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Case Studies VI: Dynamics of the 2015 Spawning Migration of American Shad (Alosa sapidissima) in the Connecticut River

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Dynamics of the 2015 spawning migration of American shad (Alosa sapidissima) in the Connecticut River

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NOAA FISHERIES

Northeast Fisheries Science Center

Fish Passage Conference 2016

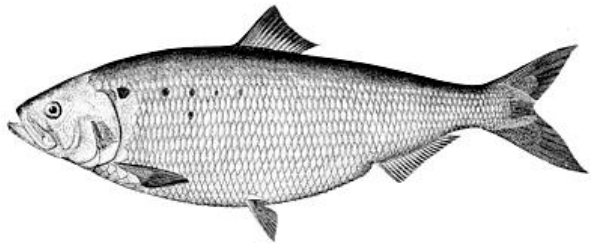
June 22, 2016

1. National Marine Fisheries Service, Northeast Fisheries Science Center, Population Biology Branch

2. Integrated Statistics

American shad (*Alosa sapidissima*)

- Range from Canada to the St. Johns River, Florida
- Home to natal river to spawn
- Latitudinal variability in parity:
  - St. Johns River, FL: 0%
  - York River: 23%
  - Connecticut River: 38%
  - St. John River, NB: 73%



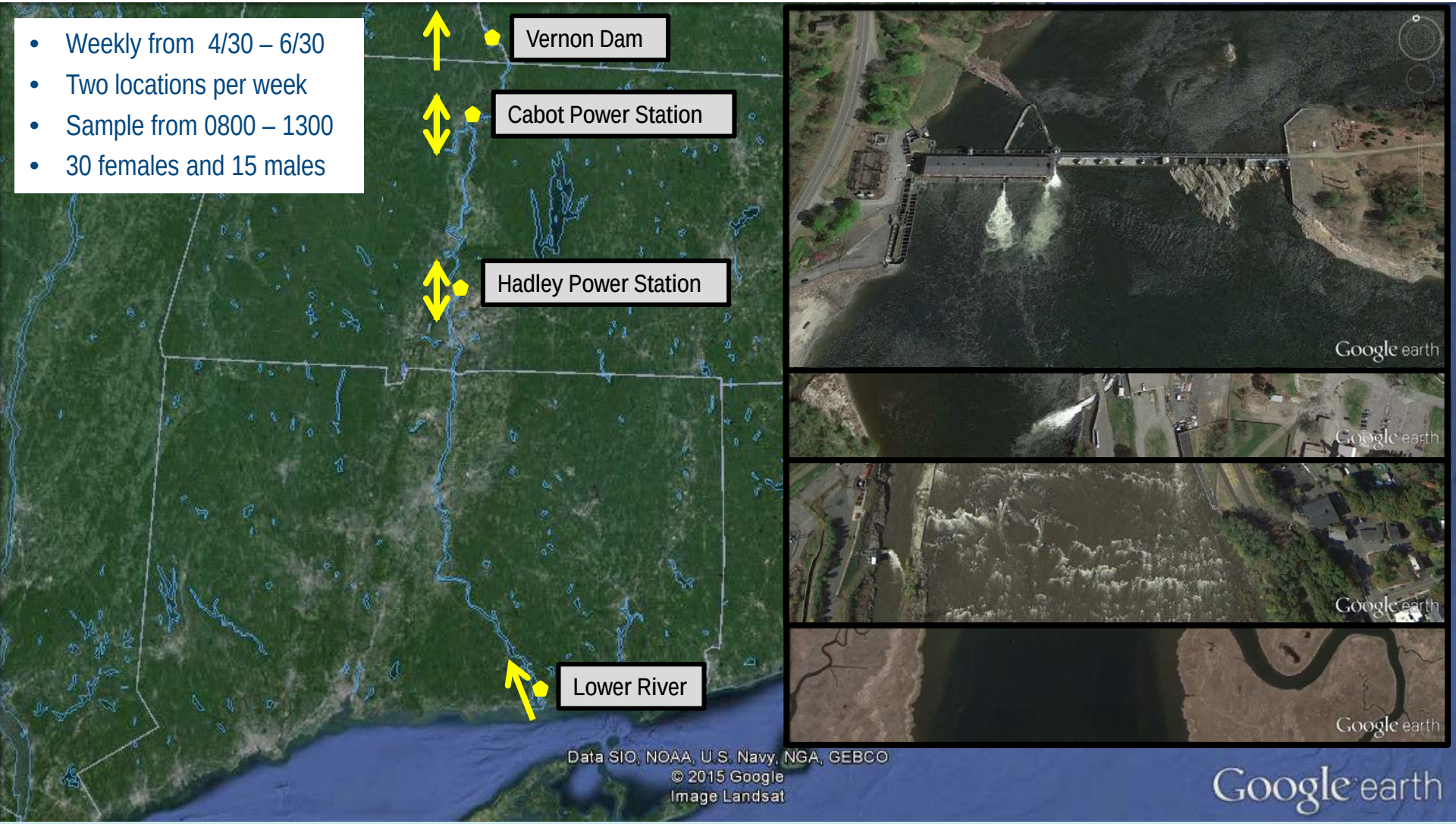
Project Scope & Methods

- Major goals
  - Estimate & compare annual fecundity
  - Estimate spawning rates and batch fecundity
  - Estimate ages and parity (virgin/repeat)
  - Estimate condition

