Selenium in Grebes, Sediment, and Brine Shrimp

"What is the concentration of selenium in the sediments, food source, and birds of the Great Salt Lake"

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Background

- **1994 GSL Study**
- **1996-97 Initial Wetlands Reconnaissance Sampling**
- **1998-2000 Additional Reconnaissance Level Sampling at**
  - **Farmington Bay/Oil Drain: Oil, PCB, metals**
  - **Farmington Bay WMA/Crystal Unit: Hg**
  - **Ogden Bay WMA: PAH**
  - **South Arm of the GSL: metals**

(data summary and report in progress)

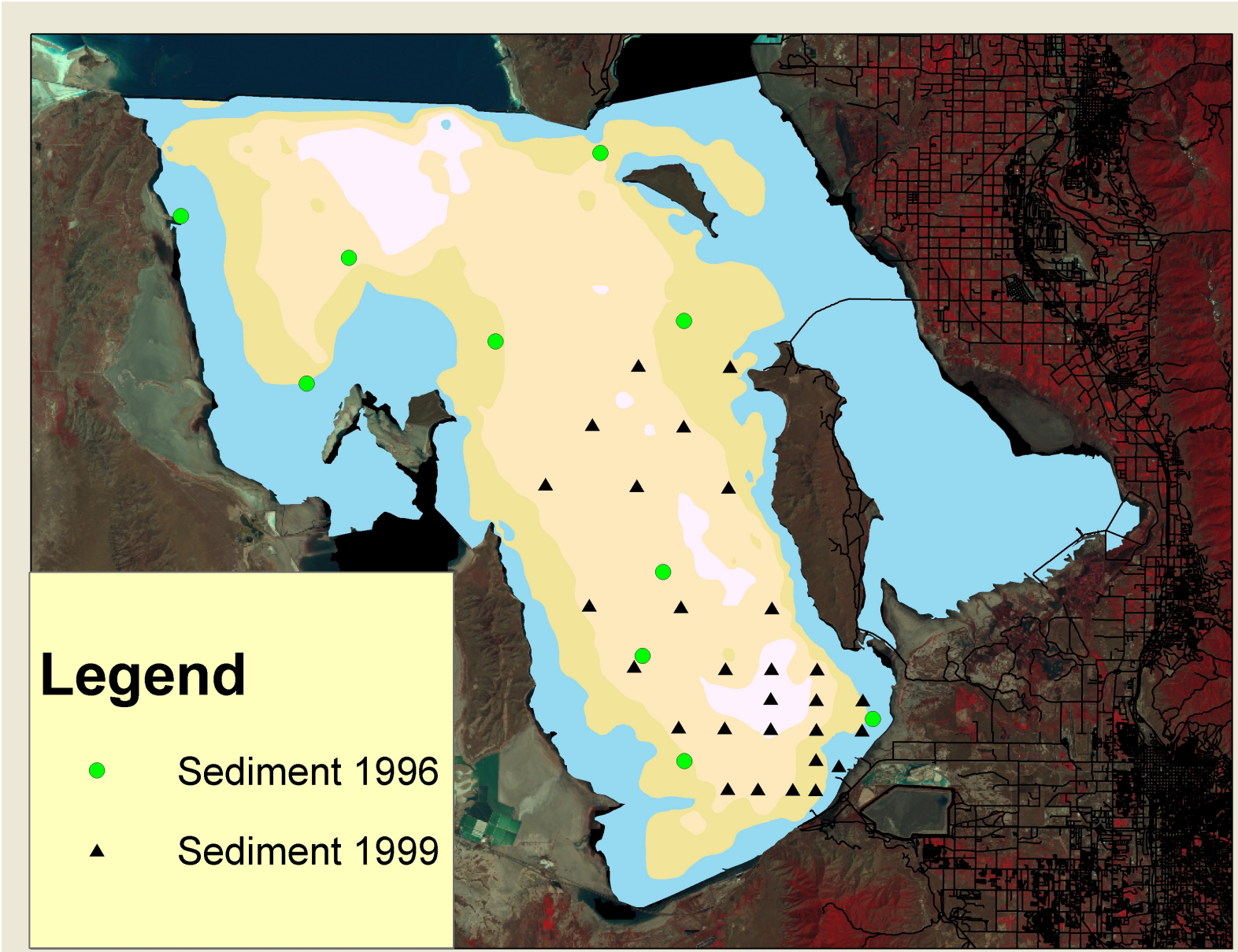
Summary 1996-97 Reconnaissance Sampling

- 28 Sites
- Metals, OC/PCB, TPH, PAH, E/T, AChE, EROD, Dioxin, e.g.:
- FBWMA - Crystal Unit 41 total analyses:
  - Bird eggs: 12 Metals, 5 OC/PCB
  - Fish tissues: 3 PAH, 4 AChE, 4 E/T, 4 EROD
  - Whole fish (composite): 3 Metals, 1 OC/PCB
  - Sediment: 1 Metals, 1 OC/PCB, 1 TPH
  - Invertebrates: 1 Metals, 1 OC/PCB

