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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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Fish Passage Conference 2016

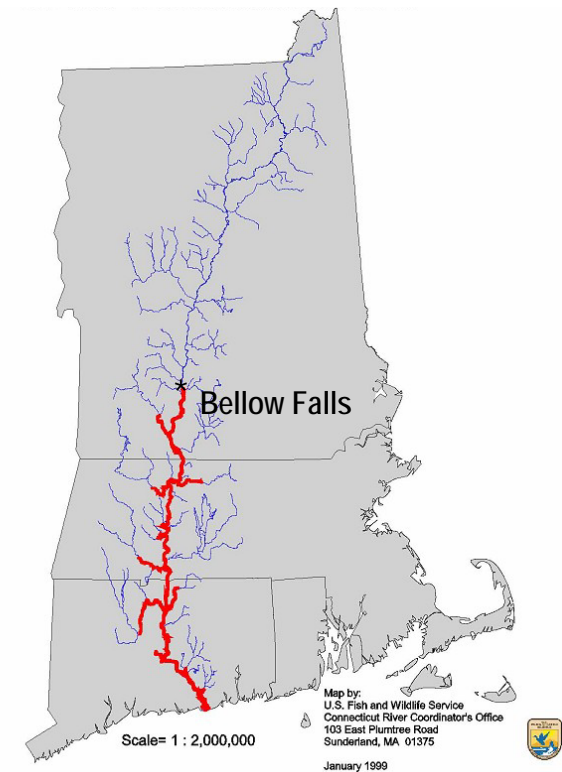
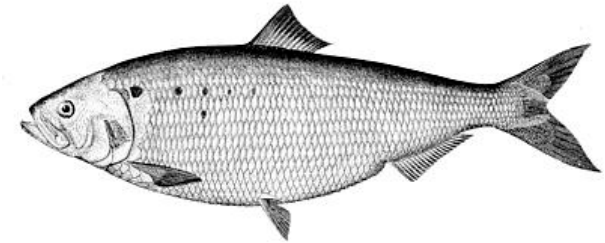
June 22, 2016

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%



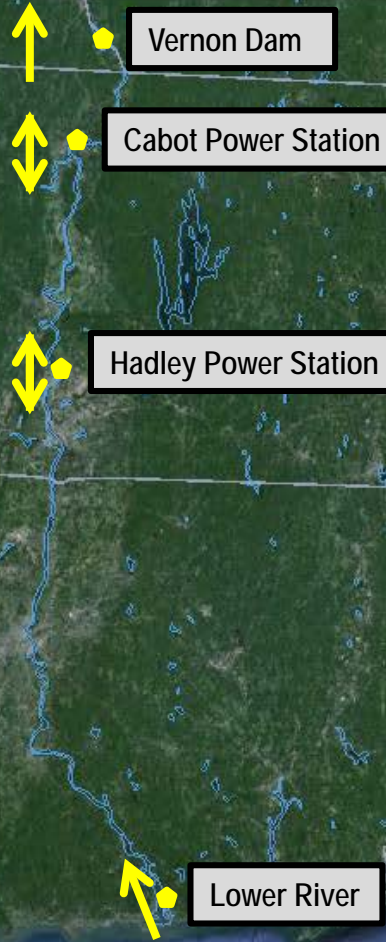
# Project Scope & Methods

- 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



Data SIO, NOAA, U.S. Navy, NGA, GEBCO  
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# Fish Collected