- Aging and fecundity workup
  - Aging
    - Scales by CT-DEEP (Jacque Benway)
    - Otoliths by MA-DMF (Scott Elzey)
  - Reproductive biology
    - Ovary histology (Mass Histology, E. Towle)
    - Oocyte size distribution (E. Towle)
    - Fecundity (E. Towle)
  - Condition by USGS (Steve McCormick)

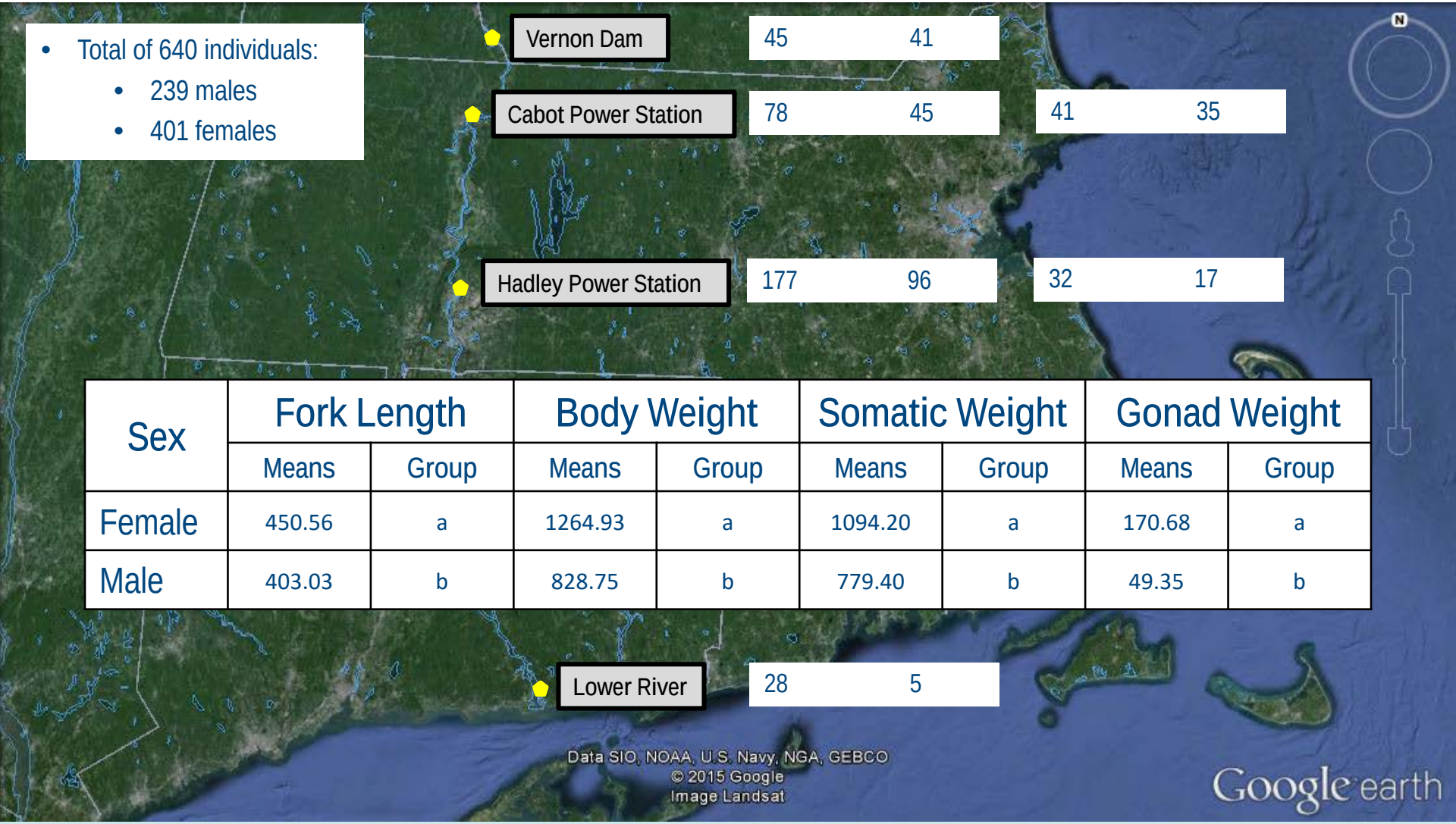
Sampling Protocol & Locations

- Weekly from 4/30 – 6/30
- Two locations per week
- Sample from 0800 – 1300
- 30 females and 15 males



