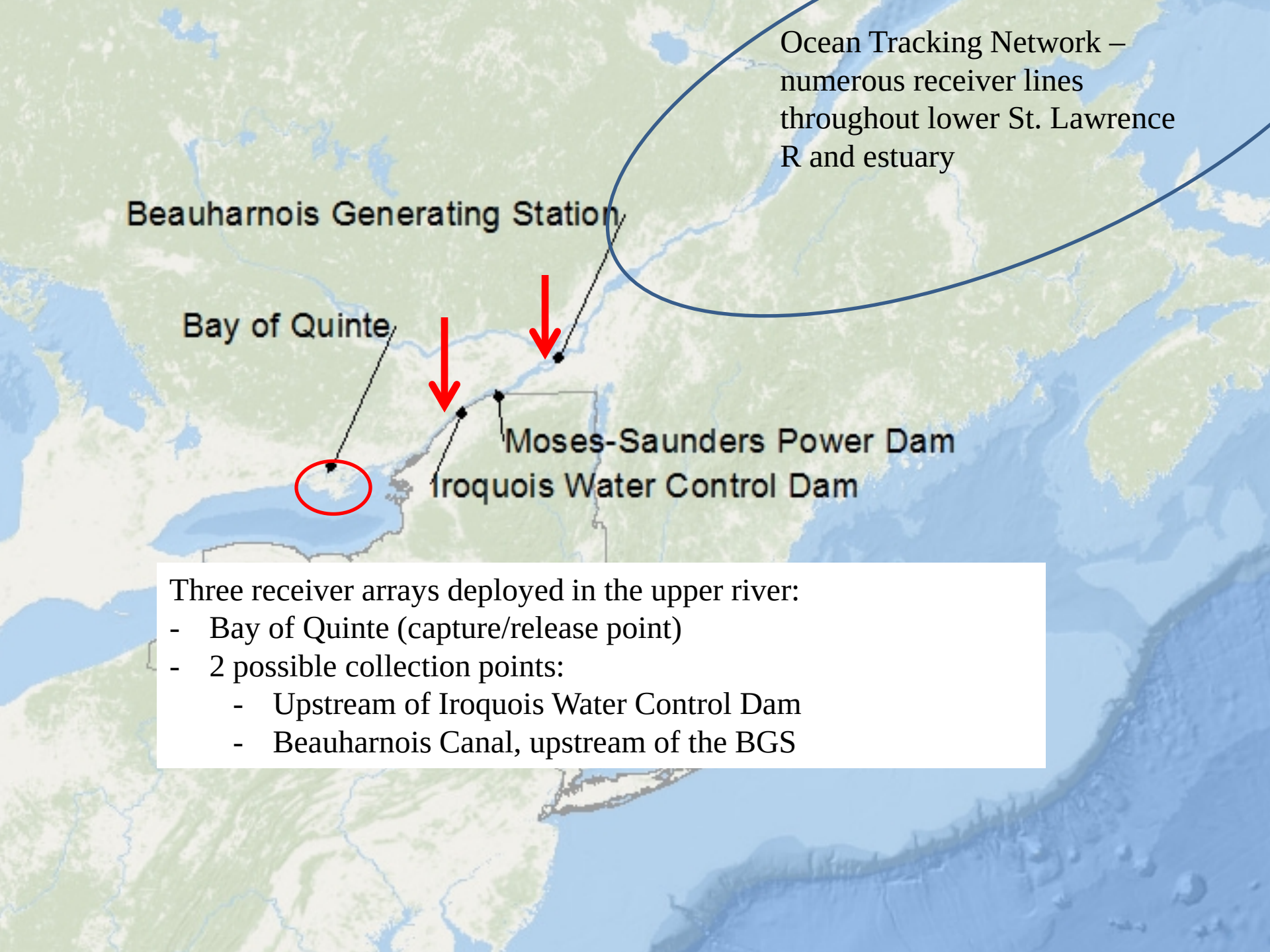
Characteristics of Tagged Eels

- Study animal selection was not random
- Large yellow eels >800 mm are targeted
- Increases likelihood of migrating in same year as tagged
- Silver eels can't be easily captured in the system



