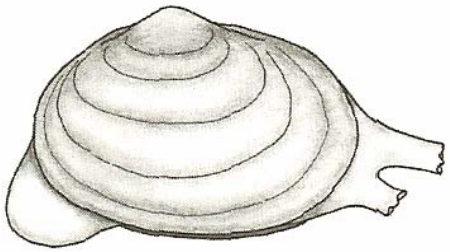
# Density and distribution of *Amblema neislerii*, Apalachicola River, Florida

- **Mussel biology and ecology**
- **Sampling for mussels**
- **Background on *A. neislerii***
- **Abundance & distribution (2007 Survey)**
- **Mussel monitoring plan**

# Unionidae: Freshwater Mussels

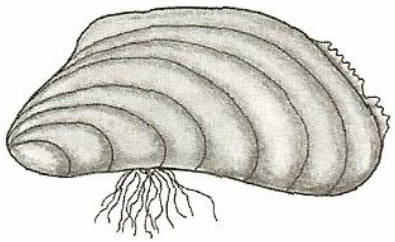
‘Clam’



**Burrows, no byssal threads**

**Asian clam, *Corbicula fluminea***

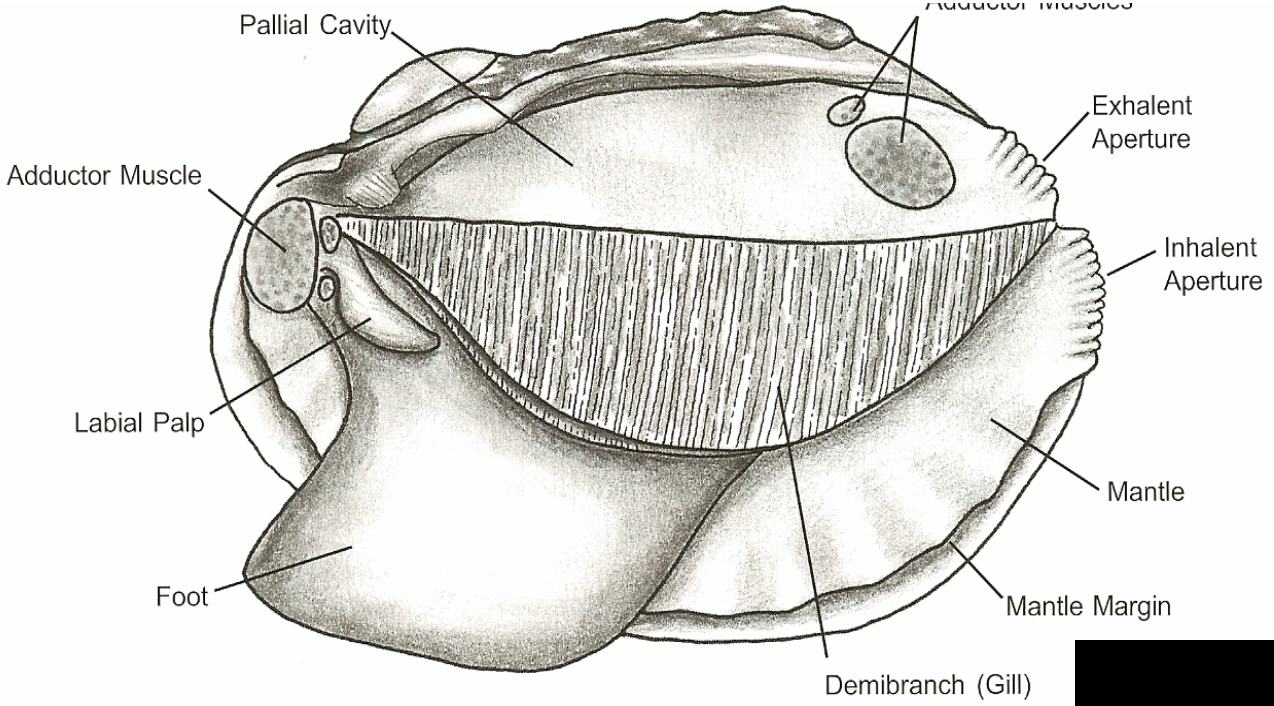
‘Mussel’

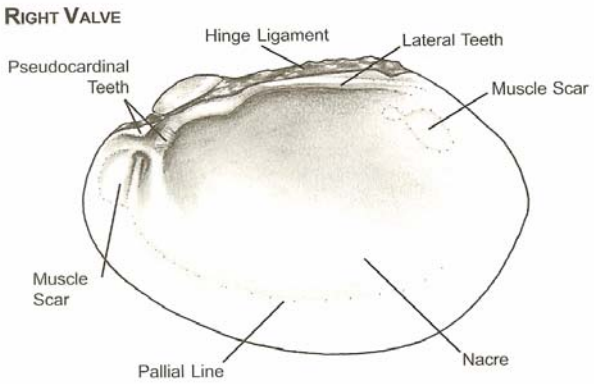


**Attached, one or More byssal threads**

***Amblema neislerii*, the fat Threeridge mussel (Endangered)**

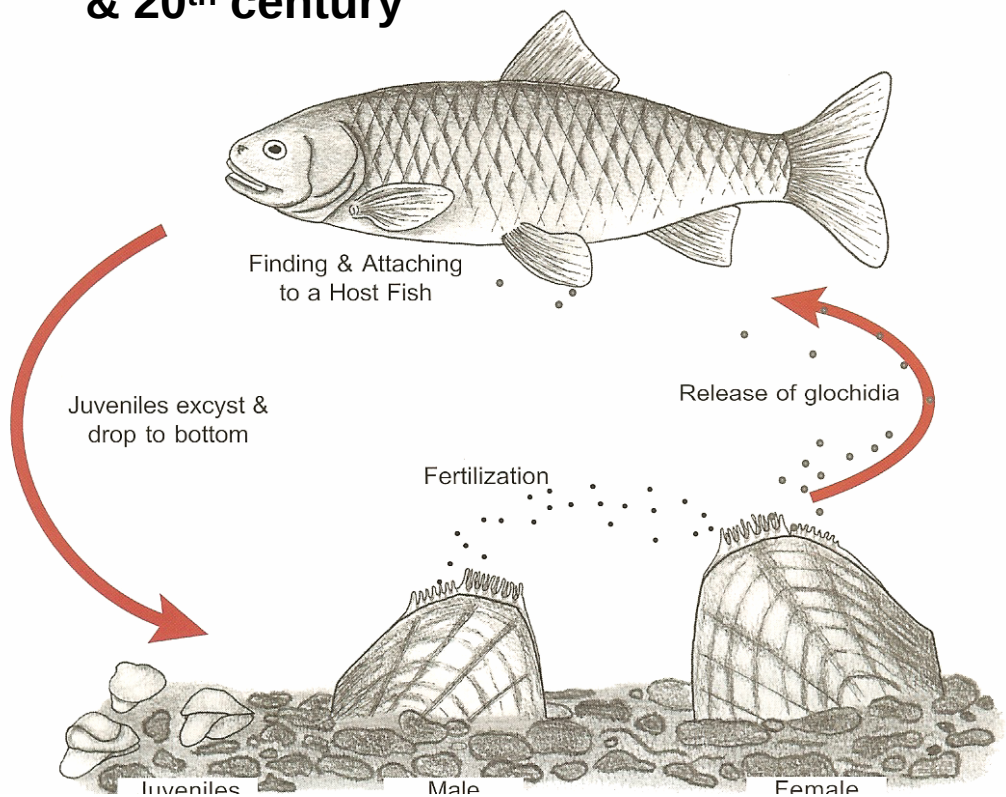
# Unionidae: Freshwater Mussels



# Unionidae: Freshwater Mussels

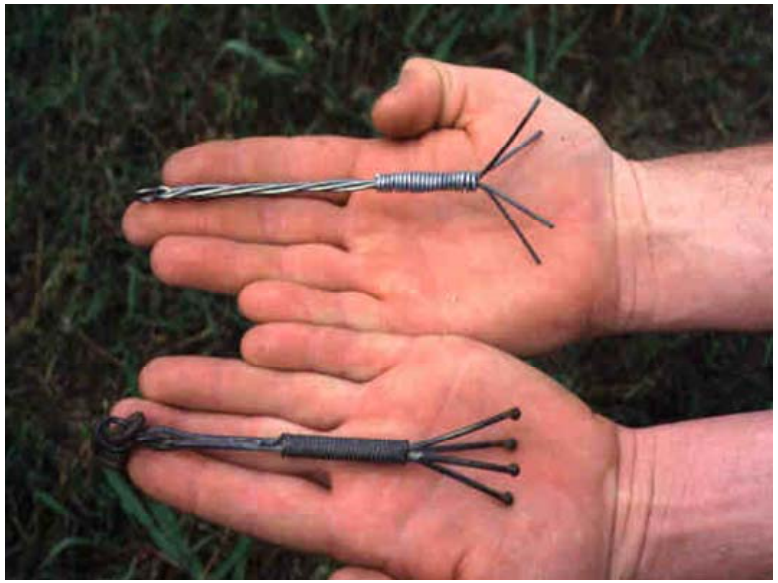
- Need for specific fish host
- Requirement for moderately depositional area
- Chance that juveniles can be dropped in unsuitable habitat
- Mussel beds can be self-sustaining
- Large rivers support diverse, dense assemblages
- Permanent water & stable substratum are important
- Tolerant of short periods of desiccation, poor water quality
- Mussels were affected by large-scale habitat changes in 19th & 20th century