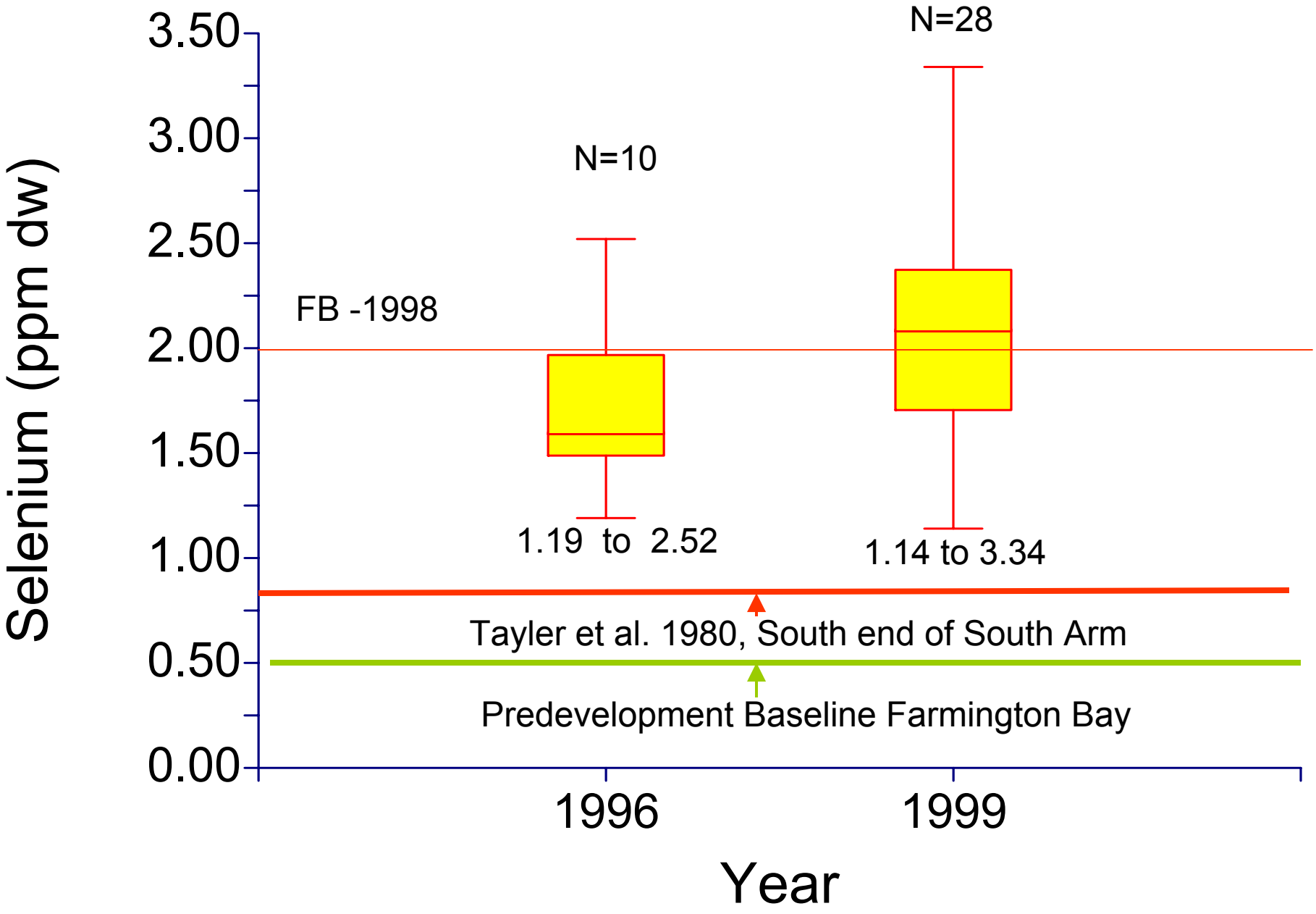
South Arm GSL Metals Analyses 1998-2000

Eared Grebe	Sept-Oct 98	n=12
Eared Grebe	Dec 98	n= 4
Sediment	Sept-Oct 99	n=28
Brine Shrimp	Sept-Oct 99	n=28
Brine Shrimp	Apr-May 00	n=28
Eared Grebe	Apr-May 00	n=24