Fish Collected

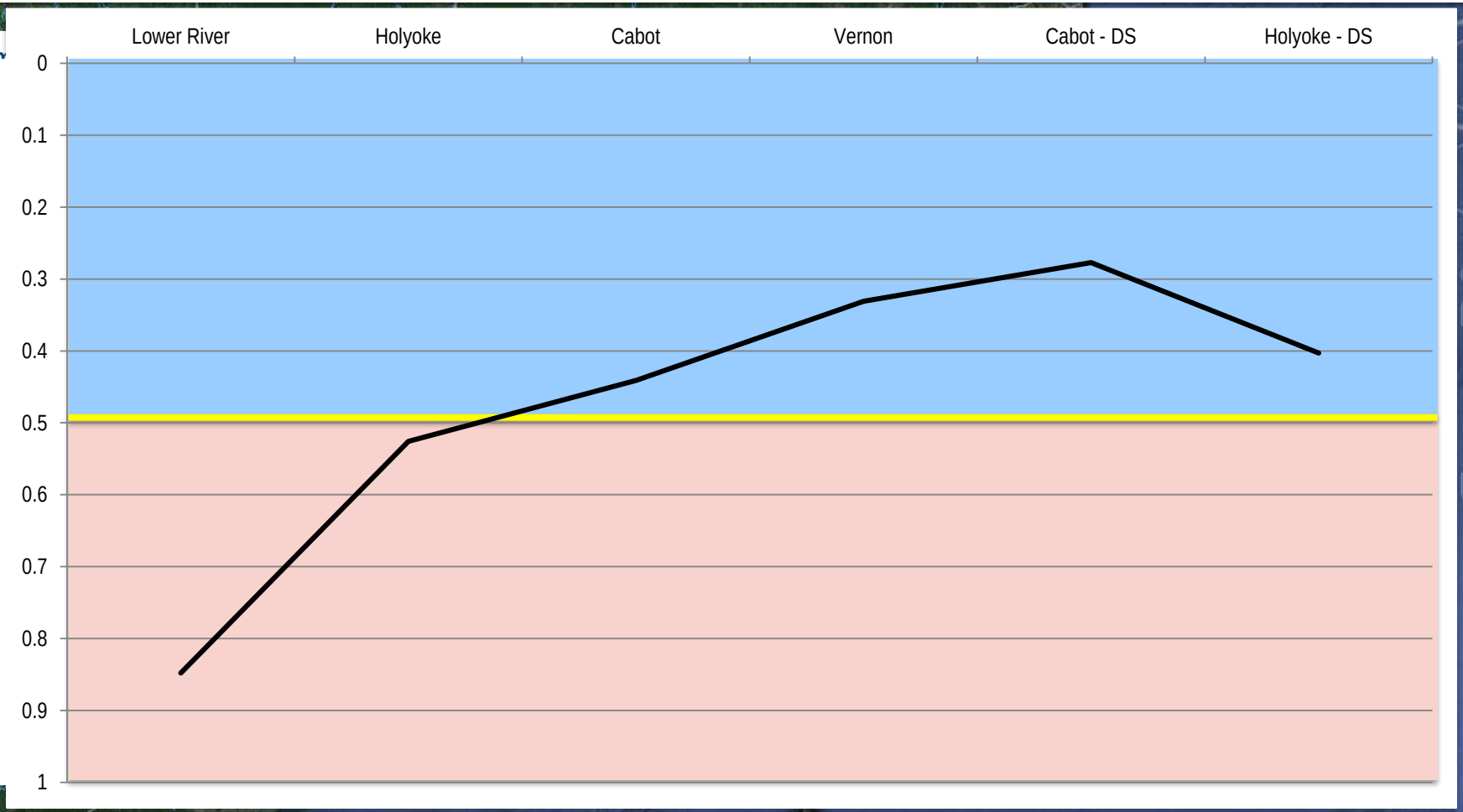
- Total of 640 individuals:
  - 239 males
  - 401 females



Sex	Fork Length		Body Weight		Somatic Weight		Gonad Weight	
	Means	Group	Means	Group	Means	Group	Means	Group
Female	450.56	a	1264.93	a	1094.20	a	170.68	a
Male	403.03	b	828.75	b	779.40	b	49.35	b

Sex Ratio

Females Males Sex Ratio



Data SIO, NOAA, U.S. Navy, NGA, GEBCO
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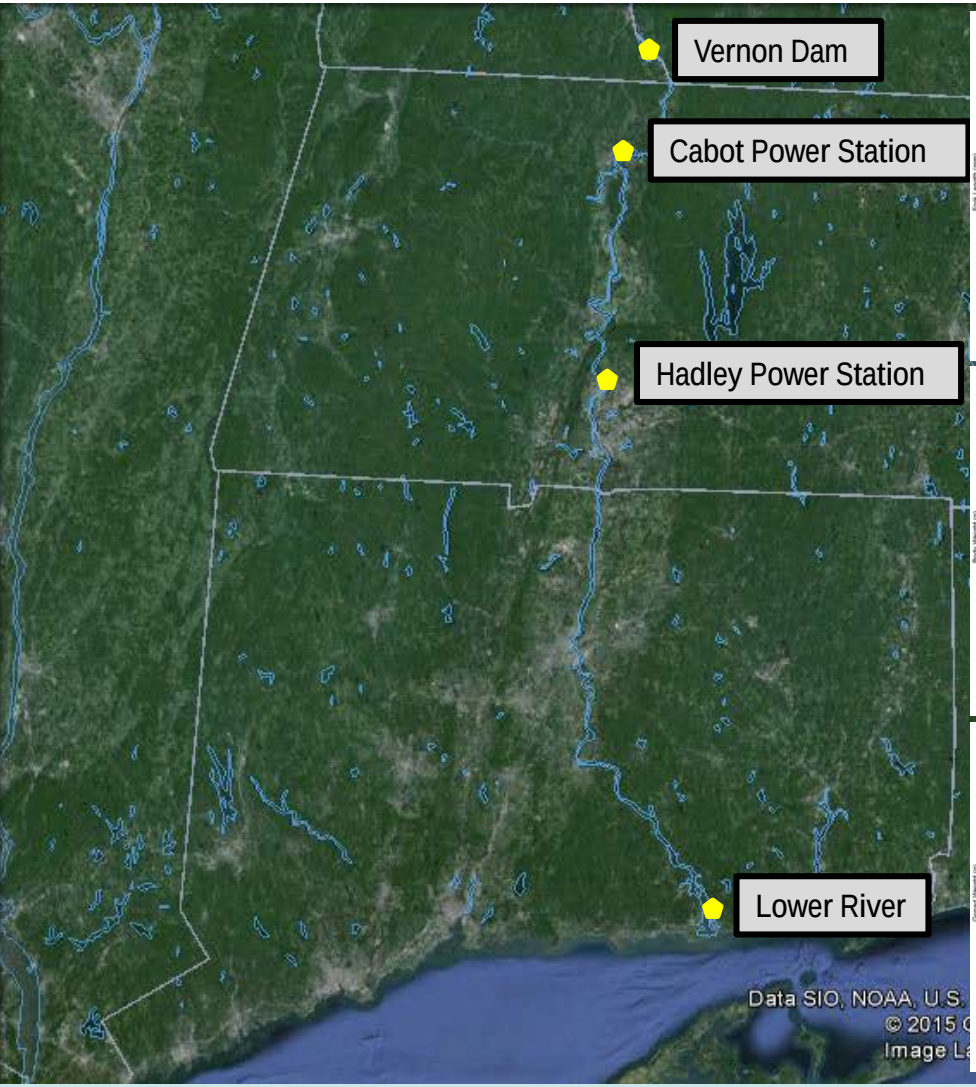
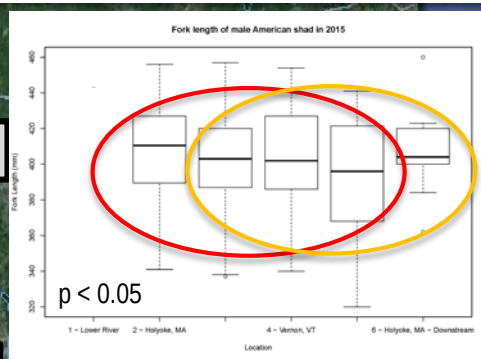
Image Landsat