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

Females      Males

Vernon Dam

45

41

Cabot Power Station

78

45

41

35

Hadley Power Station

177

96

32

17

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

Lower River

28

5

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# Sex Ratio

Females

Males

Sex Ratio

Lower River

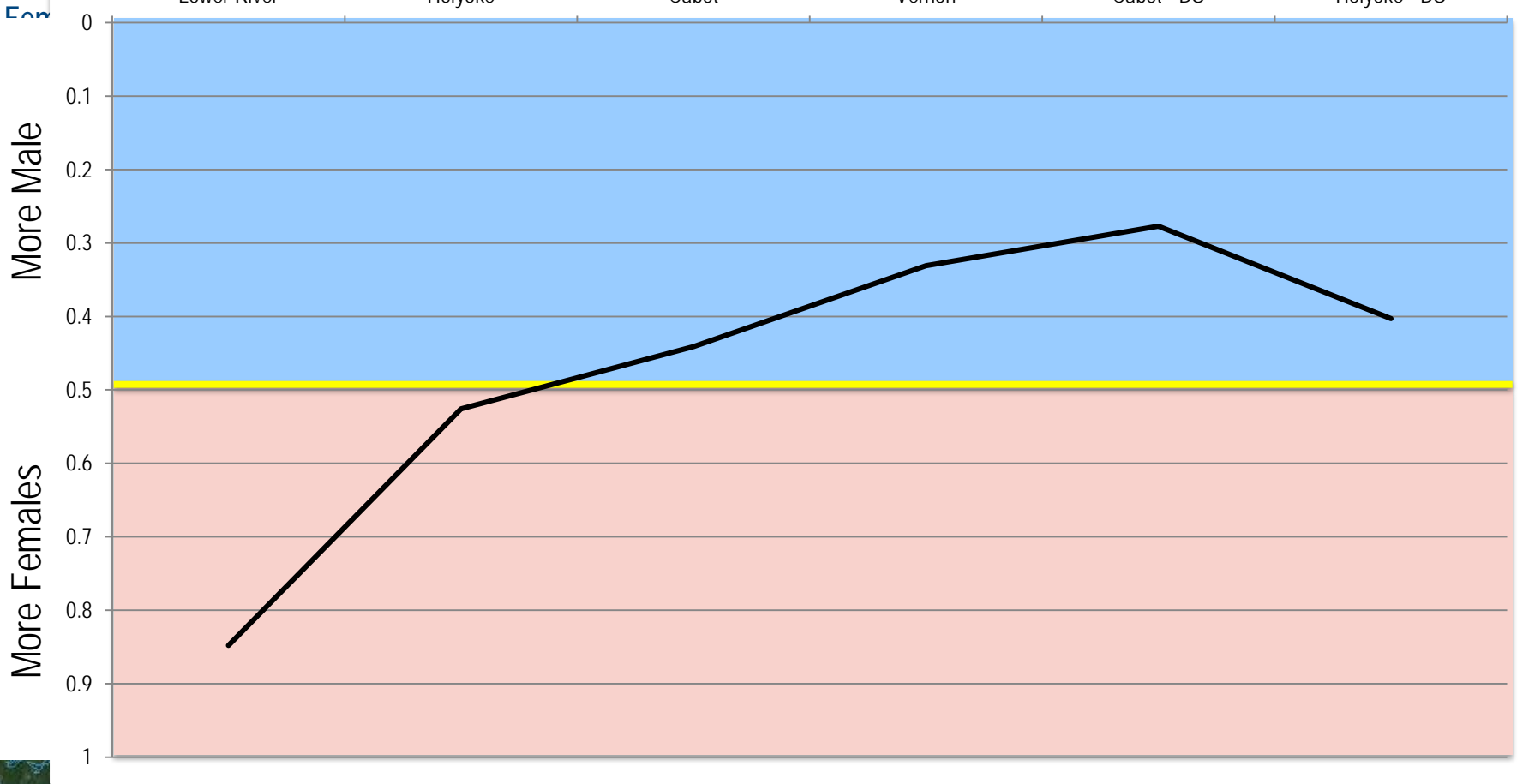
Holyoke

Cabot

Vernon

Cabot - DS

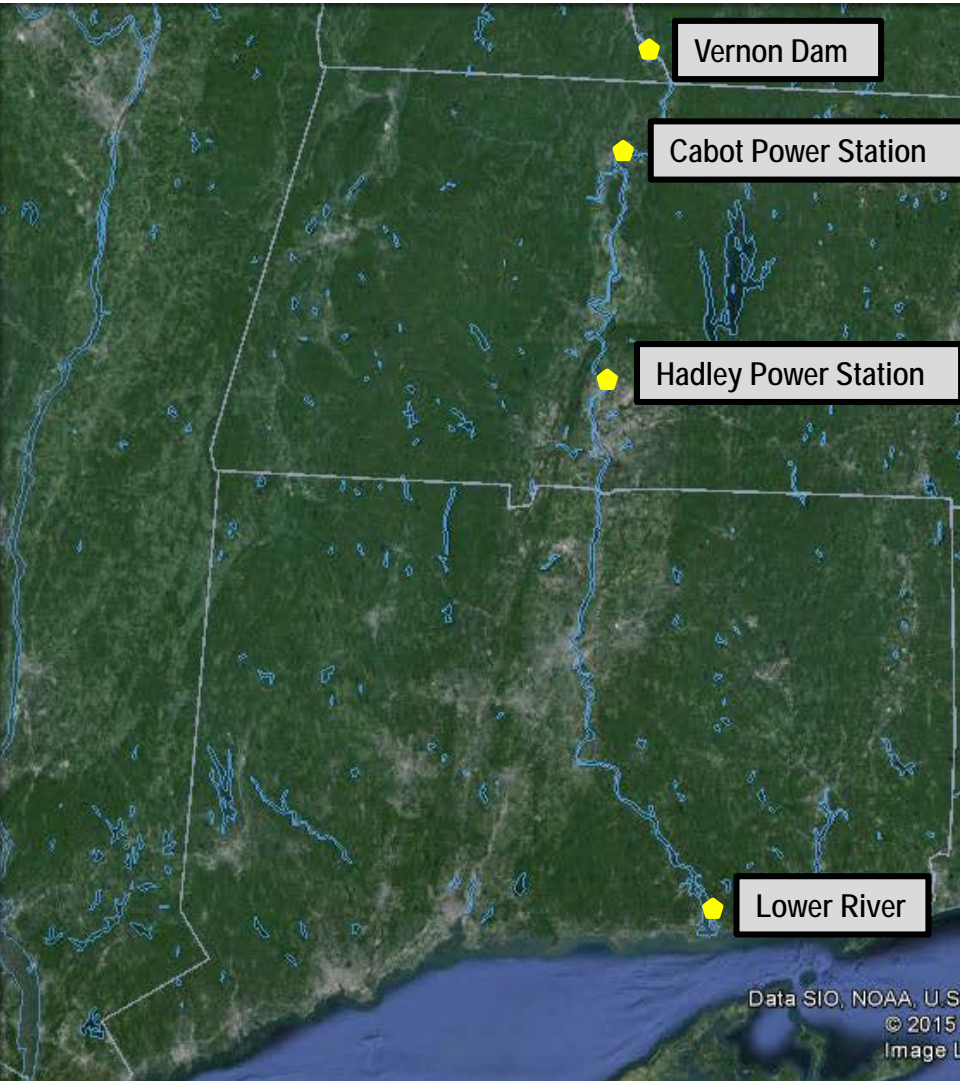
Holyoke - DS



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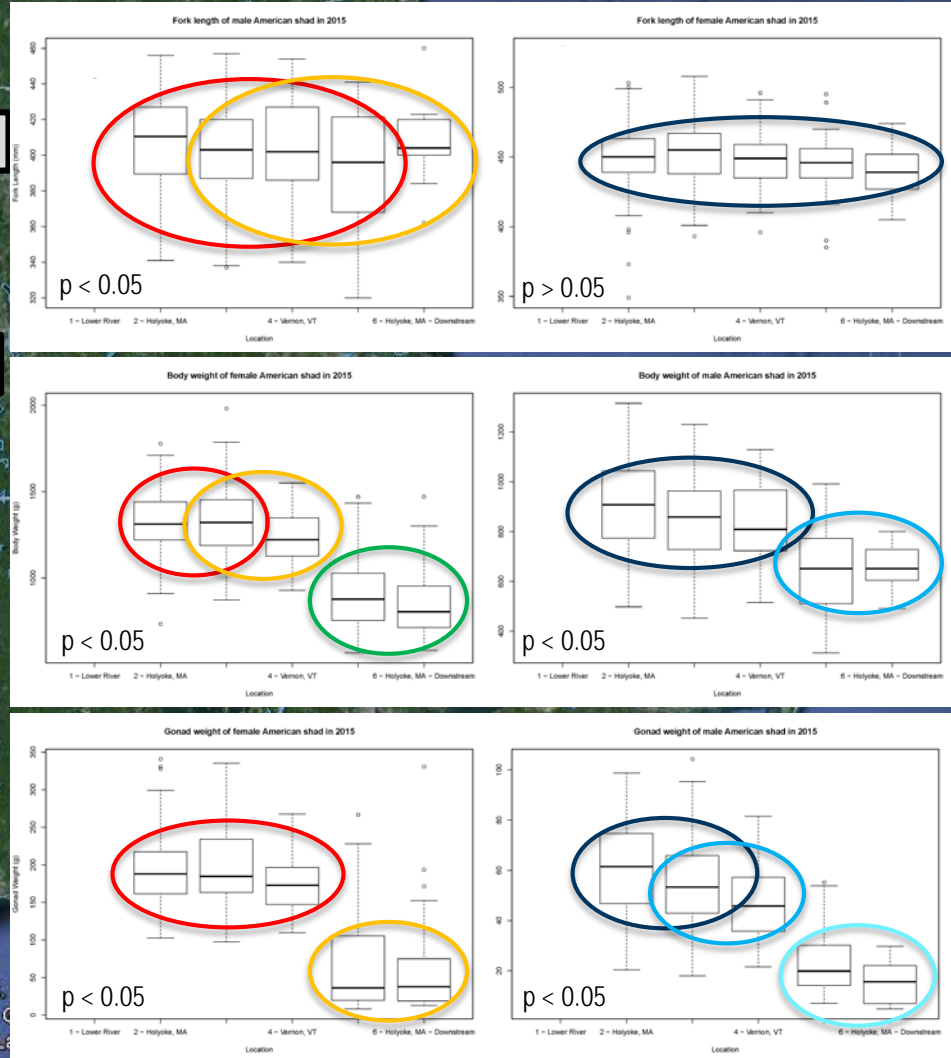
# Size Distribution