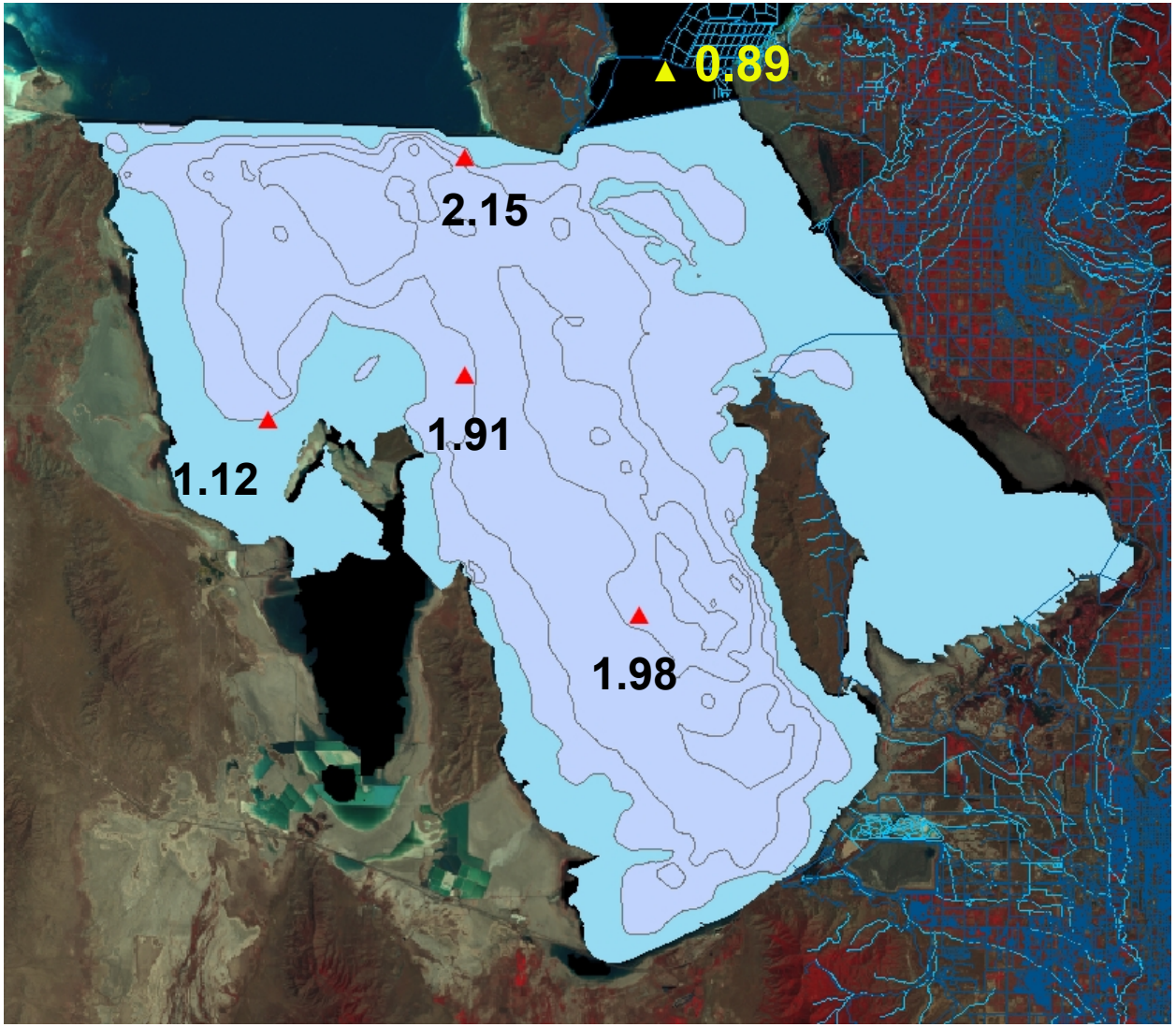
Sediment Samples – 1996 and 1999