Google earth

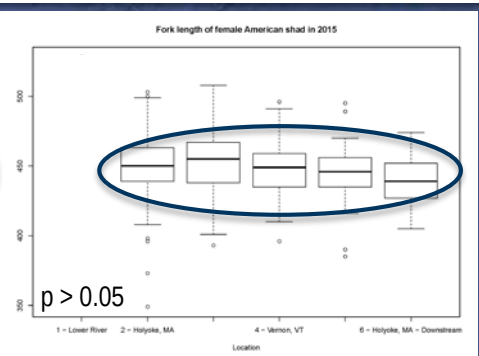
Size Distribution

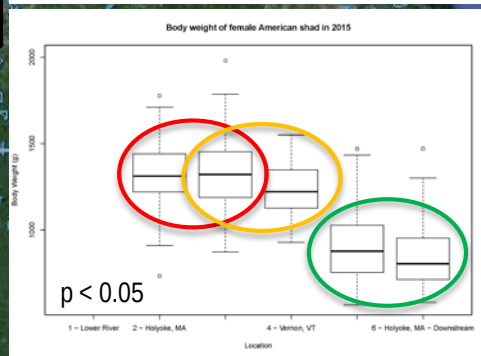


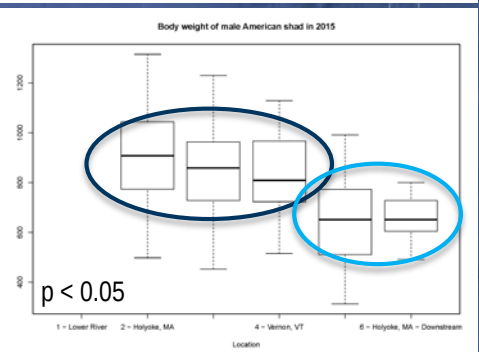
Females

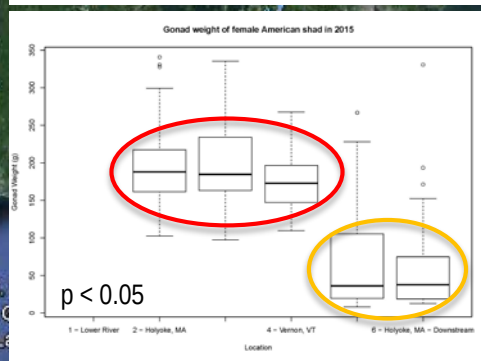


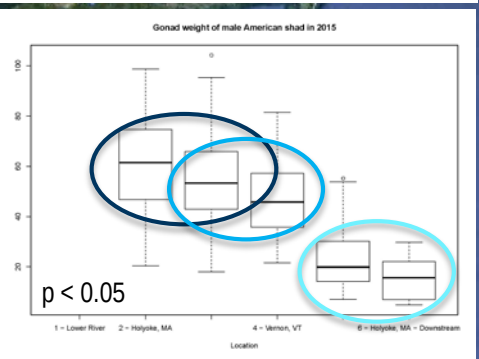
Males











Otolith-Derived Ages

*No significant difference in age between locations or time