Swift Slough

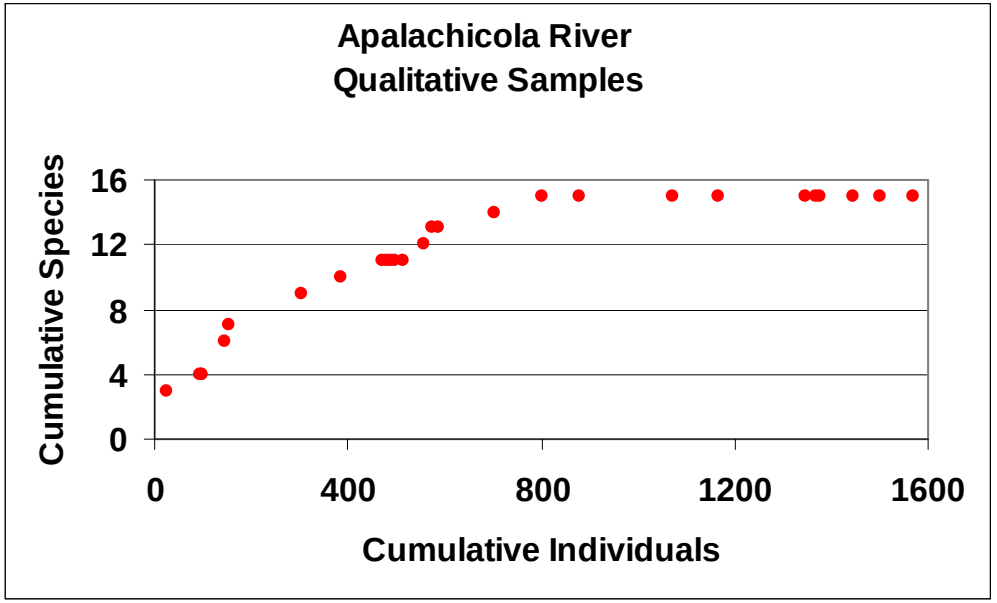
# Mussel Sampling Methods

- **Prior to 1980s – hand collecting or commercial brail**
- **After 1980s virtually everyone used divers equipped with scuba or surface supplied air**

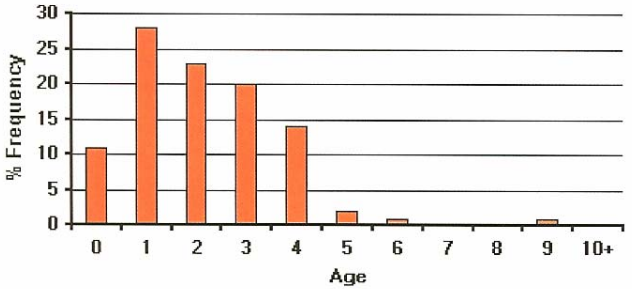


# Sampling Strategies

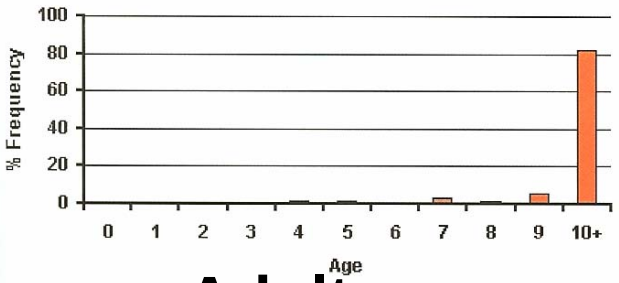
- Reconnaissance
- Qualitative – timed search
  - Species list, relative species abundance
  - Catch per unit effort (CPUE)
  - <u>Spatially extensive</u>
- Quantitative - 0.25 $m^2$ samples, sieve & pick
  - Density
  - Size demography
  - <u>Spatially intensive</u>



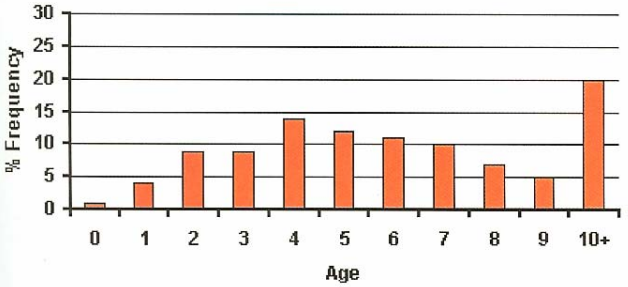
# Quantitative Sampling




**Juveniles**




**Adults**




**Even distribution**

# *Amblema neislerii* in the Apalachicola River

- **“Rare” – Hyning (1925)**
- **“Rare…but locally abundant” (Clench & Turner 1956)**
- ***A. neislerii* found at one site (Heard 1975)**
- **32 live A. neislerii at 7 sites (Brim Box & Williams 2000)**

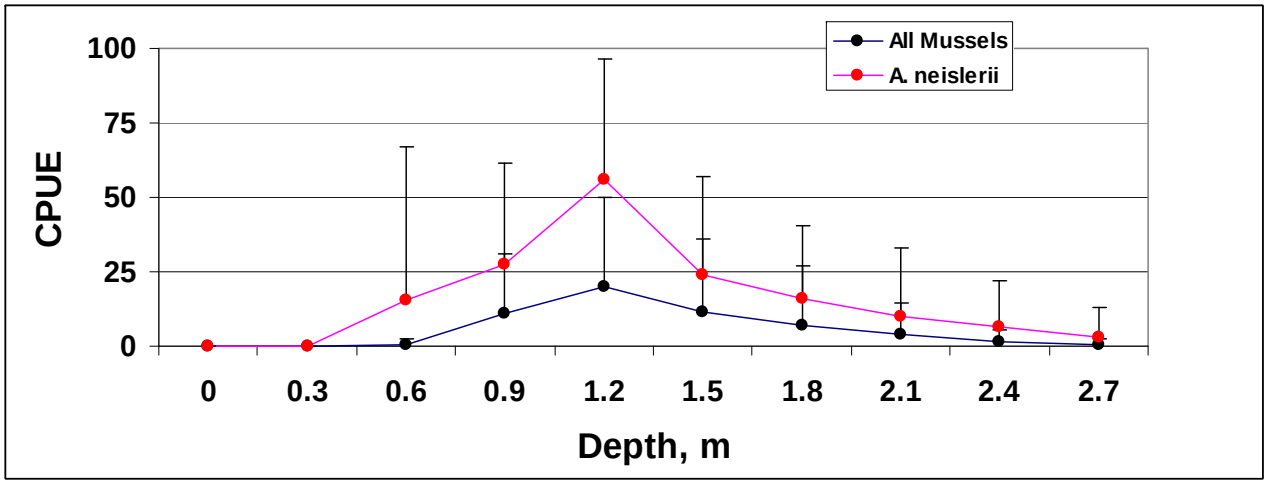
**Mussels in the Apalachicola River have been misunderstood and misrepresented……**

# Previous Studies

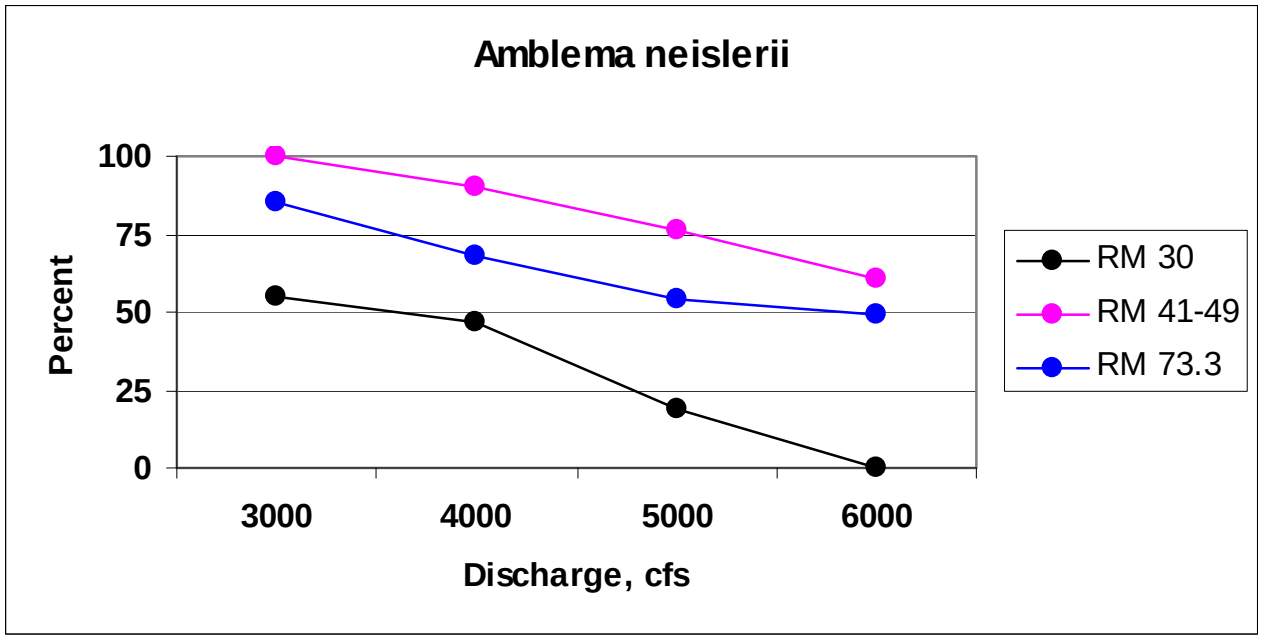
- **Phase I – Dredging impacts**
  - **96 sites likely affected by dredging**
  - **Timed searches above & below disposal areas**
  - **Studies conducted 96, 97, 99, 01, 02**
- **Phase II – Low water impacts**
  - **11 sites where A. neislerii was abundant**
  - **Transects from shallow to deep water**
  - **CPUE for *A. neislerii* versus water depth**
  - **Studies conducted in 2003**