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## Females

## Males

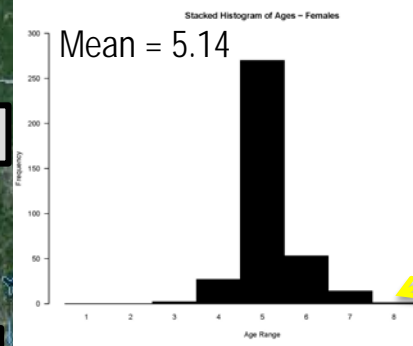


# Otolith-Derived Ages

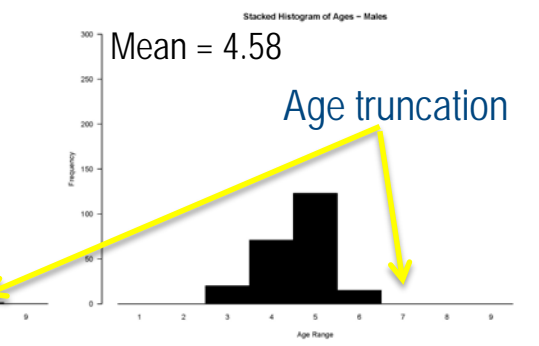
\*No significant difference in age between locations or time



## Females



## Males



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

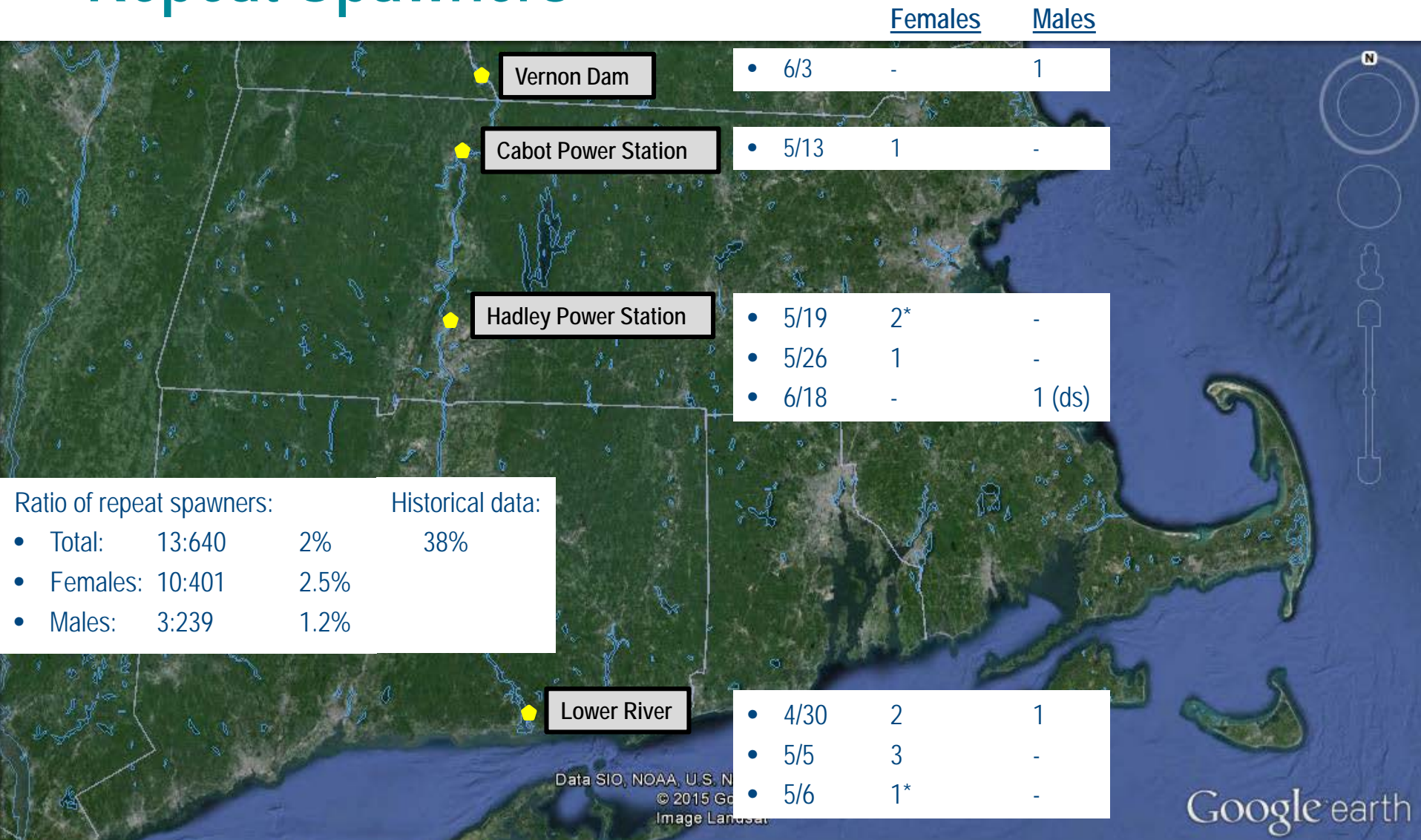