Vernon Dam

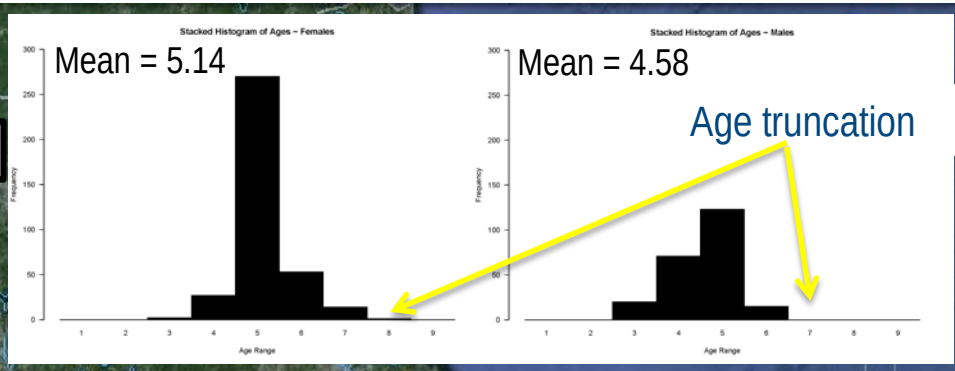
Cabot Power Station

Hadley Power Station

Lower River

Females

Males



Mean age-at-maturity (Leggett & Carscadden 1978):

Females: 4.8

Males: 4.1

Data SIO, NOAA, U.S. Navy, NGA, GEBCO
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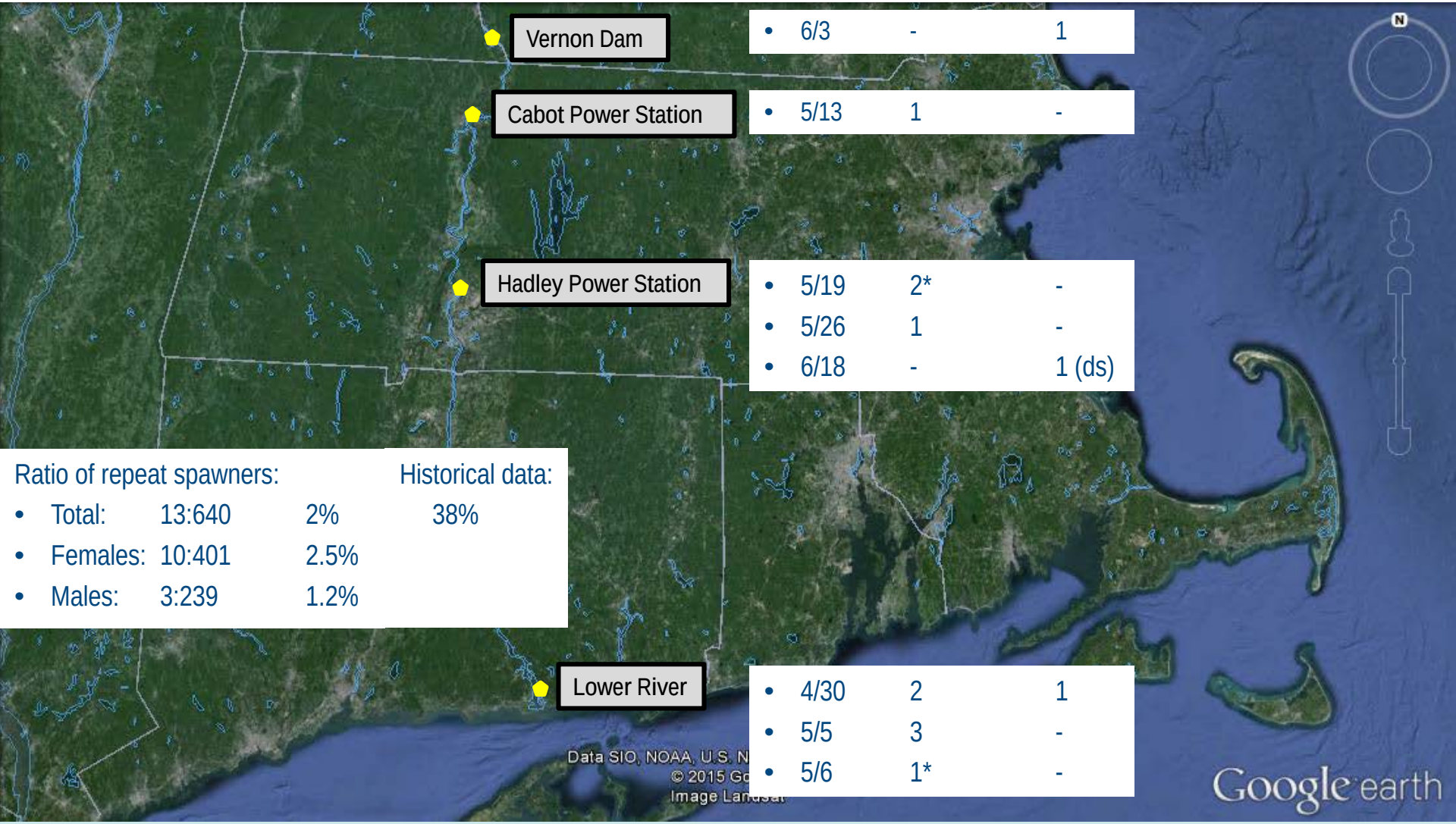
Repeat Spawners