**Much data on mussels in the river…..**
**but how much understanding and wisdom?**

# Predicting Low Water Impacts-2003 Study




**Depth vs. distribution**

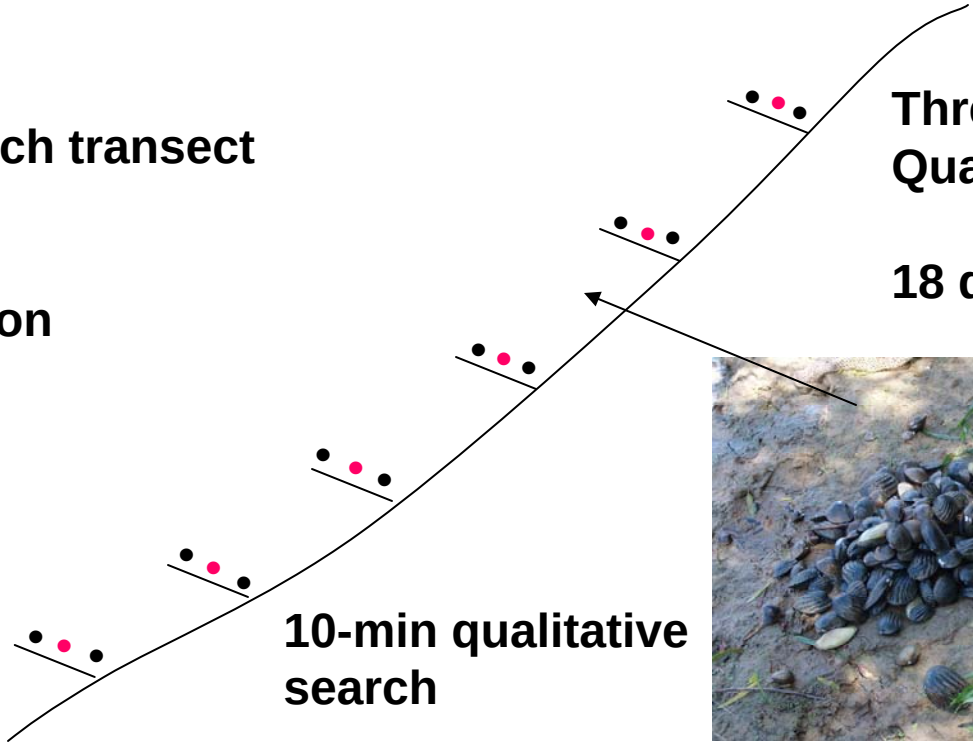



**Percent exposed at low water**

**Based on decisions at a multi-agency meeting, USFWS chose ~25 sites between NM 40 & 50**

**Ten were randomly chosen for detailed studies**

**Depth & Distance at each transect**
- **~ 1 m deep**
- **Shoreline**
- **Beginning of vegetation**



**Three 0.25 m² Quadrats/transect**

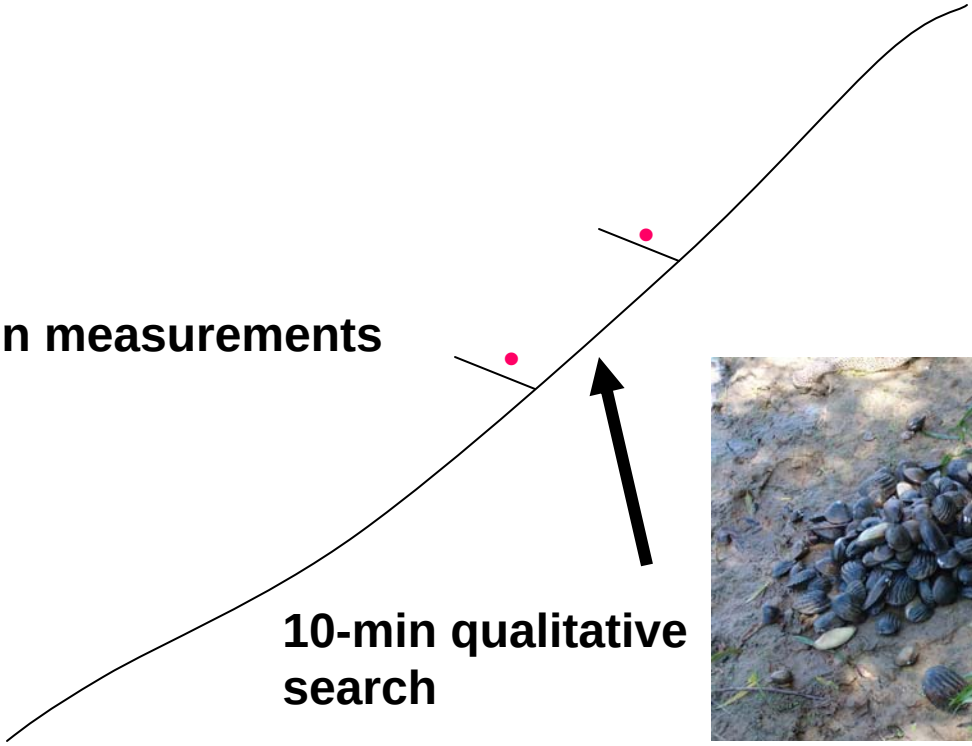
**18 quadrats/site**

**Sediment samples**
- **Moisture content (60°C)**
- **Organic content (550°C**
- **Grain size distribution**

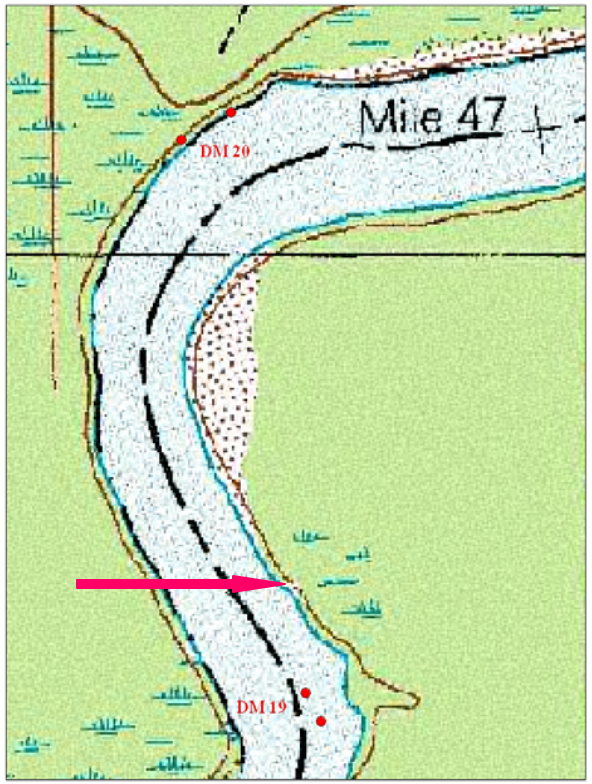
**10-min qualitative search**

**Reduced studies were conducted**
**At the remaining 15 sites**

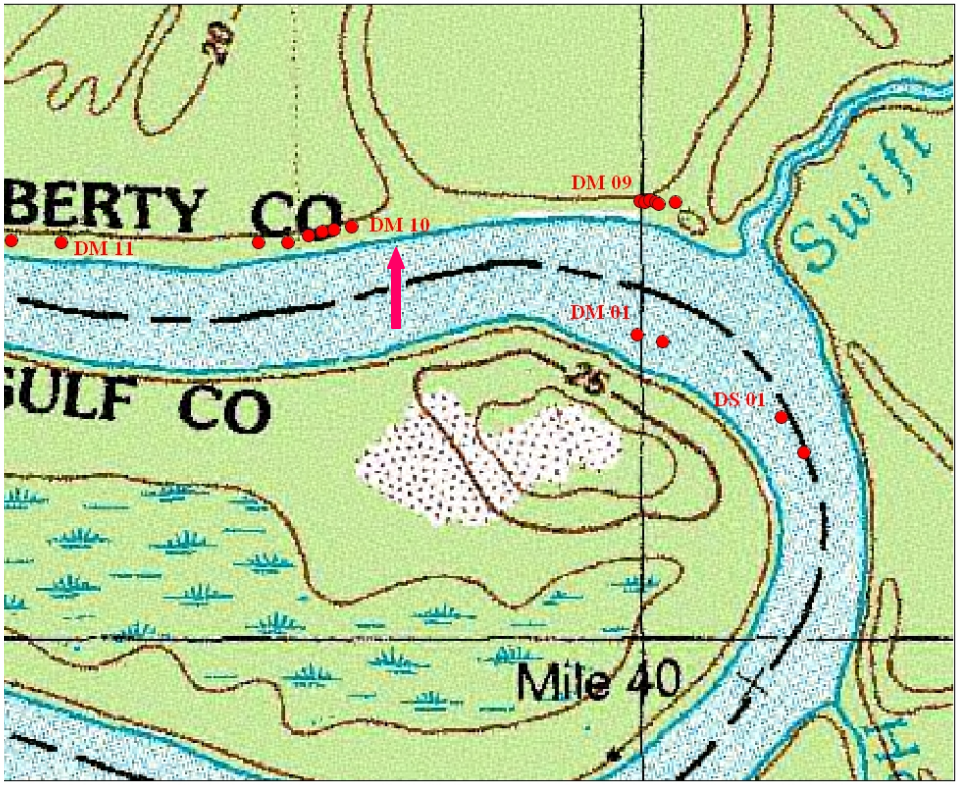
**Sediment samples**
**Distance and elevation measurements**
**Along two transects**