Females: 4.8

Males: 4.1

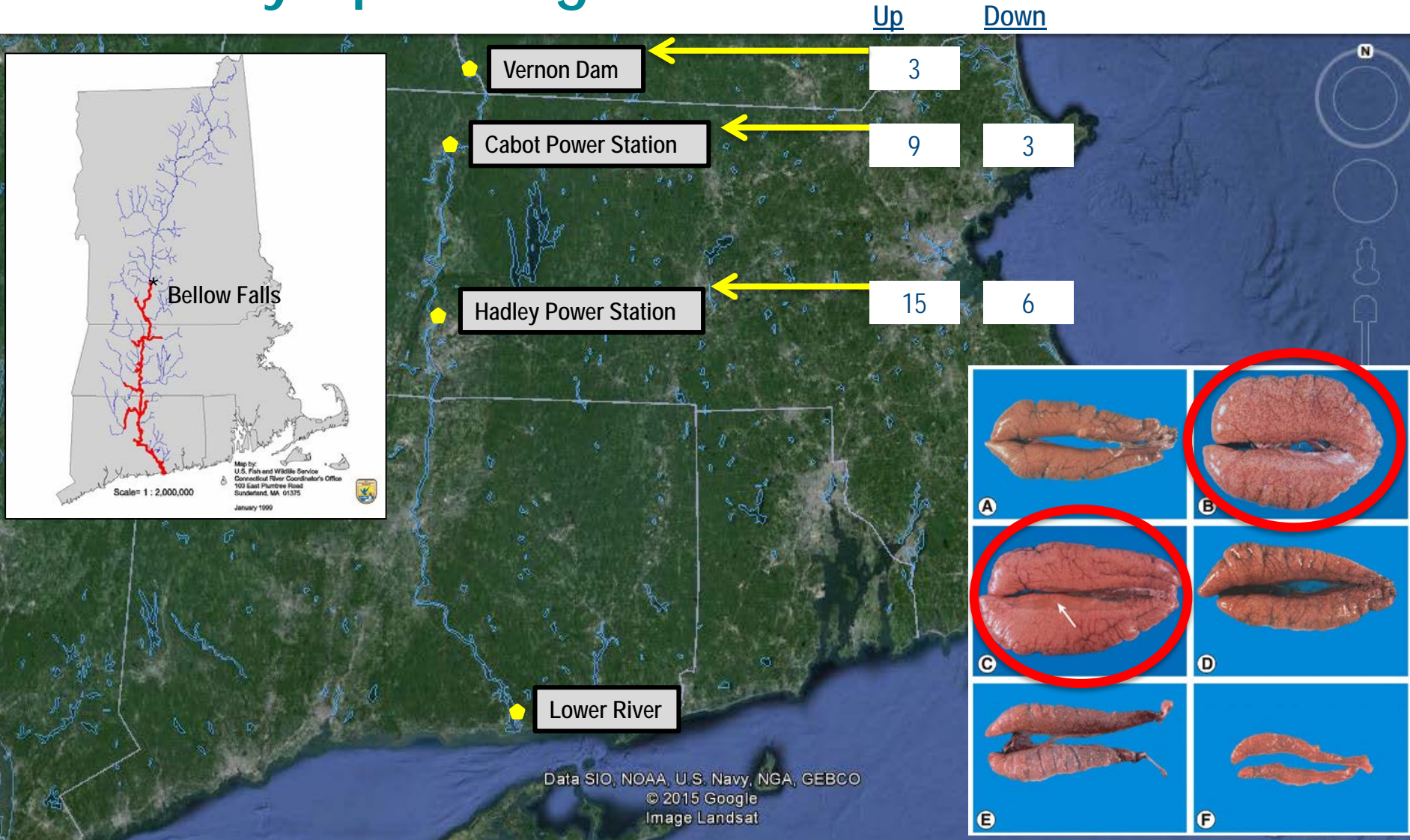
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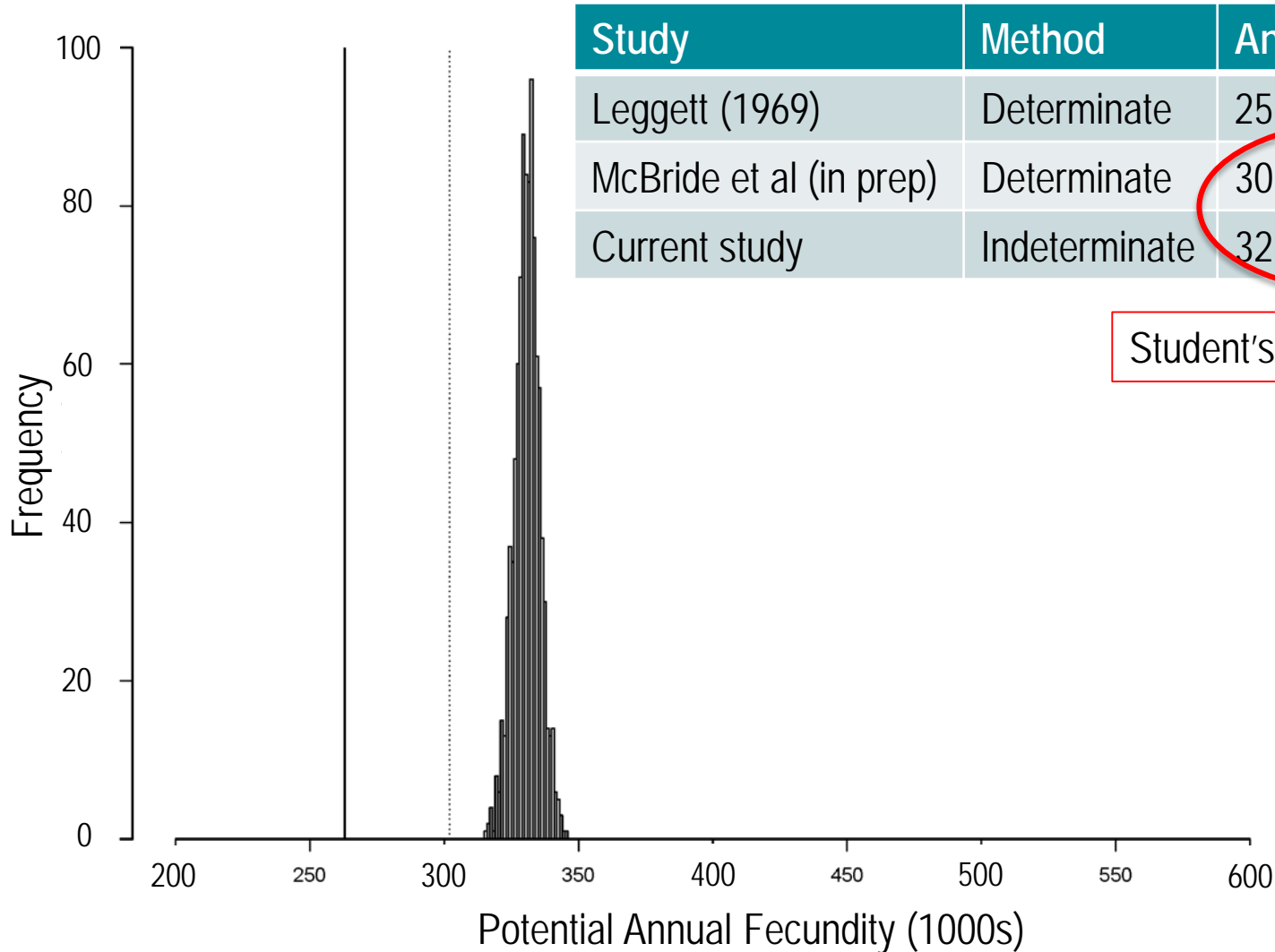
# Repeat Spawners