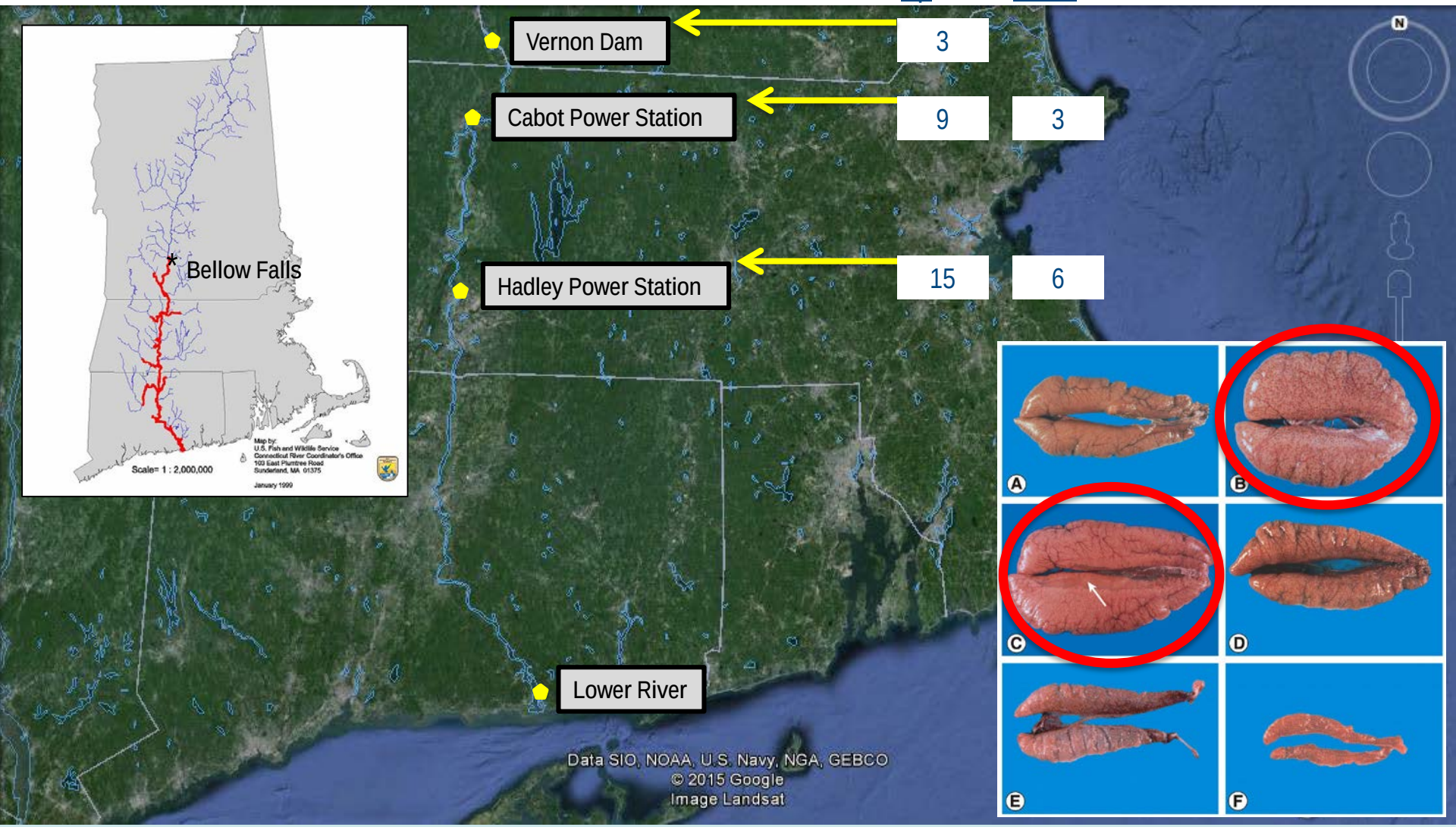


	Females	Males
• 6/3	-	1
• 5/13	1	-
• 5/19	2*	-
• 5/26	1	-
• 6/18	-	1 (ds)
• 4/30	2	1
• 5/5	3	-
• 5/6	1*	-