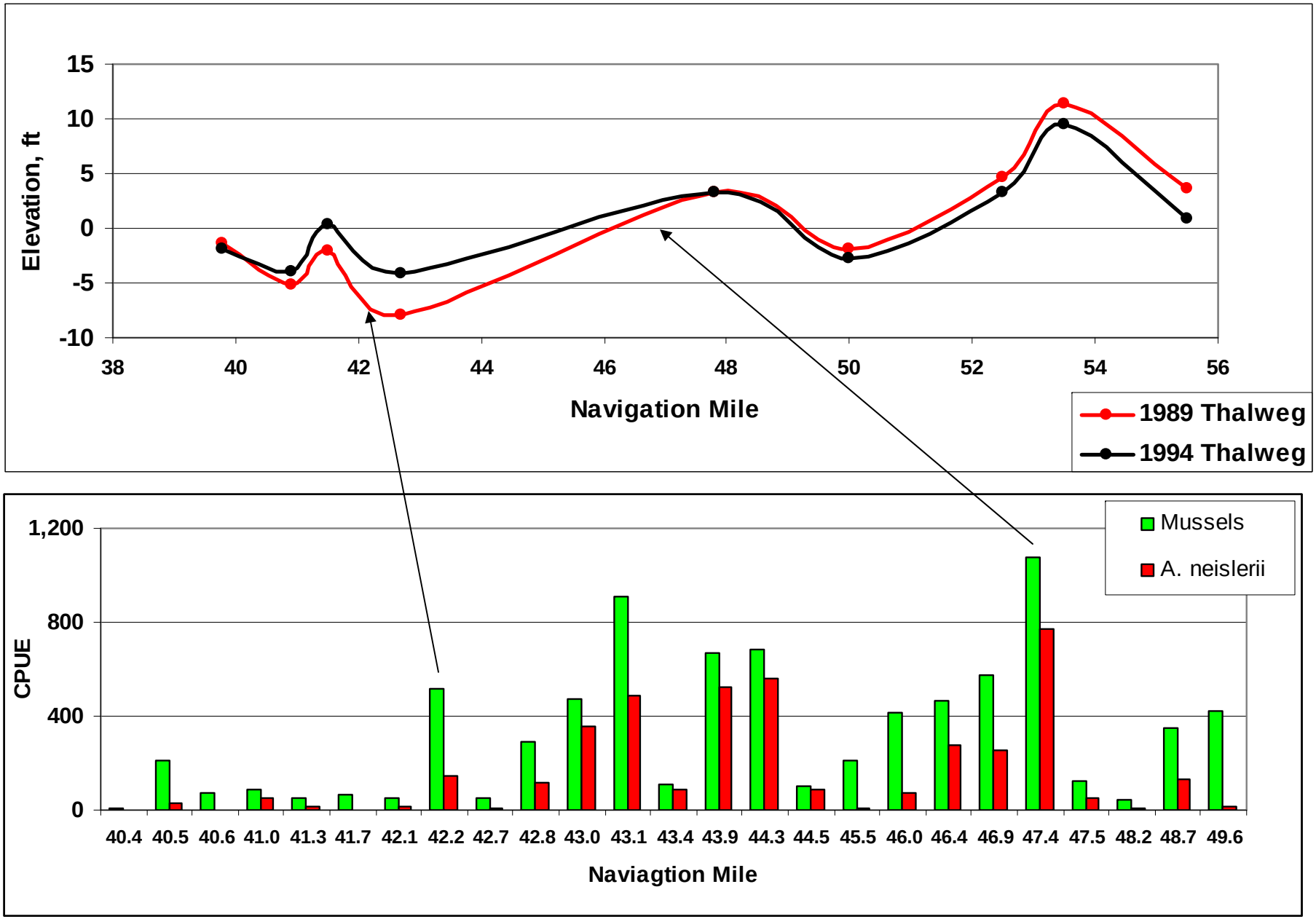
**10-min qualitative search**

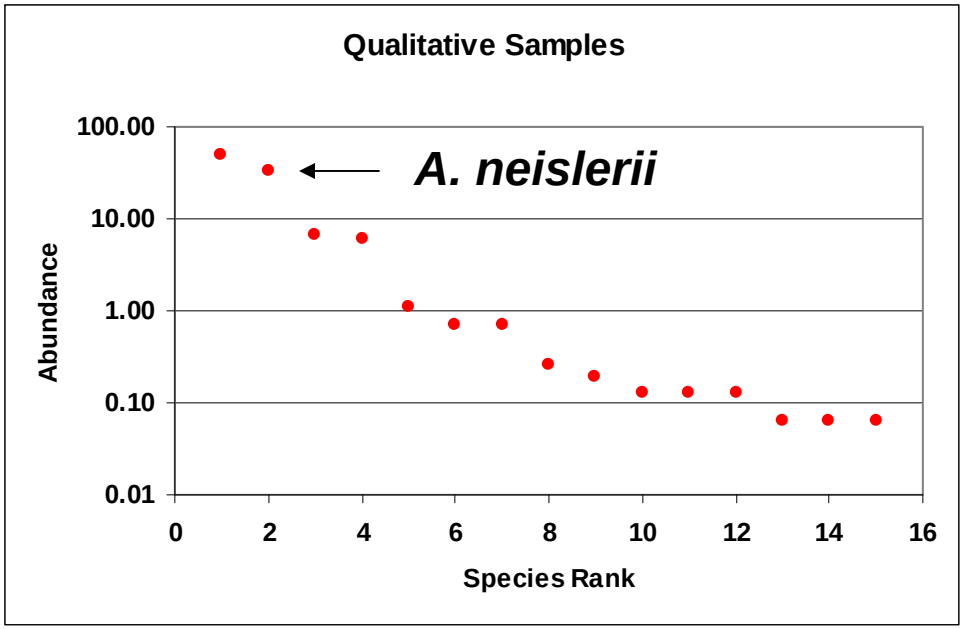


**DM19**
**NM 46.4**
**CPUE**
***A. neislerii* – 276**
**All Mussels - 462**

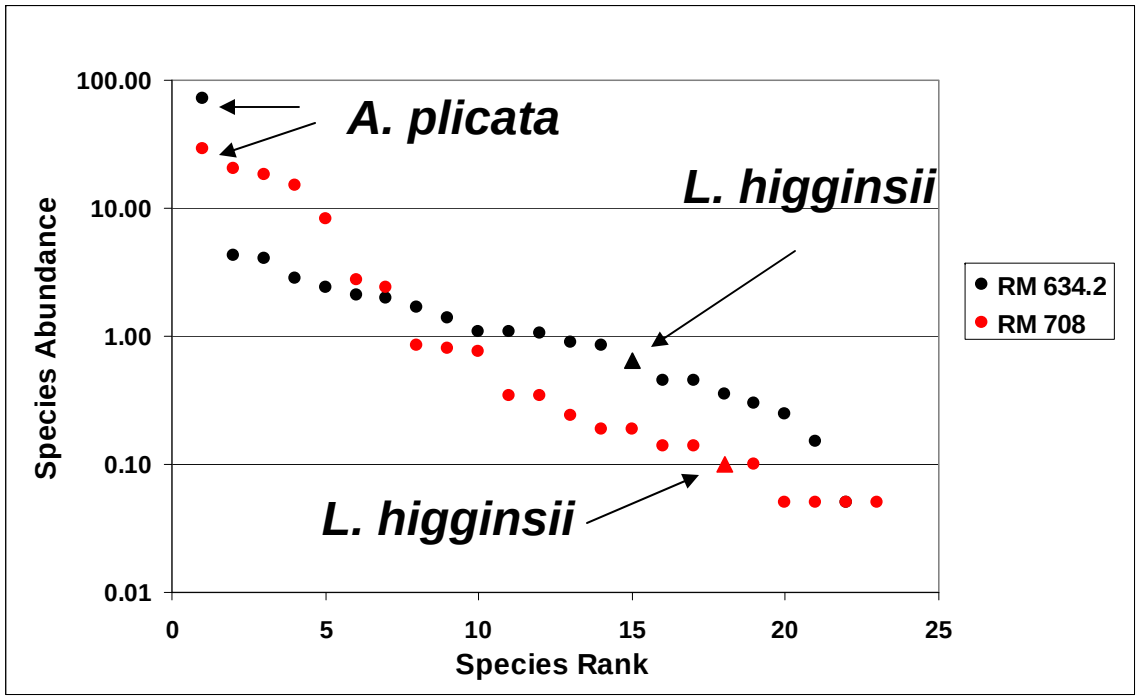


**DM 10**
**NM 40.6, LDB**
**CPUE**
***A. neislerii* – 3**
**All mussels - 72**


15
10
5
0
-5
-10
Elevation, ft
38
40
42
44
46
48
50
52
54
56
Navigation Mile
1989 Thalweg
1994 Thalweg
1,200
800
400
0
CPUE
Mussels
A. neislerii
40.4
40.5
40.6
41.0
41.3
41.7
42.1
42.2
42.7
42.8
43.0
43.1
43.4
43.9
44.3
44.5
45.5
46.0
46.4
46.9
47.4
47.5
48.2
48.7
49.6
Naviagtion Mile