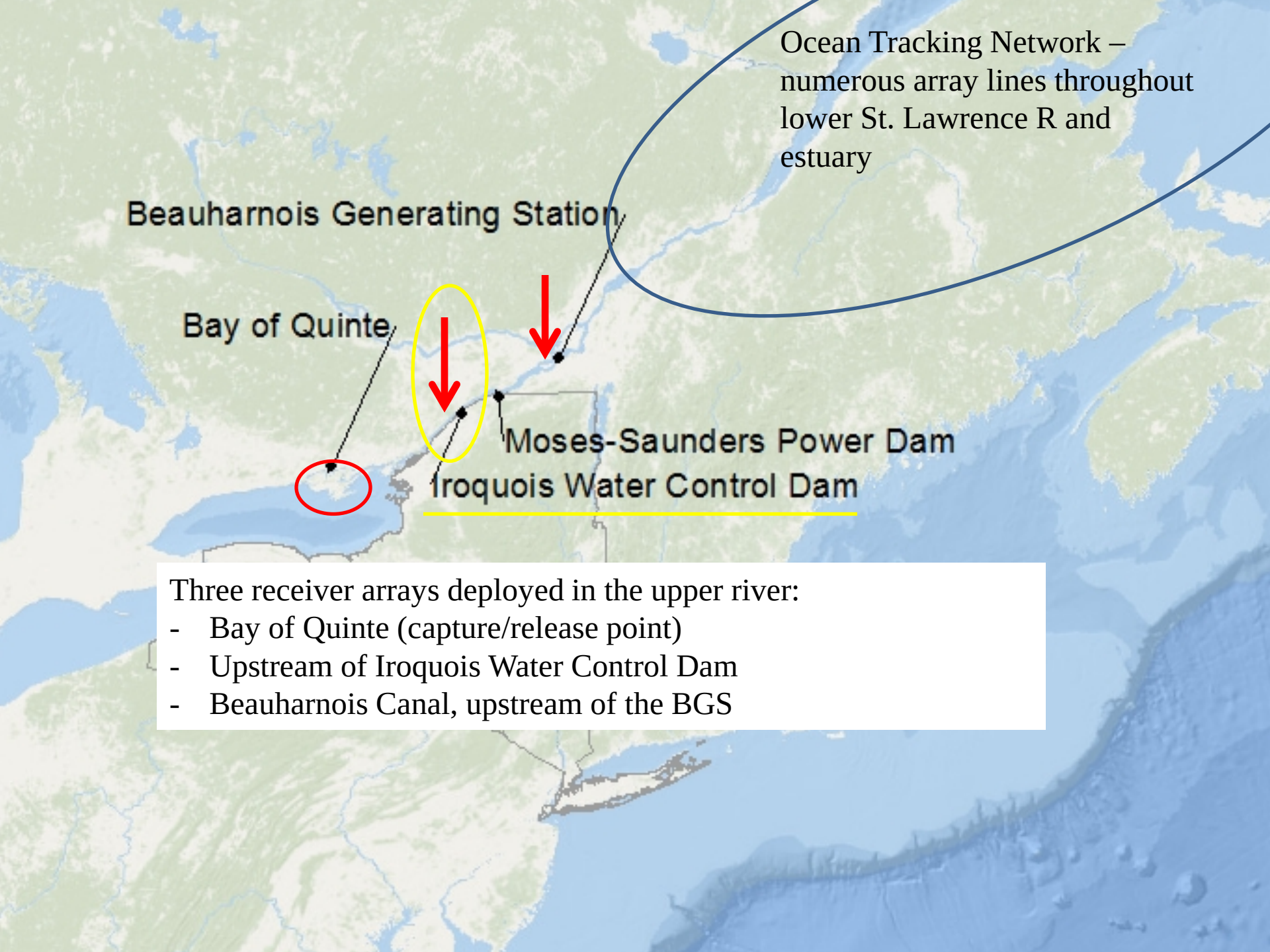

Beauharnois Generating Station
Bay of Quinte
Moses-Saunders Power Dam
Iroquois Water Control Dam
NYFO
You are here
N
0 75 150 300
Miles


Beauharnois Generating Station
Bay of Quinte
Moses-Saunders Power Dam
Iroquois Water Control Dam
Beauharnois Generating Station
Iroquois WCD
Moses-Saunder Power Dam
N



Three receiver arrays deployed in the upper river:

- Bay of Quinte (capture/release point)
- 2 possible collection points:
  - Upstream of Iroquois Water Control Dam
  - Beauharnois Canal, upstream of the BGS



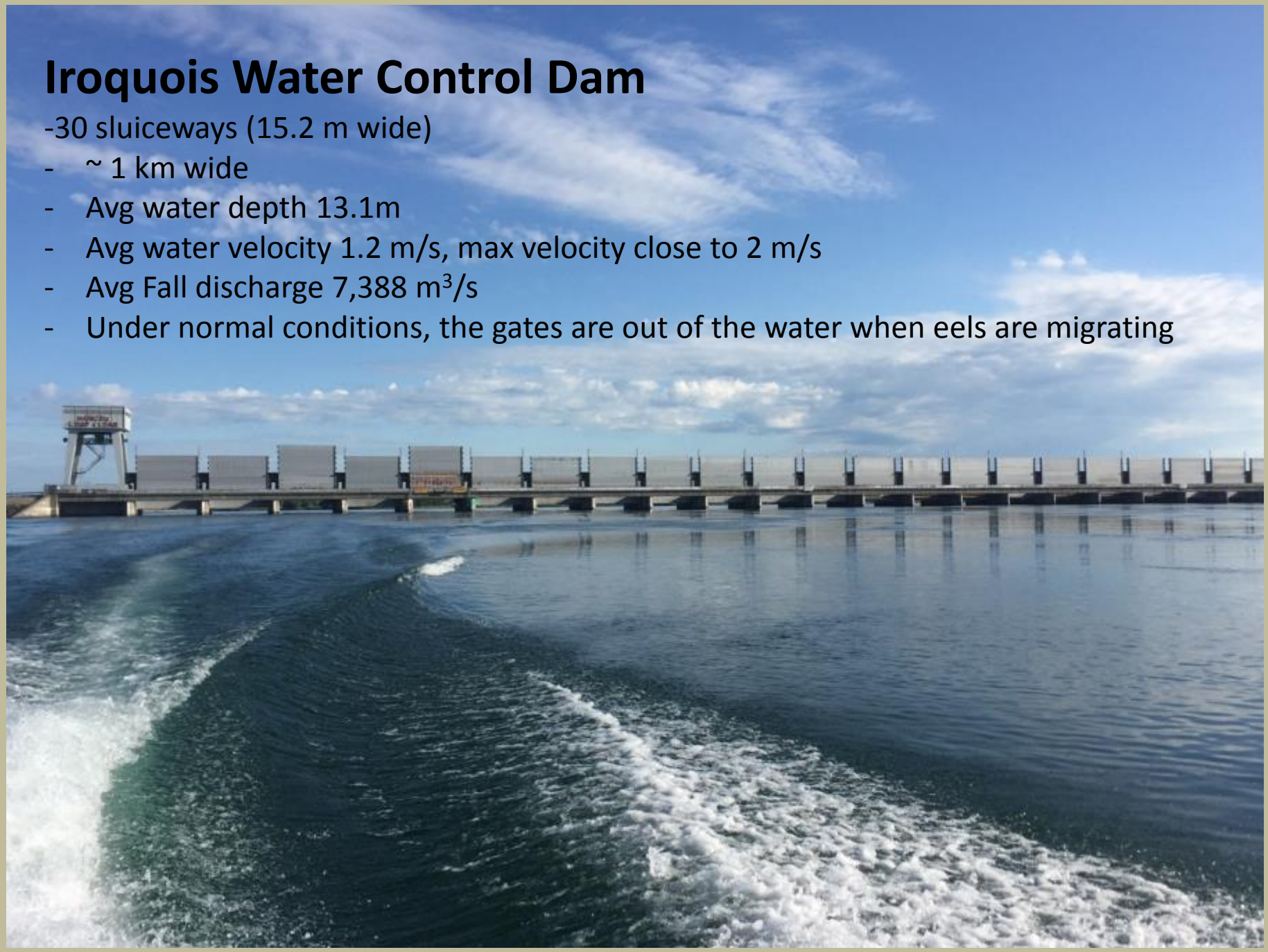
Three receiver arrays deployed in the upper river:

- Bay of Quinte (capture/release point)
- Upstream of Iroquois Water Control Dam
- Beauharnois Canal, upstream of the BGS

Iroquois Water Control Dam

-30 sluiceways (15.2 m wide)

- ~ 1 km wide
- Avg water depth 13.1m
- Avg water velocity 1.2 m/s, max velocity close to 2 m/s
- Avg Fall discharge 7,388 m^3/s
- Under normal conditions, the gates are out of the water when eels are migrating



2017

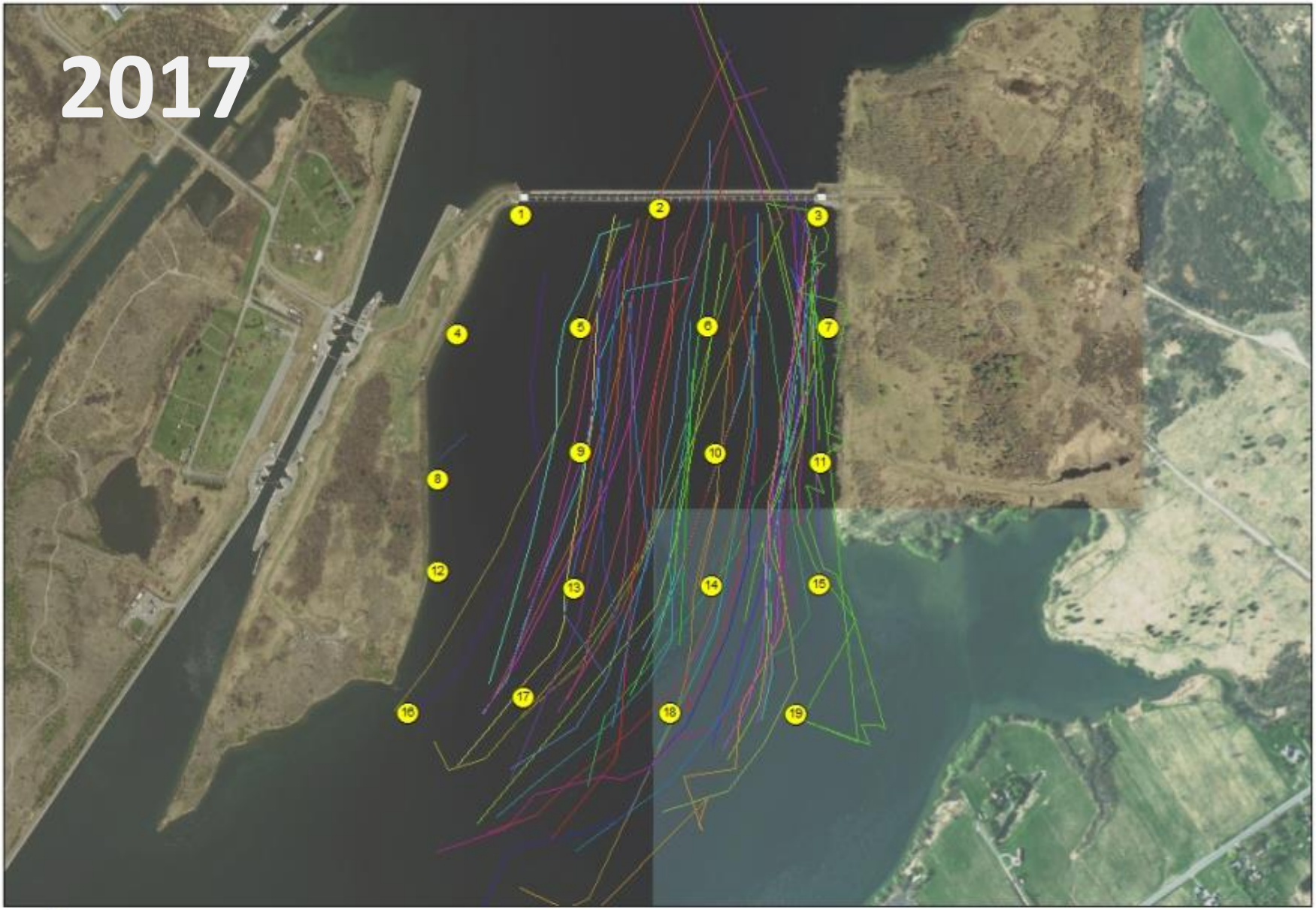
- VPS array- July 12 – Nov 30
- 19 Receivers-16 VR2ARs, 3 tethered VR2W/Txs
- 100 V13 tags deployed
  - ping rate- 90 sec