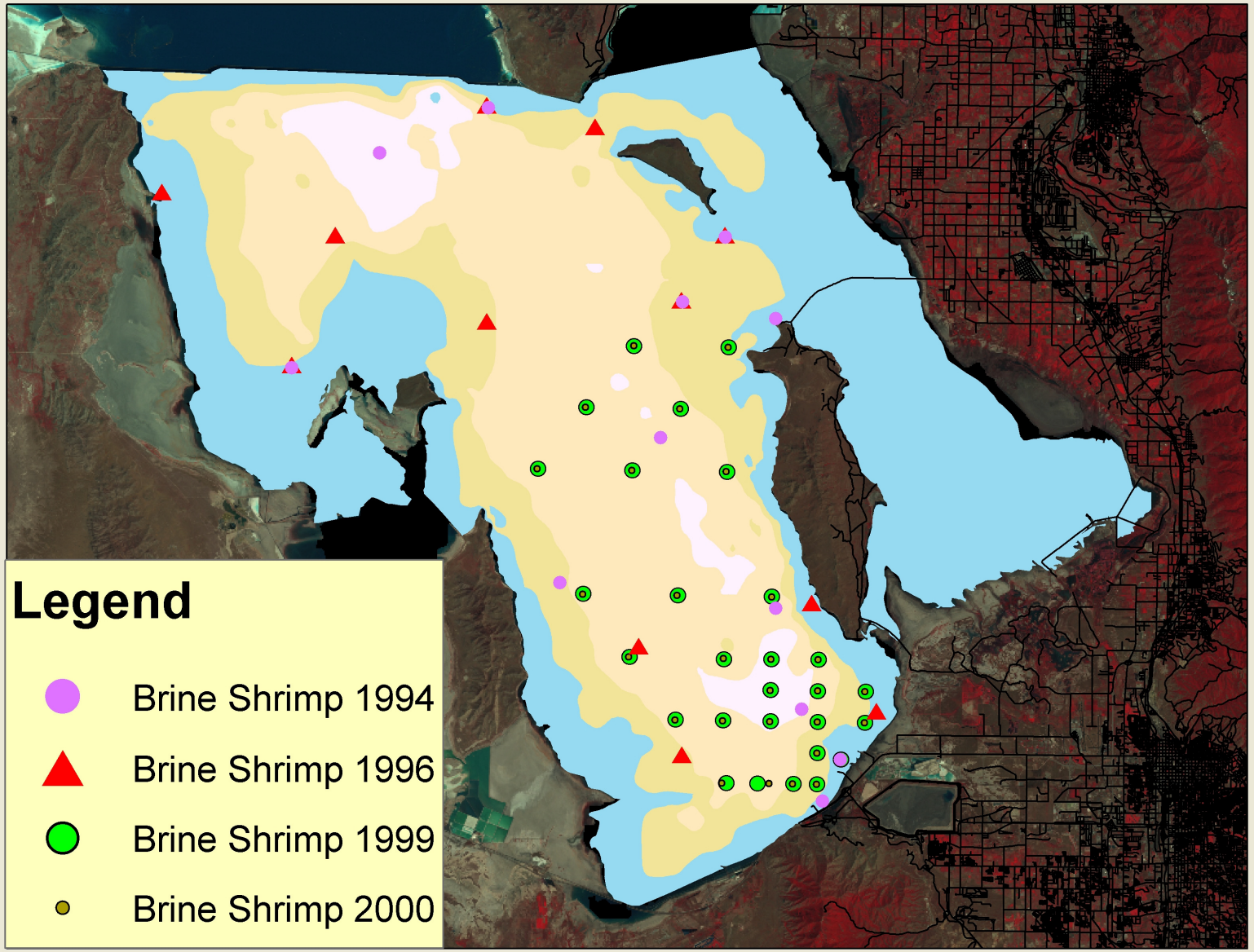
Selenium in Sediments 1996 and 1999