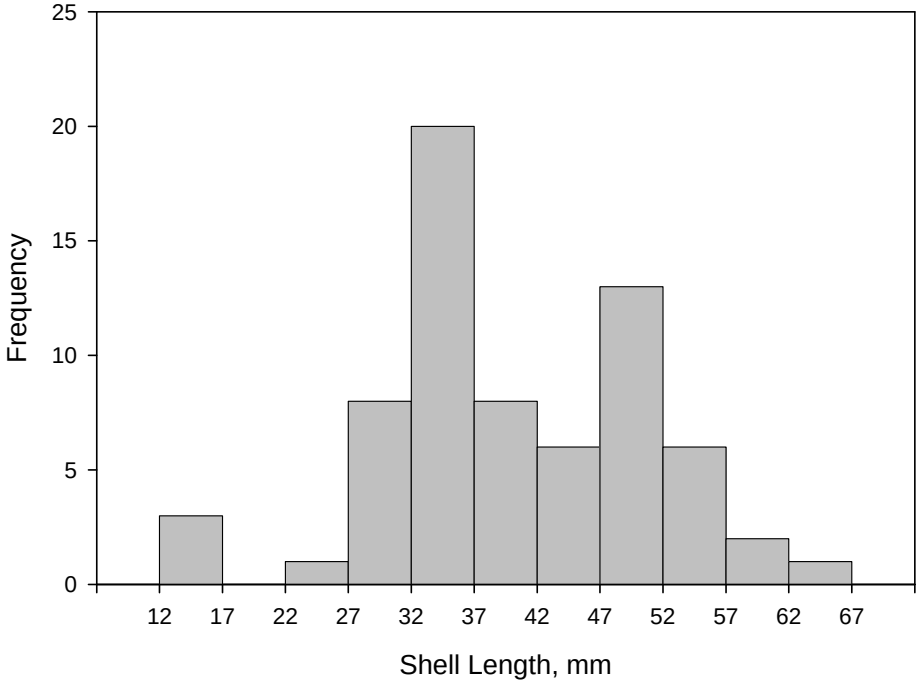



# Relative Species Abundance

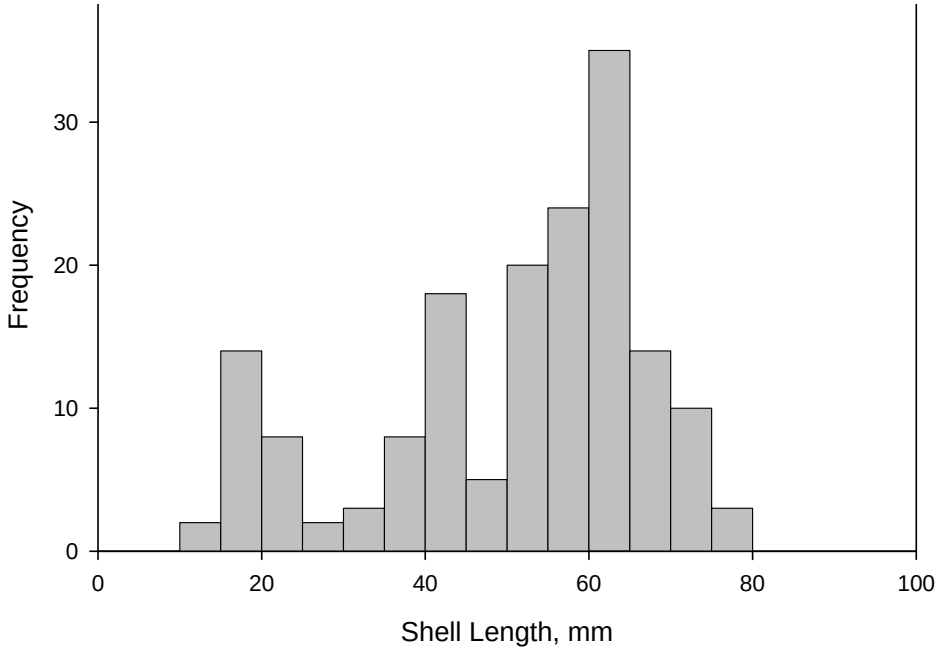


RM 635 near Prairie du Chien, WI

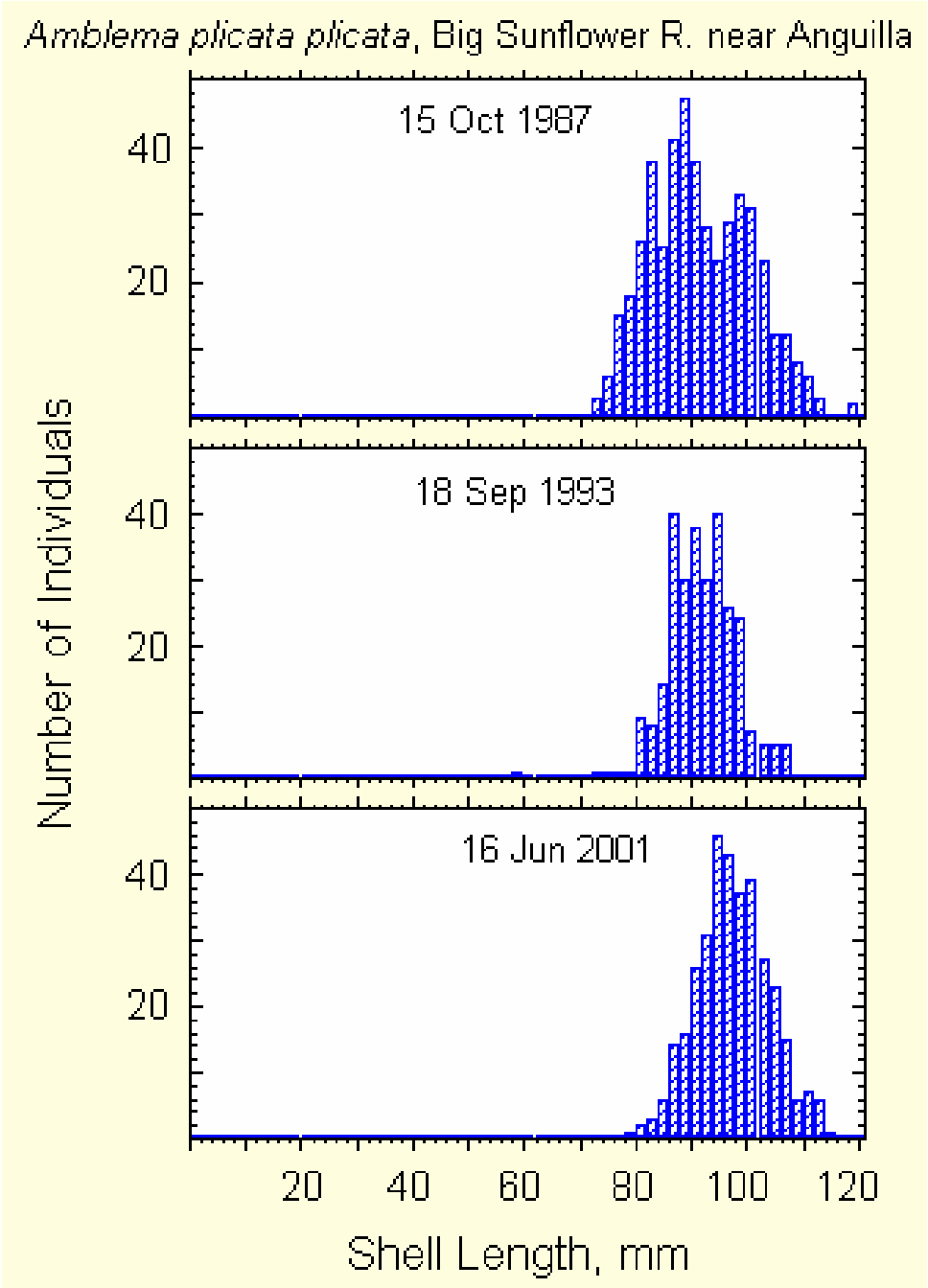
# *Amblema neislerii*, Evidence of Recent Recruitment