Changes from 2016…

- Increased receiver density and tag ping rate

N

0 0.125 0.25 0.5 Miles

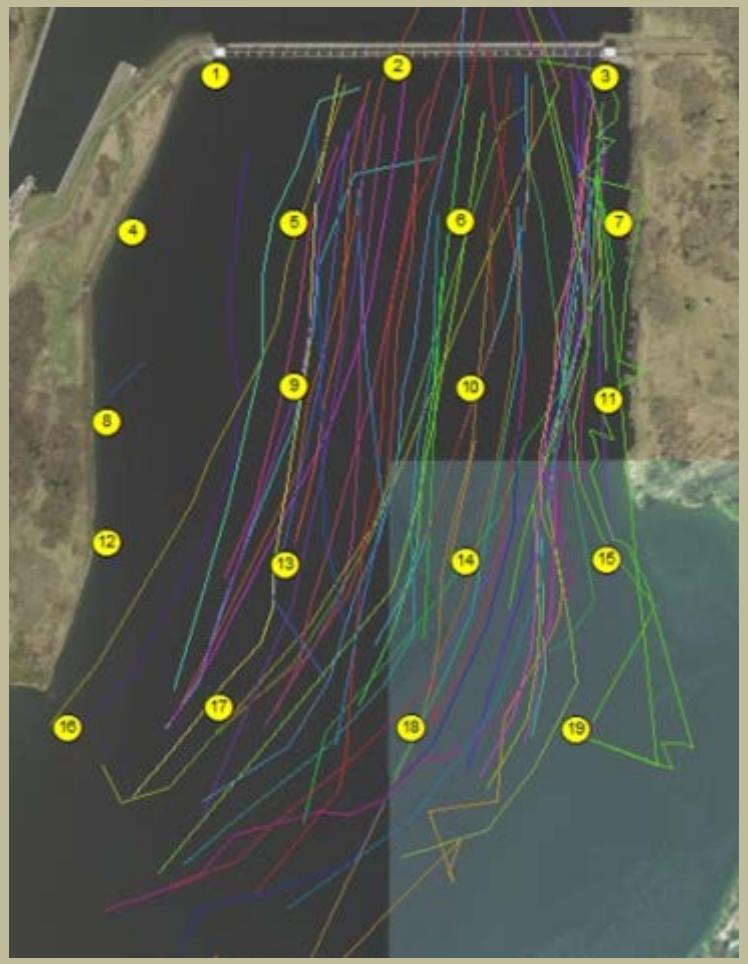

2017
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
N
0
0.125
0.25
0.5
Miles

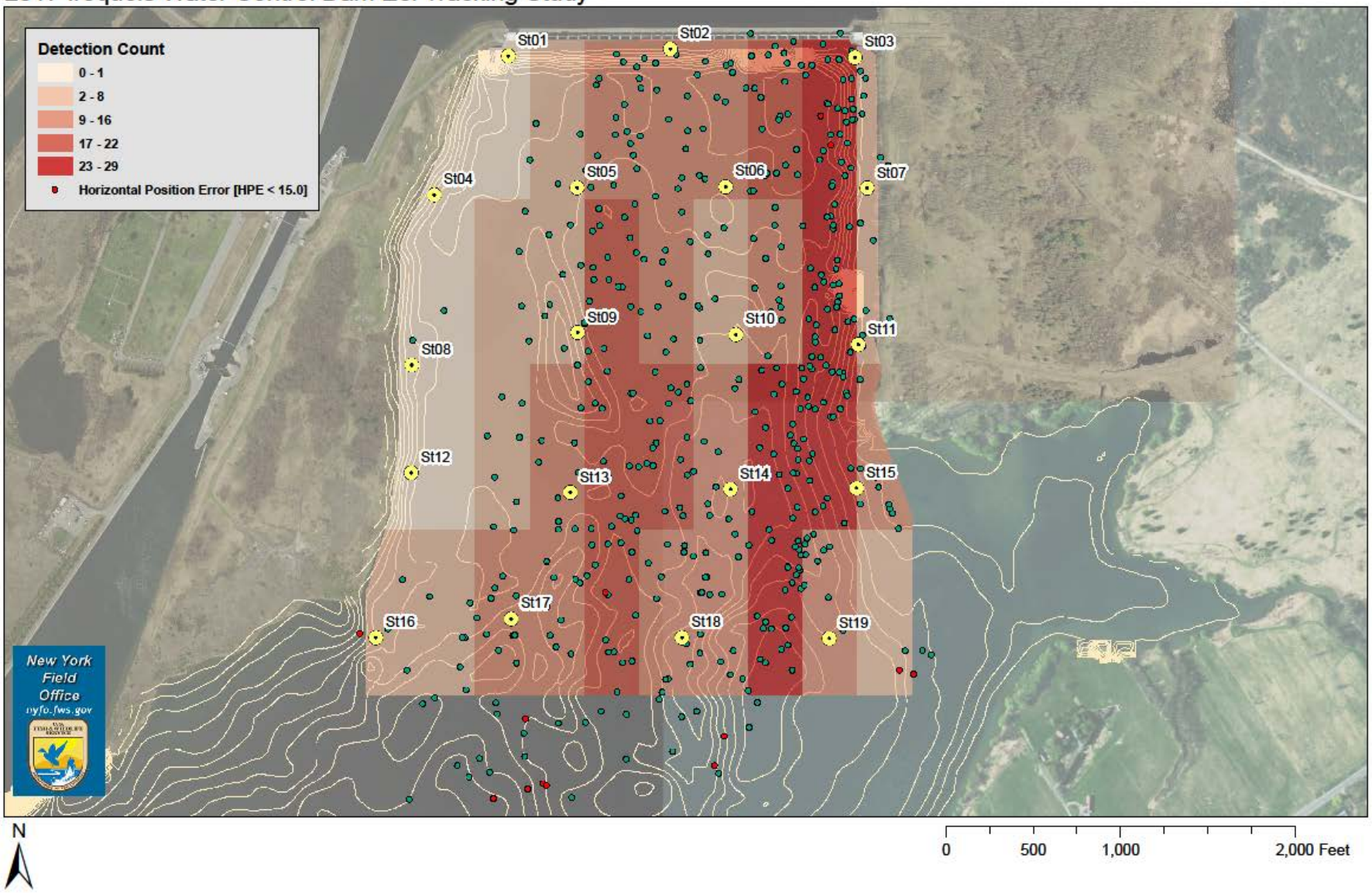
2017

- 57 fish detected; 53 fish multiple positions
- 487 positions calculated (VPS)