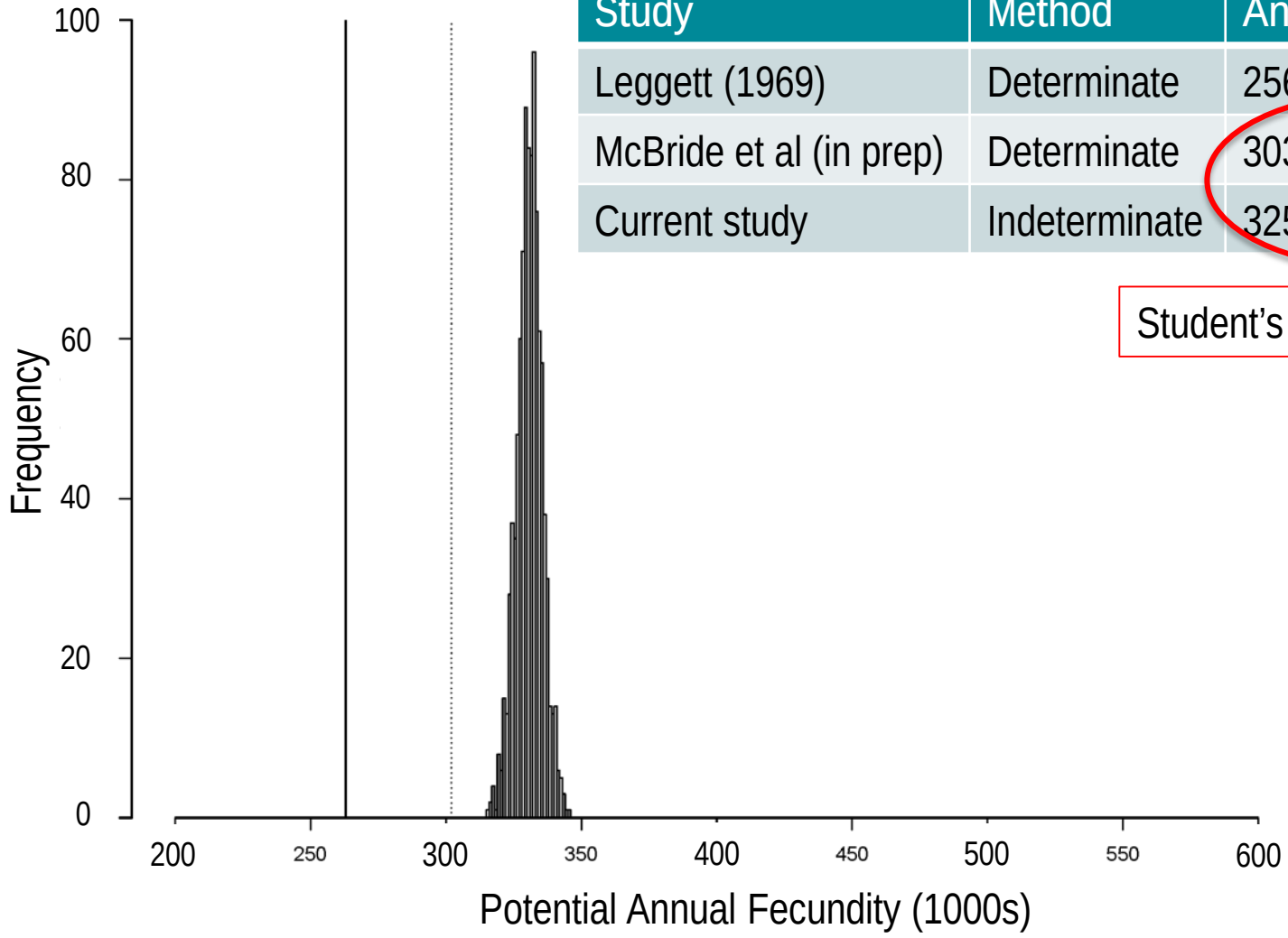
Ratio of repeat spawners:

			Historical data:
• Total:	13:640	2%	38%
• Females:	10:401	2.5%	
• Males:	3:239	1.2%	