**Mouth of Chipola Cutoff, NM 41.6, 1999**

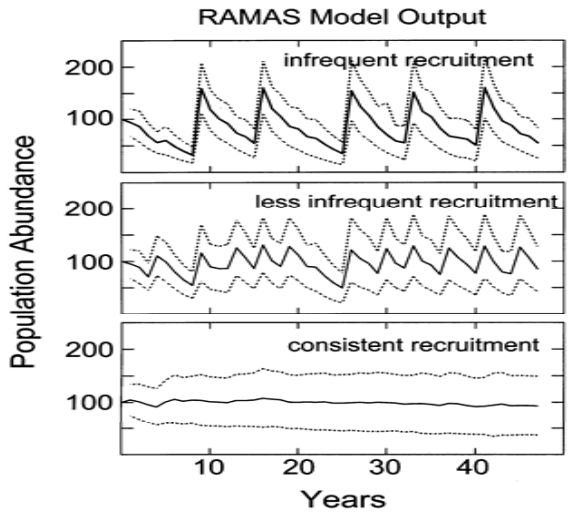


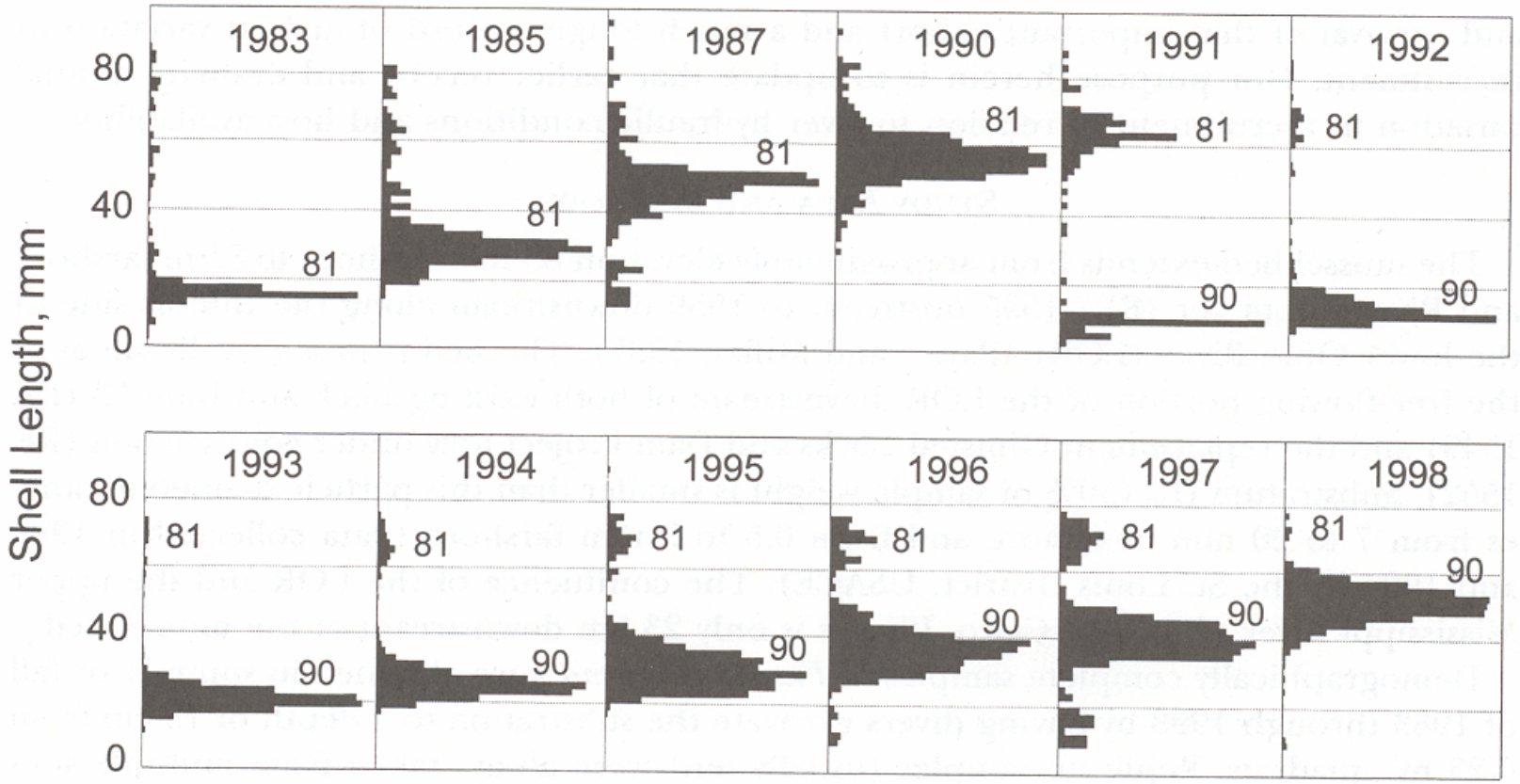

**10 Sites between NM 40 & 50 2007**



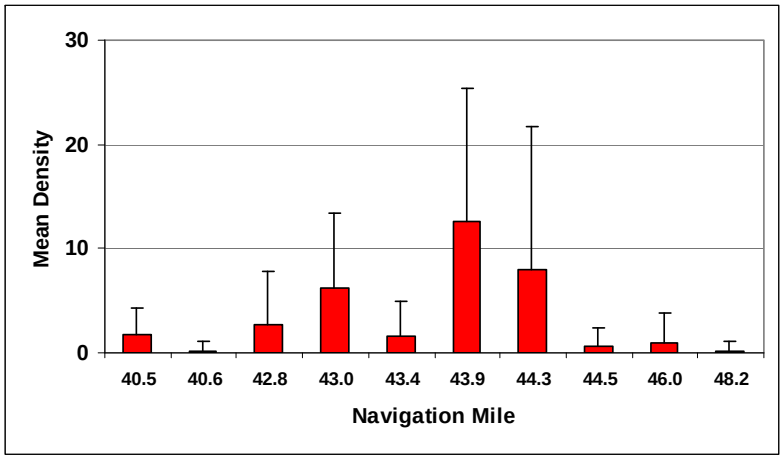

**We have never found much evidence of recent mussel recruitment in the Big Sunflower River**

# Fusconaia ebena, Lower Ohio River, KY

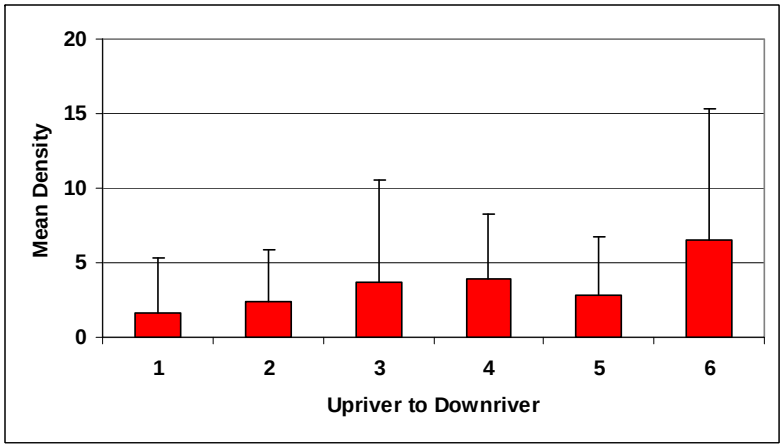


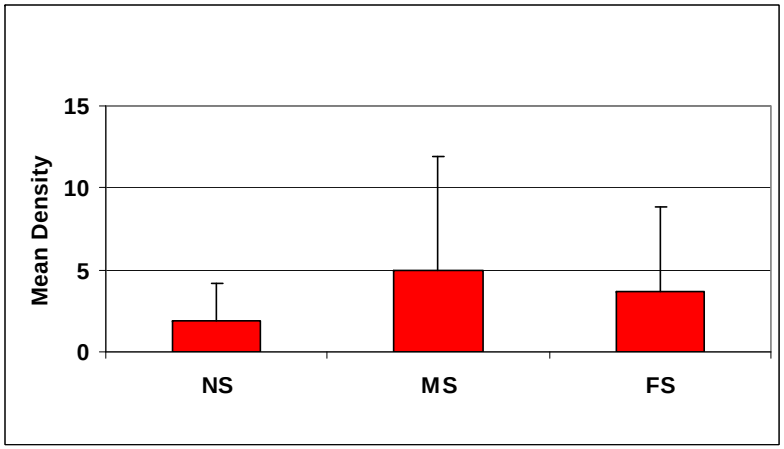
# Total Mussel Density




**By river mile**

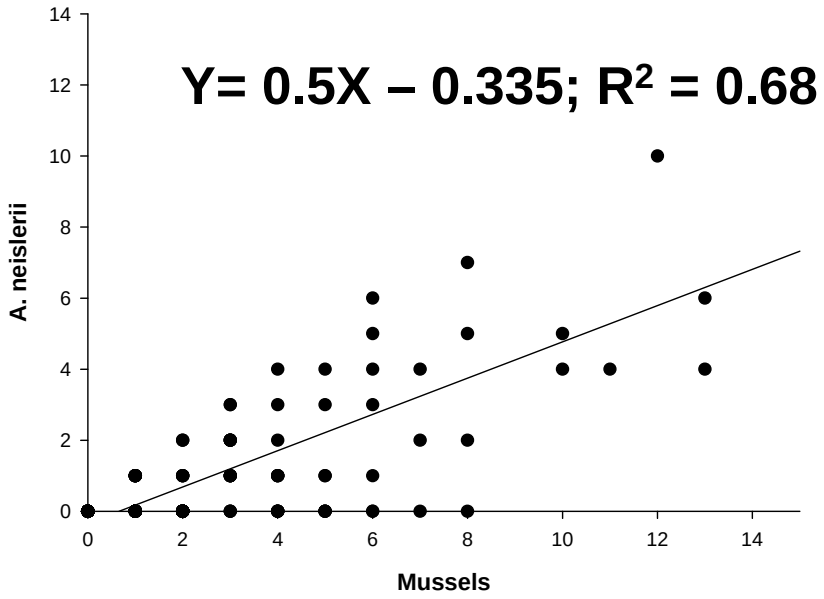


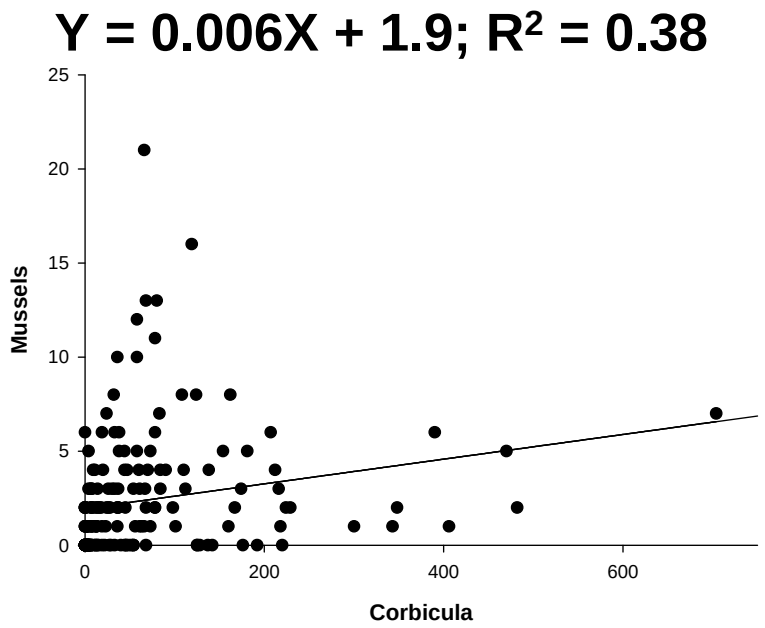

**Within site variation – up to downriver**

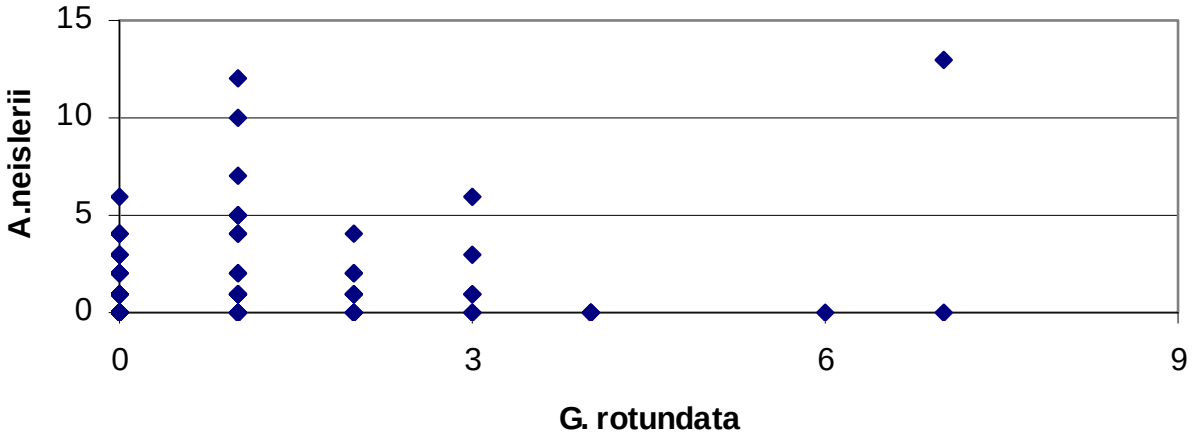


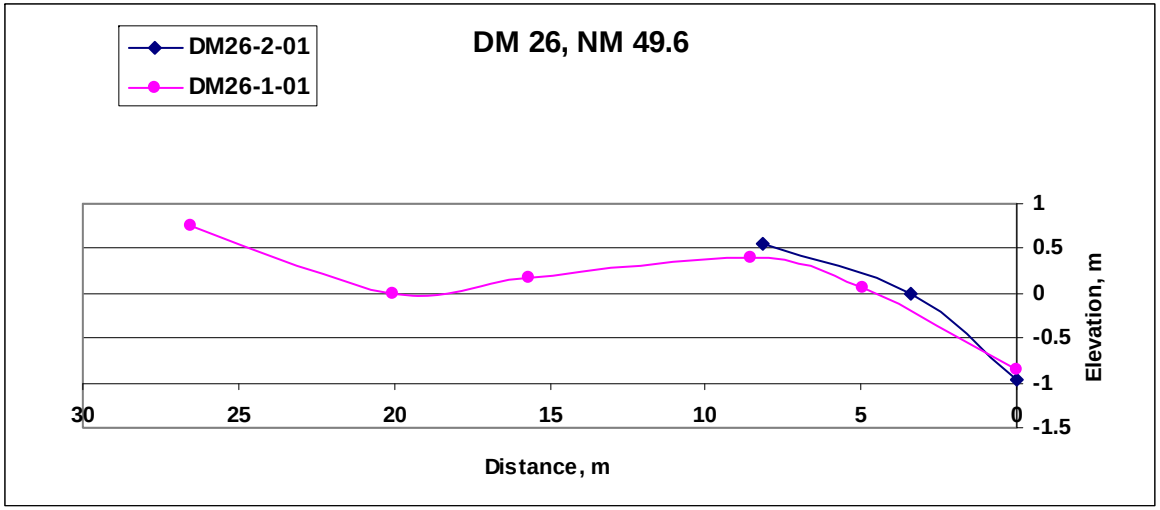

**Within site variation – near to farshore**

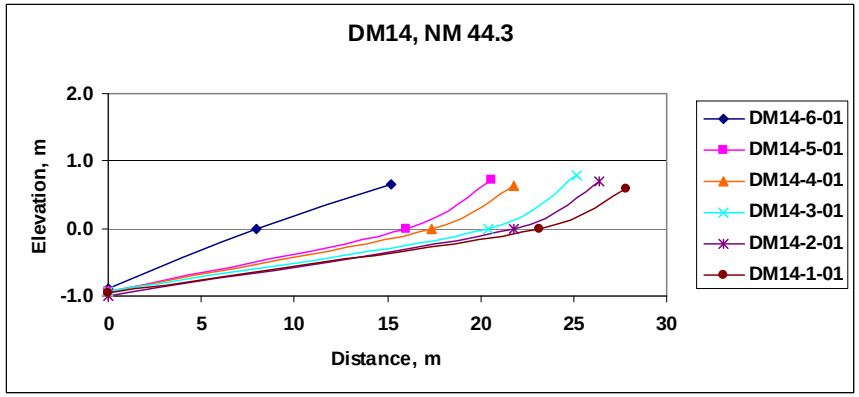
| Year | River | State | Density |