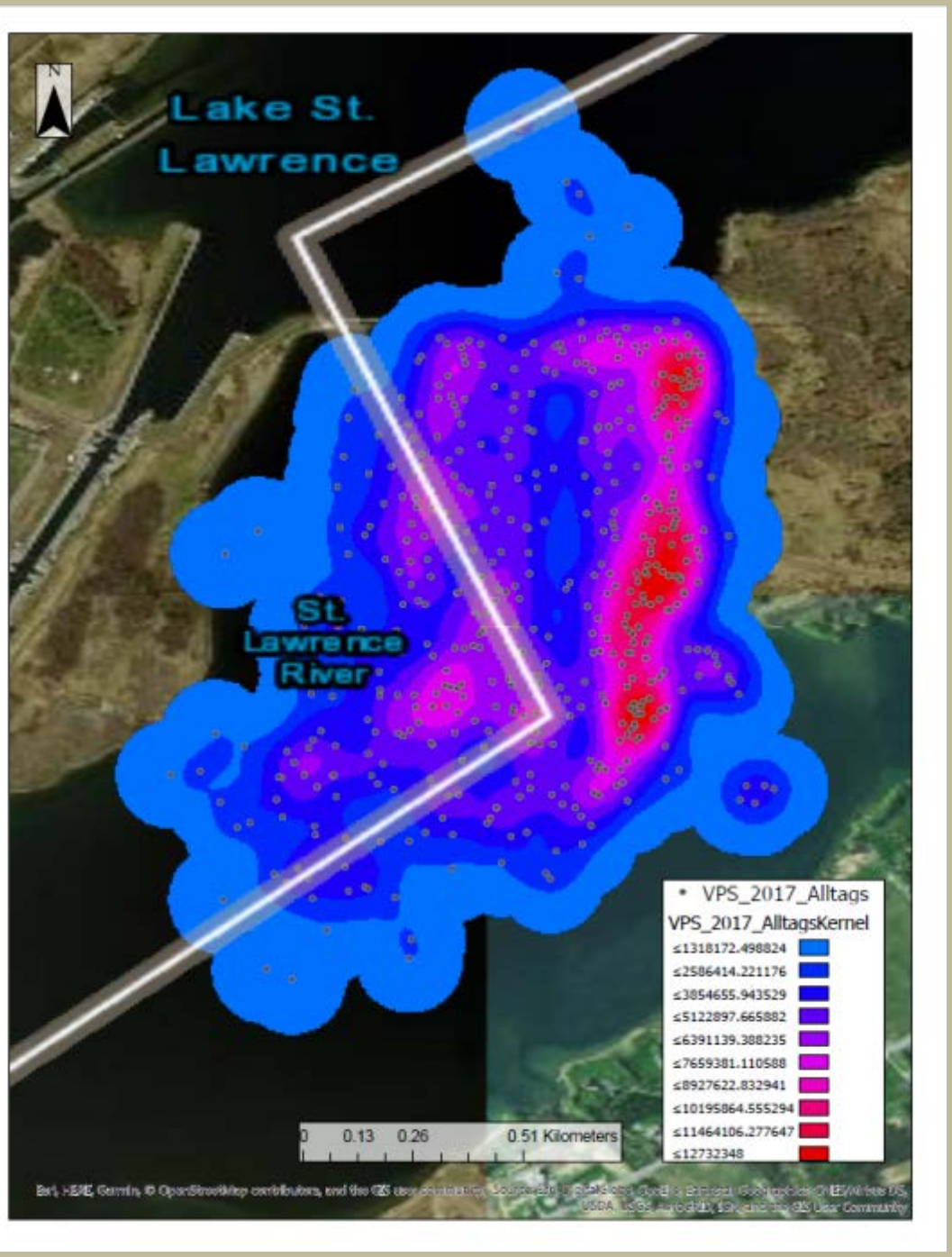
Trends/observations-

- Eels avoiding Canadian shoreline
- Tracks are more complete; still assumptions needed on which gate was passed
- Depth sensor tags (n=6) showed porpoising behavior
- VR2AR acoustic release receivers worked as designed; increased cost but resulted in a much safer project