# Actively Spawning Females



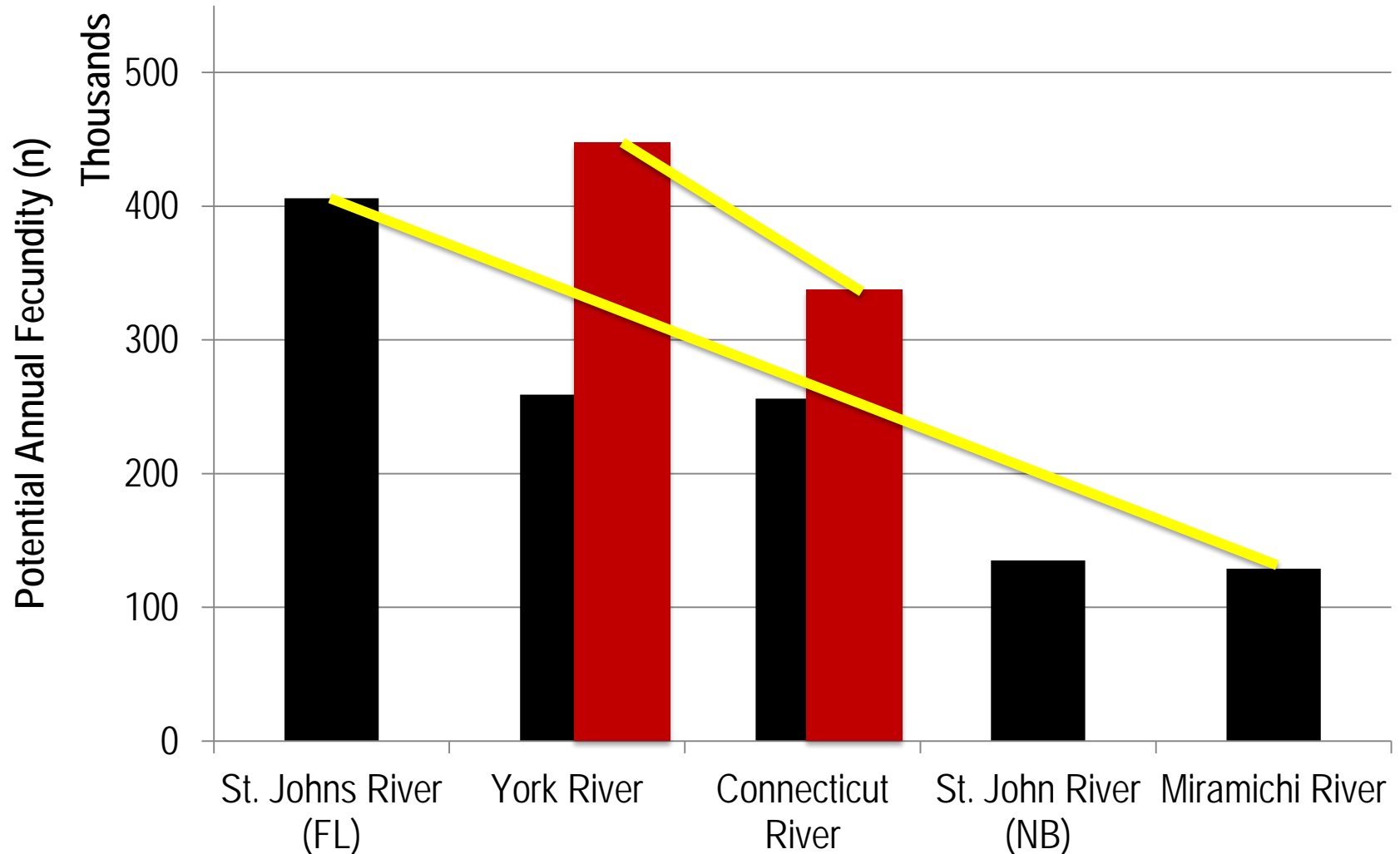
# Connecticut River PAFs

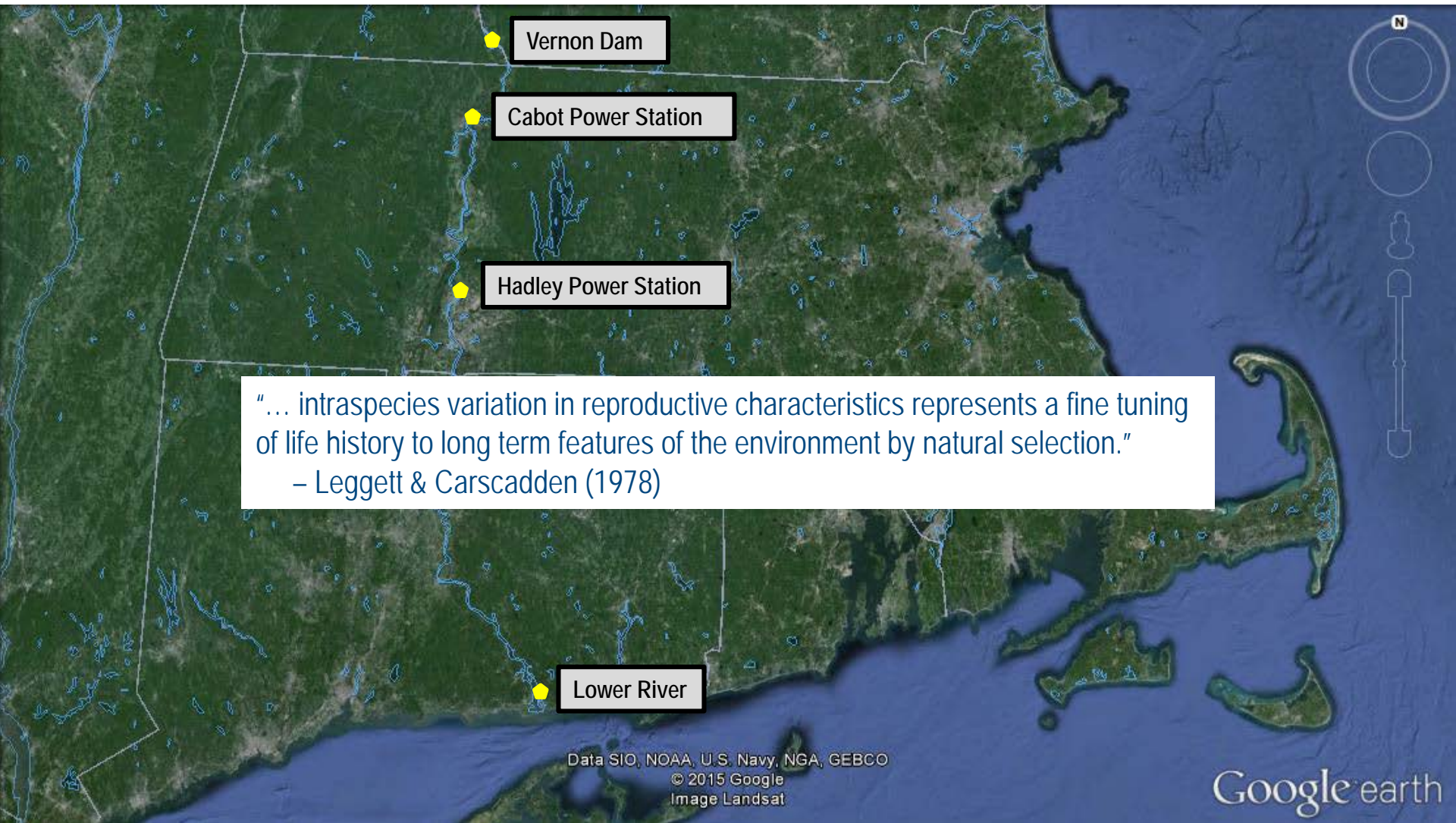


Study	Method	Annual Fecundity
Leggett (1969)	Determinate	256,000
McBride et al (in prep)	Determinate	303,000 ± 73,400
Current study	Indeterminate	325,100 ± 11,300

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)

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# Acknowledgements

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  - Robert Johnston
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  - Ken Sprankle
- **CT DEEP**
  - Tom Savoy
  - Jacque Benway
- **MA DMF**
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  - Jennifer Griffin
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