|---|---|---|---|
| 1998 | Upper Mississippi | IA | 333.2 |
| **1993** | **Big Sunflower, Lock & Dam** | **MS** | **235.0** |
| 1990 | Lower Tennessee | KY | 128.0 |
| 1997 | Lower Ohio | IL | 40.4 |
| 1993 | Upper Ohio | WV | 13.4 |
| **1993** | **Big Sunflower, RM 71.4** | **MS** | **8.0** |
| 2001 | Upper Mississippi | IA | 4.2 |
| 1992 | Green | KY | 3.3 |
| **1993** | **Big Sunflower, RM 68.4** | **MS** | **1.3** |

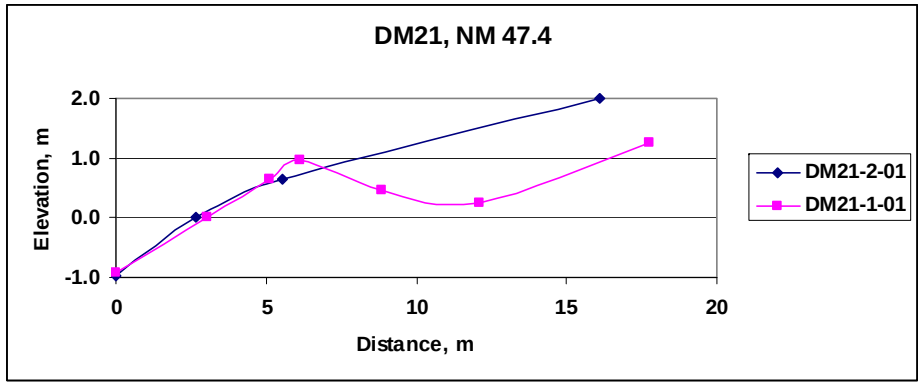

Y= 0.5X – 0.335; R2 = 0.68
A. neislerii
Mussels
0
2
4
6
8
10
12
14


Y = 0.006X + 1.9; R2 = 0.38
Mussels
Corbicula
0
5
10
15
20
25
0
200
400
600


A.neislerii
G. rotundata
0
5
10
15
0
3
6
9

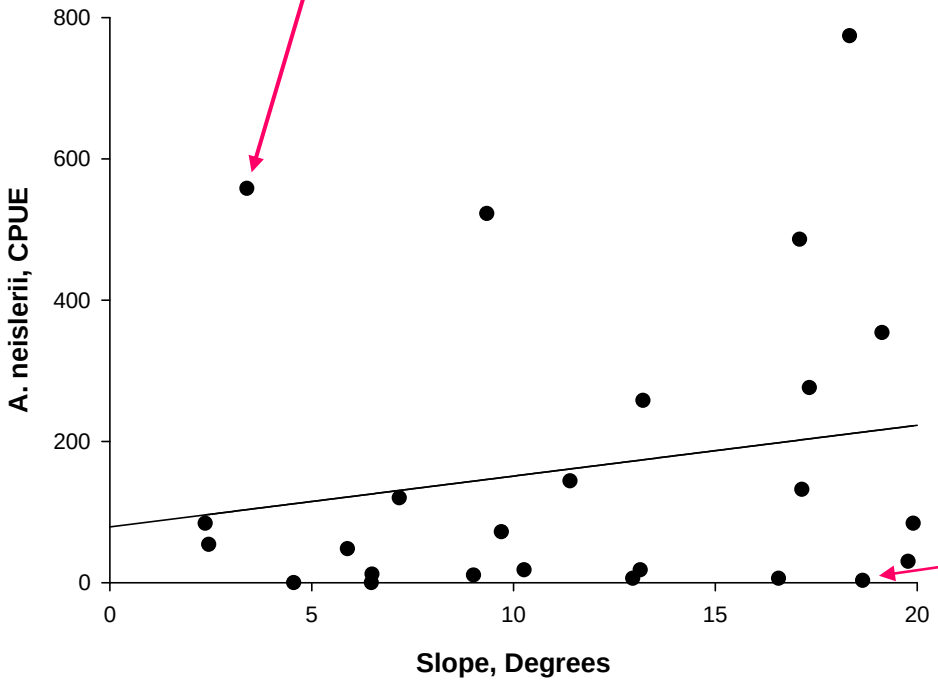

DM26-2-01
DM26-1-01
DM 26, NM 49.6
1
0.5
0
-0.5
-1
-1.5
Elevation, m
30
25
20
15
10
5
0
Distance, m