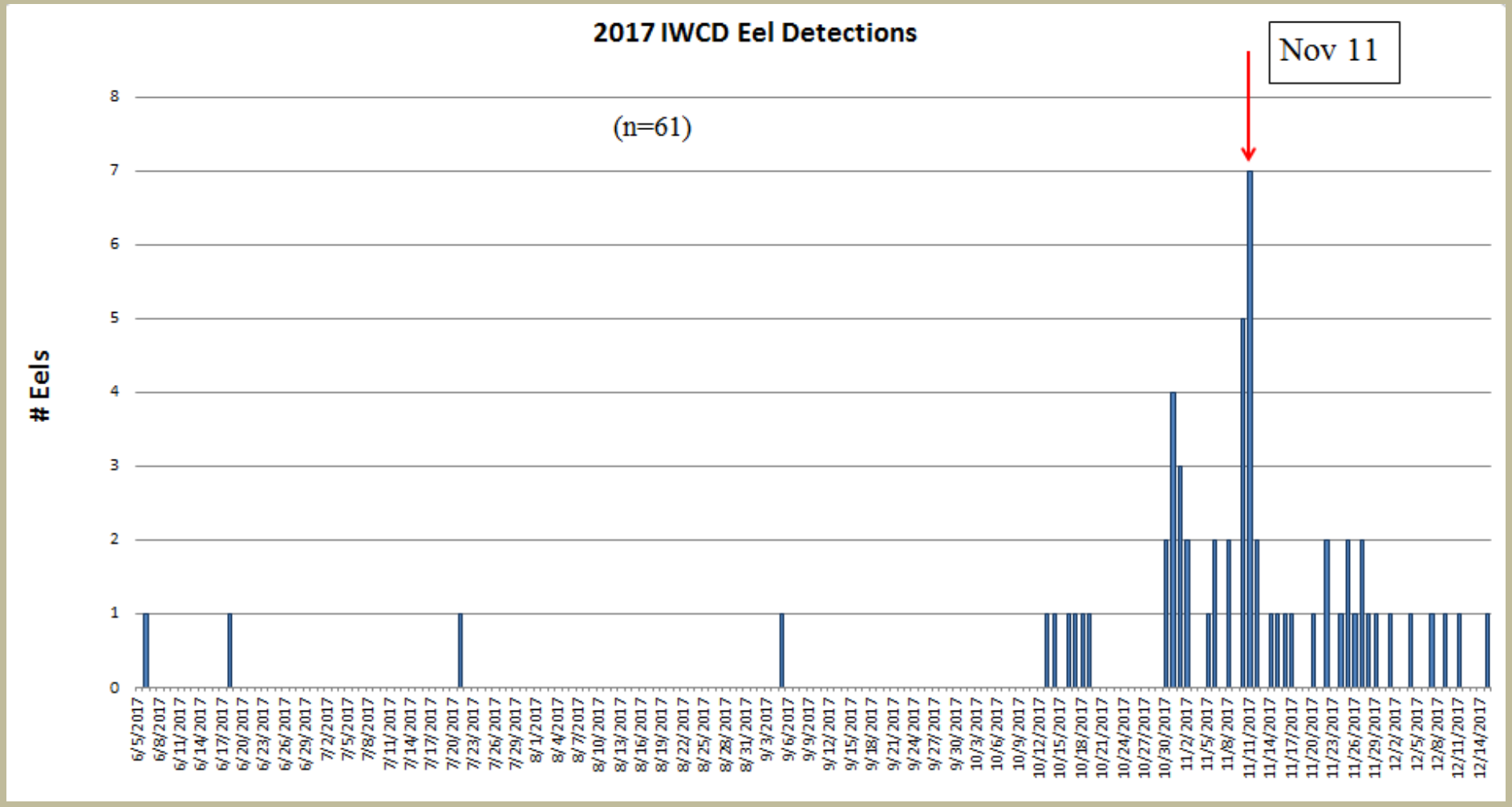

2017 Iroquois Water Control Dam Eel Tracking Study
Detection Count
0 - 1
2 - 8
9 - 16
17 - 22
23 - 29
Horizontal Position Error [HPE < 15.0]
St01
St02
St03
St04
St05
St06
St07
St08
St09
St10
St11
St12
St13
St14
St15
St16
St17
St18
St19
New York Field Office
nyfo.fws.gov
N
0
500
1,000
2,000 Feet

2017

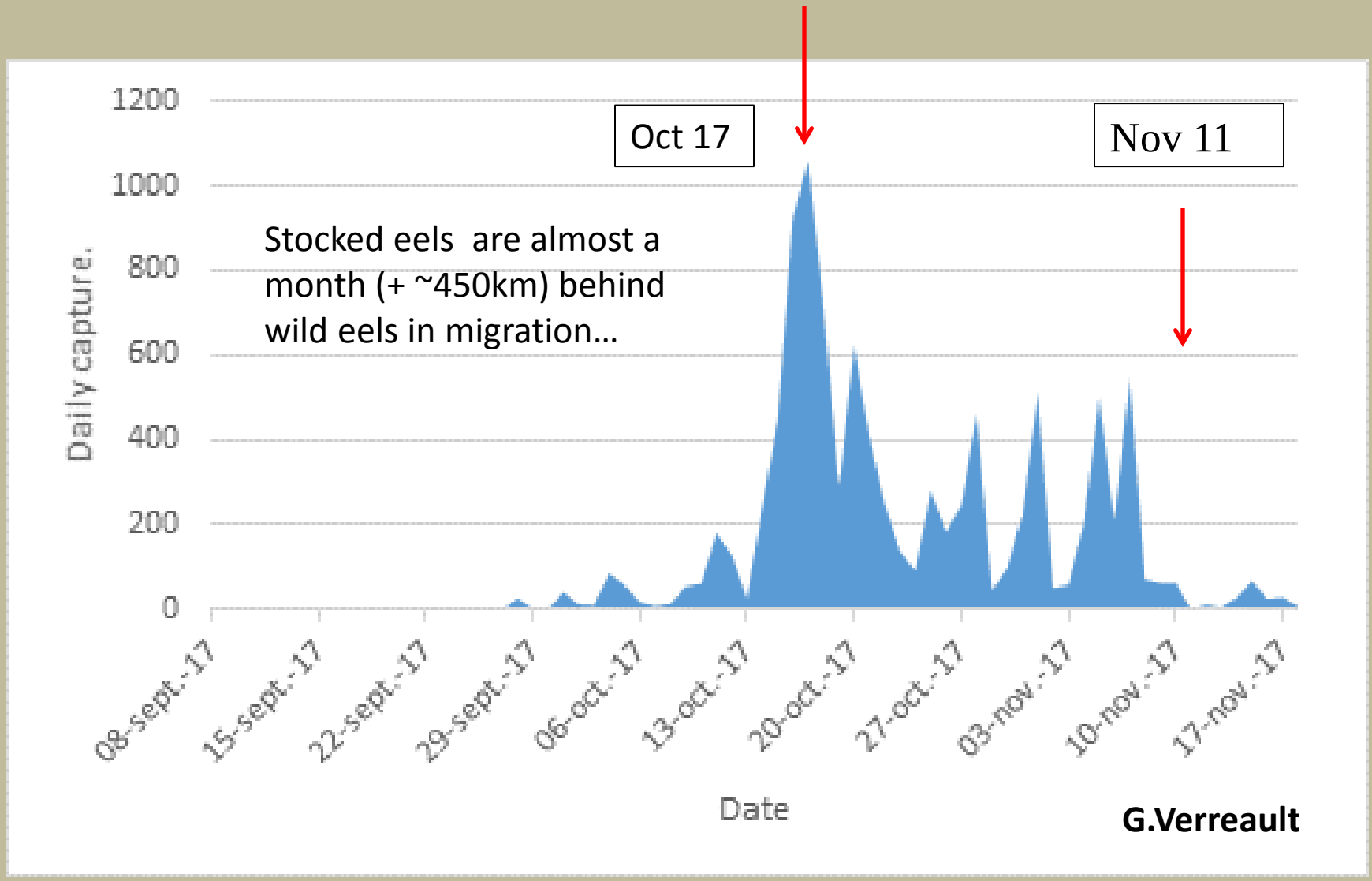

Lake St.
Lawrence
St.
Lawrence
River
VPS_2017_Alltags
VPS_2017_AlltagsKernel
≤1318172.498824
≤2586414.221176
≤3854655.943529
≤5122897.665882
≤6391139.388235
≤7659381.110588
≤8927622.832941
≤10195864.555294
≤11464106.277647
≤12732348
0 0.13 0.26 0.51 Kilometers


2017 - Timing of Migration
Quebec weir fishery
- long-term dataset
Beauharnois Generating Station
Bay of Quinte
Moses-Saunders Power Dam
Iroquois Water Control Dam
NYFO
N
0 75 150 300
Miles

2017 Iroquois WCD



2017 StLR Estuary Weir Fishery



What did we learn….