Actively Spawning Females



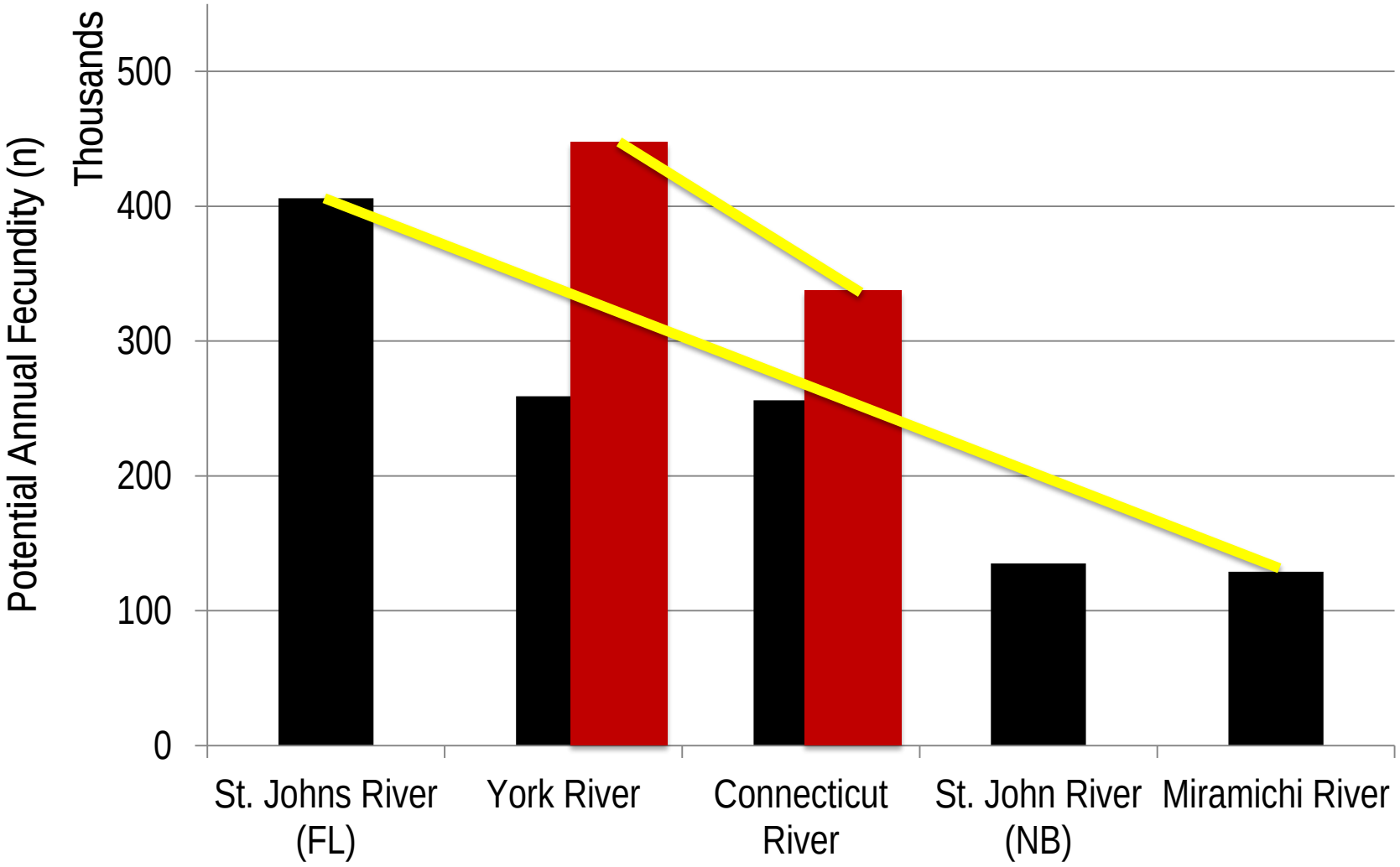
Connecticut River PAFs

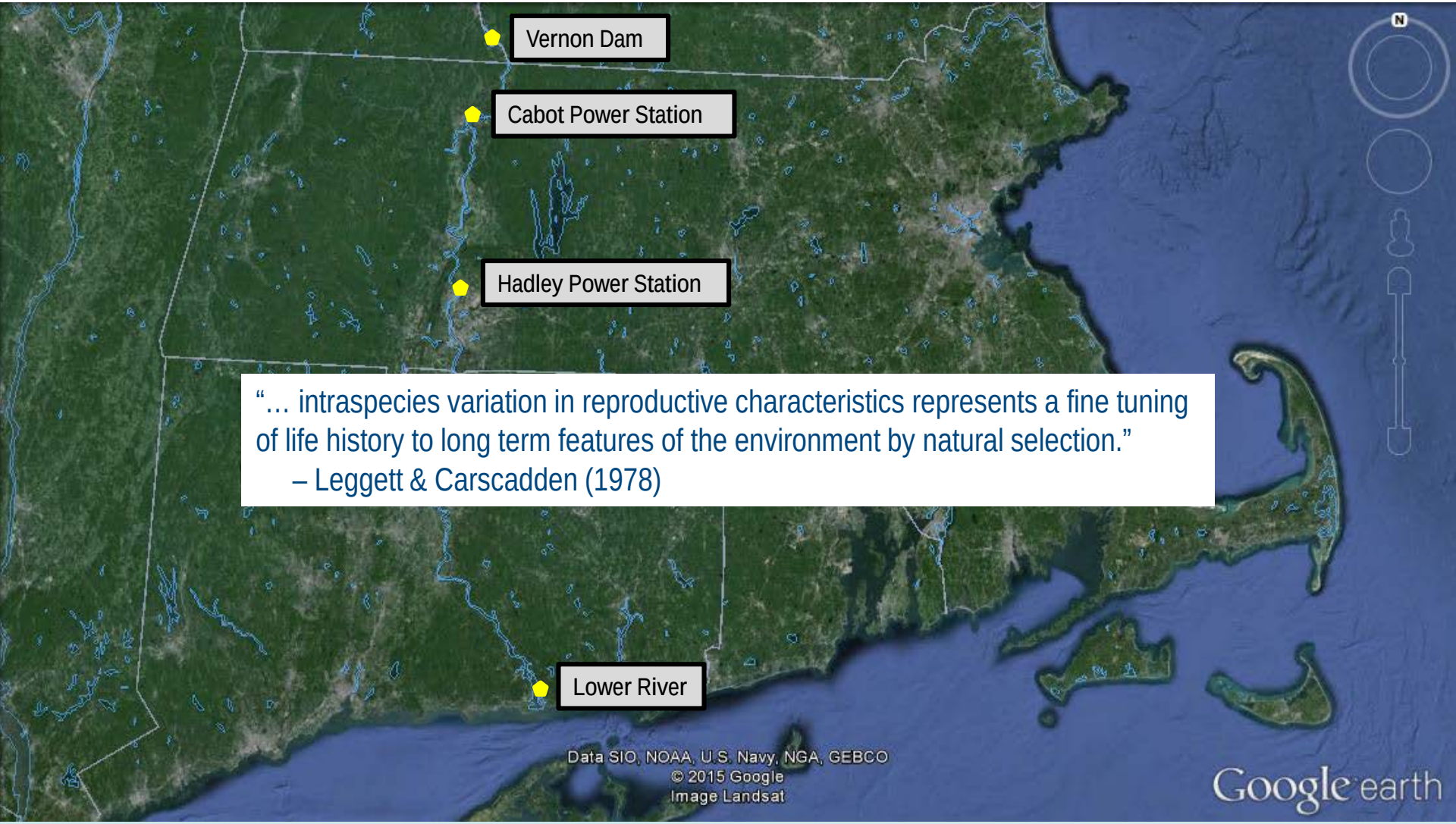


Study	Method	Annual Fecundity
Leggett (1969)	Determinate	256,000
McBride et al (in prep)	Determinate	303,000 ± 73,400
Current study	Indeterminate	325,100 ± 11,300

Student's t-test, $P > 0.05$

Annual Fecundity Estimates





"… intraspecies variation in reproductive characteristics represents a fine tuning of life history to long term features of the environment by natural selection."
– Leggett & Carscadden (1978)

Acknowledgements

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  - Steve McCormick
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