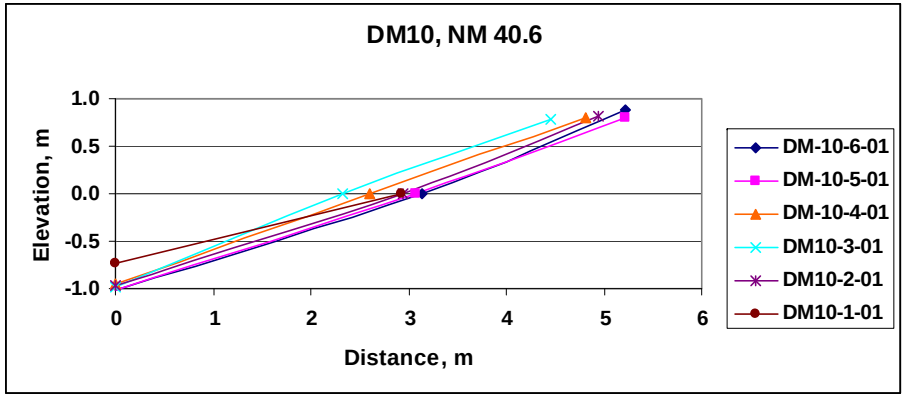



**CPUE = 558**

**CPUE = 774**




**CPUE = 3**

# *Amblema neislerii* in the Apalachicola River

- ***A. neislerii* is much more common in Apalachicola River than previously thought**
- **Most abundant in moderately depositional areas**
- **Ample evidence of recent recruitment**
- **Considerable mortality in 2006 and 2007; however, dense populations still survive—Sedimentation and low water are natural phenomena**
- **Swift Slough should not be considered a source or sink for *A. neislerii* – A moot point since there are no mussels in Swift Slough**

# Major Findings

- **Swift Slough**
  - **Maximum CPUE: 228**
  - **Density: 0.0 – 4.4/$m^2$**
  - **19.8% abundance**
- **Apalachicola River, NM 40 - 50**
  - **CPUE: 0.0 -774**
  - **Density: 0.2 – 12.7/$m^2$**
  - **37 % abundance**

## I – Detailed monitoring at <u>three</u> locations

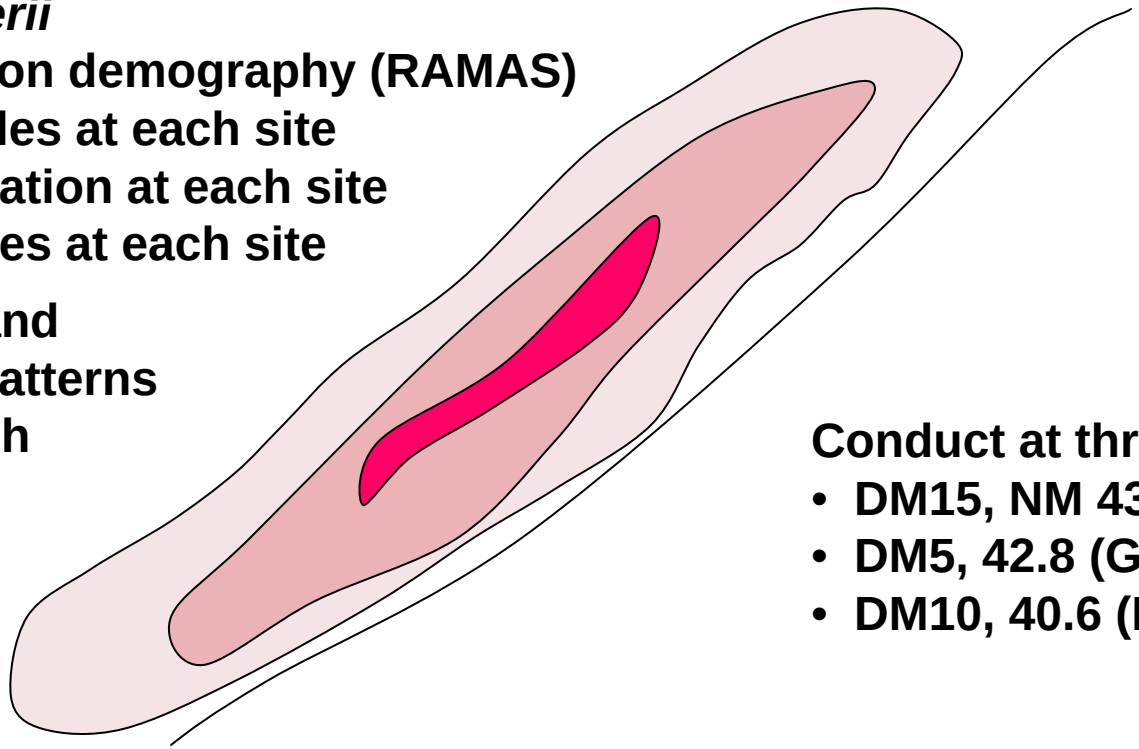
**Relate sedimentation and velocity patterns at a Site to A. neislerii distribution and abundance**

- **Reconnaissance to map bed**
- **Identify 6 – 10 permanent sites**
- **~ 10 quantitative samples/site**
- **30 min search/site**
- **Measure & mark demographically complete set of *A. neislerii***
- **Model population demography (RAMAS)**

**Sediment samples at each site**

- **Depth and elevation at each site**
- **GPS Coordinates at each site**

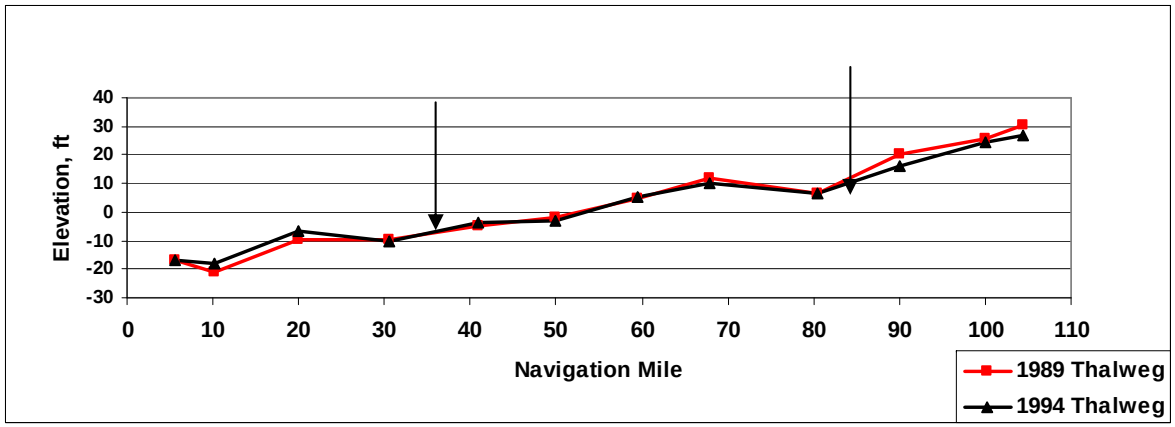
**Model velocity and sedimentation patterns in this river reach**



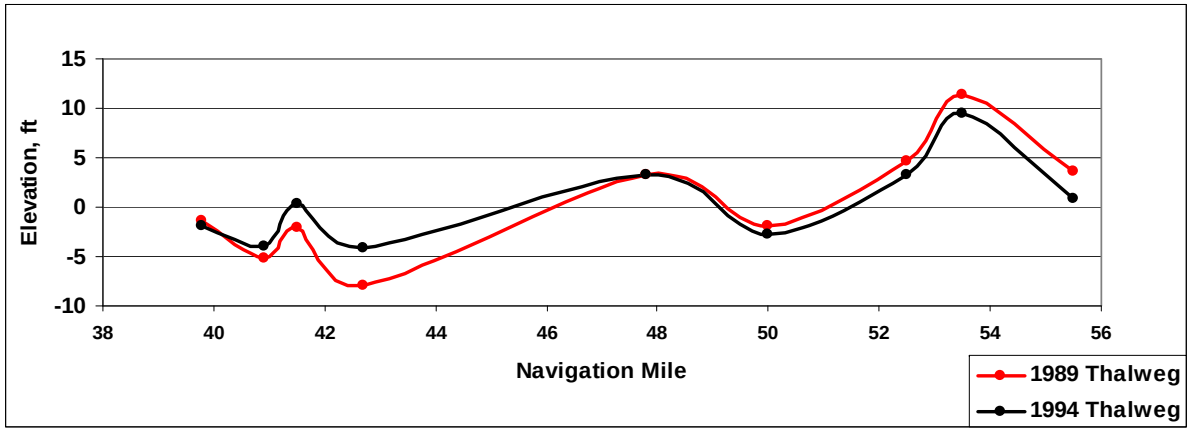
**Conduct at three locations**

- **DM15, NM 43.9 (Very good)**
- **DM5, 42.8 (Good)**
- **DM10, 40.6 (Poor**

## II – Assess effects of scale by biotic and modeling physical studies in selected river reaches




**Also—**
**Good quality mussel aggregations at NM 30 & 73.3**




**Understand importance of large and small scale physical effects on density & distribution of mussels…..**