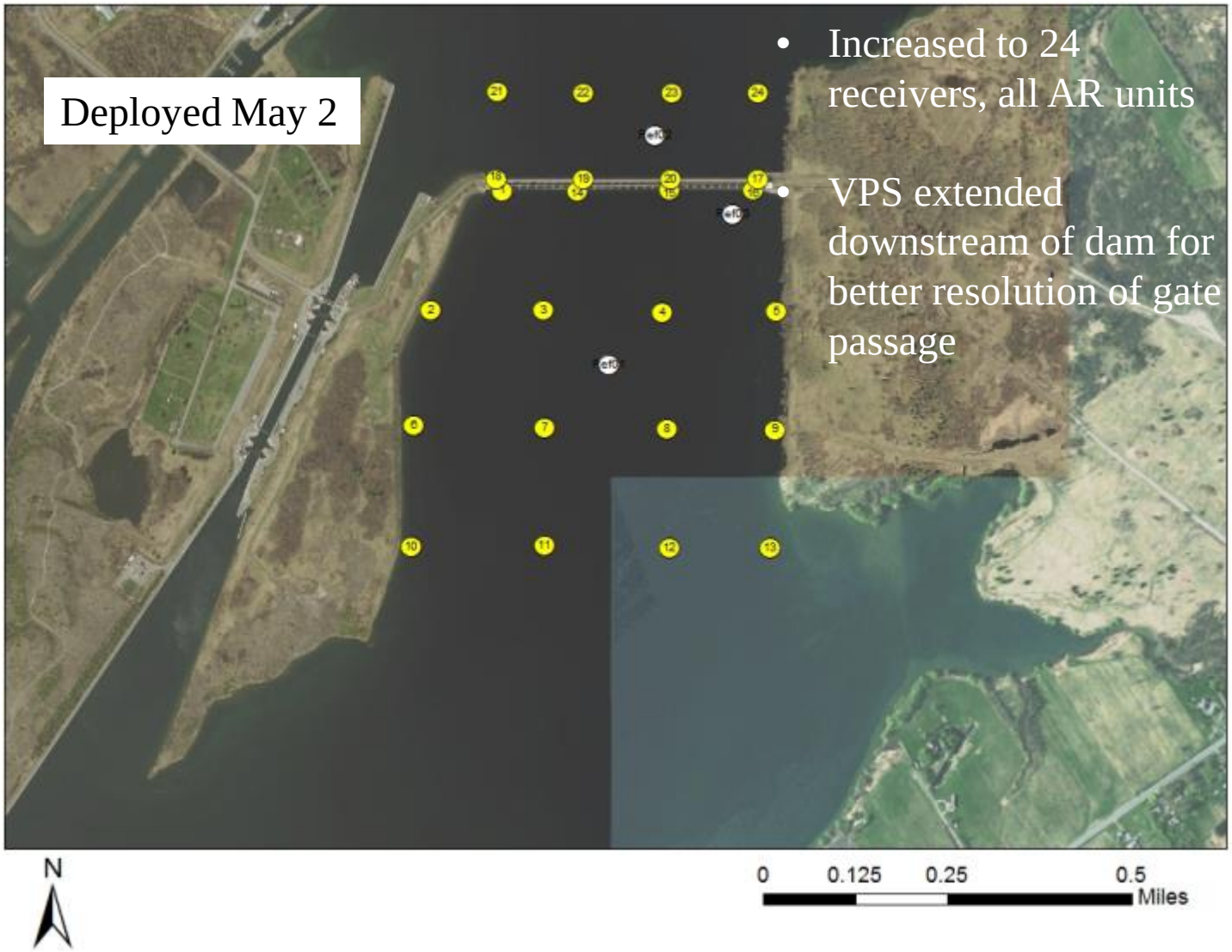
- Survival rate post-tagging has been high (5 morts/191 eels)
- Large yellow eels implanted with acoustic tags migrate out of the Bay of Quinte towards the estuary of the St. Lawrence River
  - 49% of eels tagged in 2017 were detected passing Iroquois Dam in the same year as tagged
  - 4 were detected as far downstream as the Cabot Strait line (~1,600km)
- Most (98%) eels moved past Iroquois during the dark
- Movements of eels past both IWCD/Beauharnois Dam were delayed, with peaks being almost 1 month after peak in downstream wild eel fishery
- Eels were successfully tracked with VEMCO VPS, including 2-D fine-scale positioning (some 3-D) as they approached Iroquois Dam

Where are we headed…

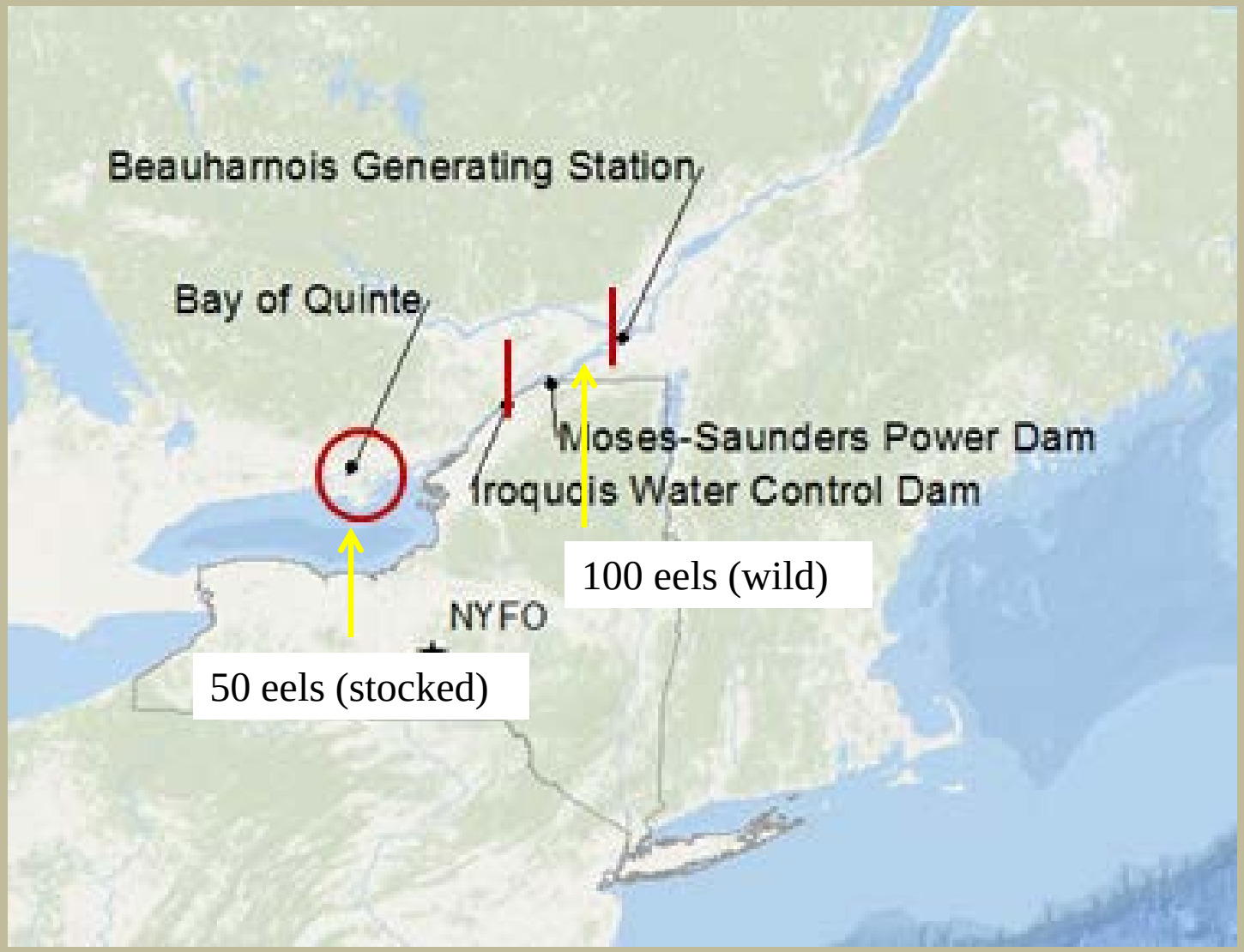
2018…study is underway….

- 3 arrays were installed – BQ, IWCD, BC
- 150 fish tagged via multi-agency tagging effort;
  - VEMCO V13, 40 sec ping rate
- Source fish for tagging was modified
  - BQ and Lac St. Francis
  - All fish supplied by OPG – T & T Program
- Receivers scheduled to be retrieved in Dec

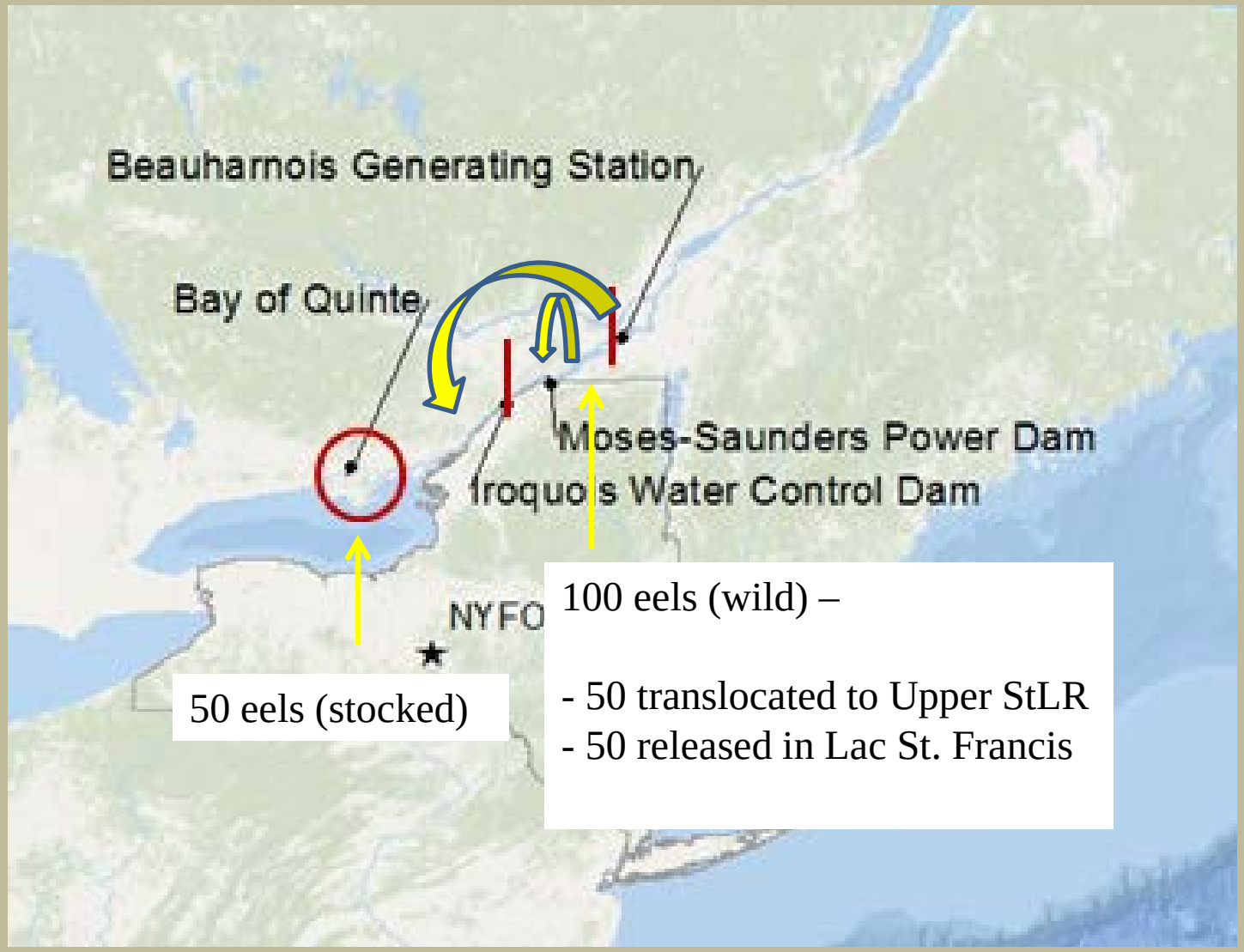
2018 IWCD


Deployed May 2
• Increased to 24 receivers, all AR units
• VPS extended downstream of dam for better resolution of gate passage
N
0
0.125
0.25
0.5
Miles

2018 Eel Tagging



2018 Eel Tagging




?
Scott_Schlueter@fws.gov
607-753-9334
D.Stanley