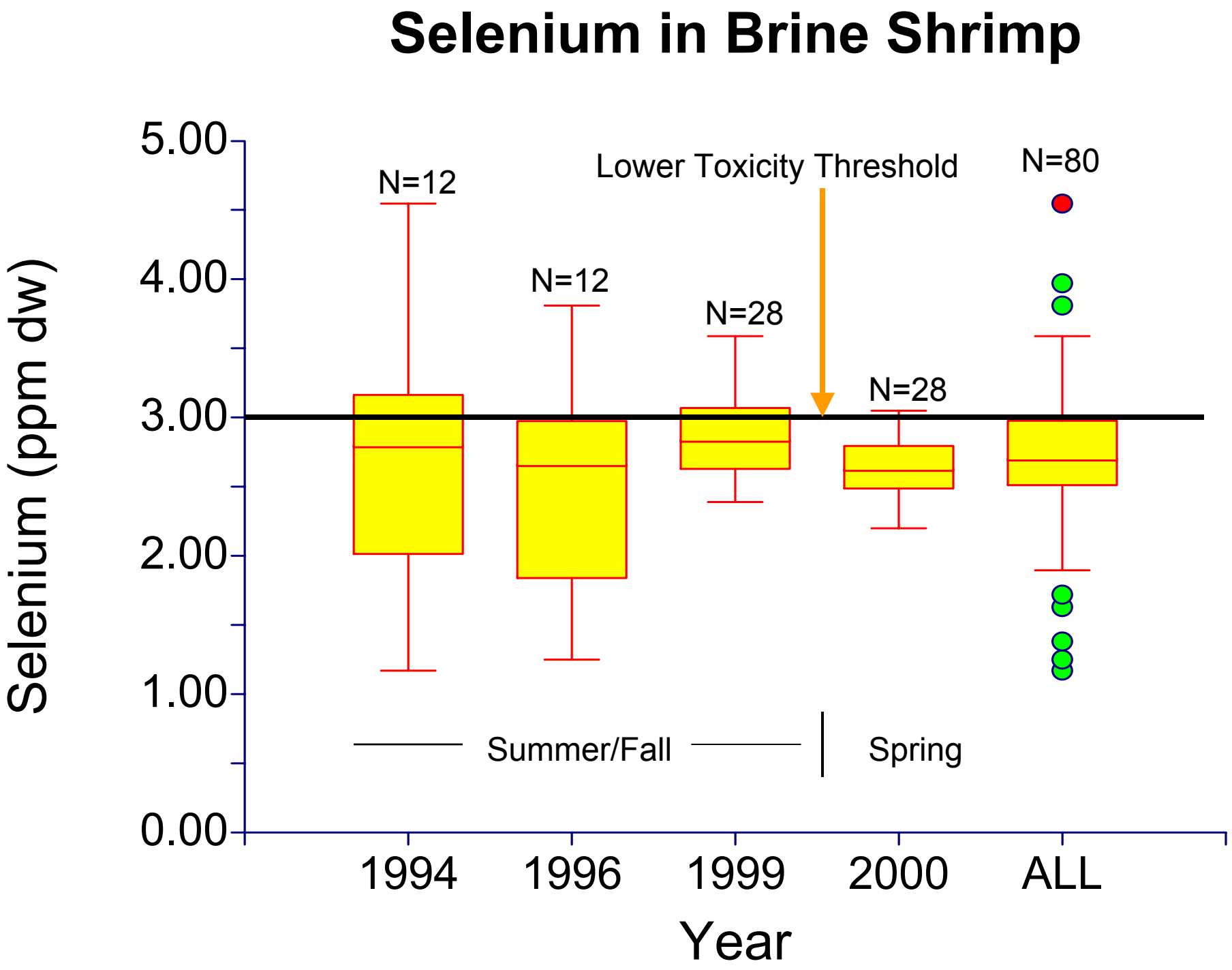


Brine Shrimp Cyst Samples (ppm dw)

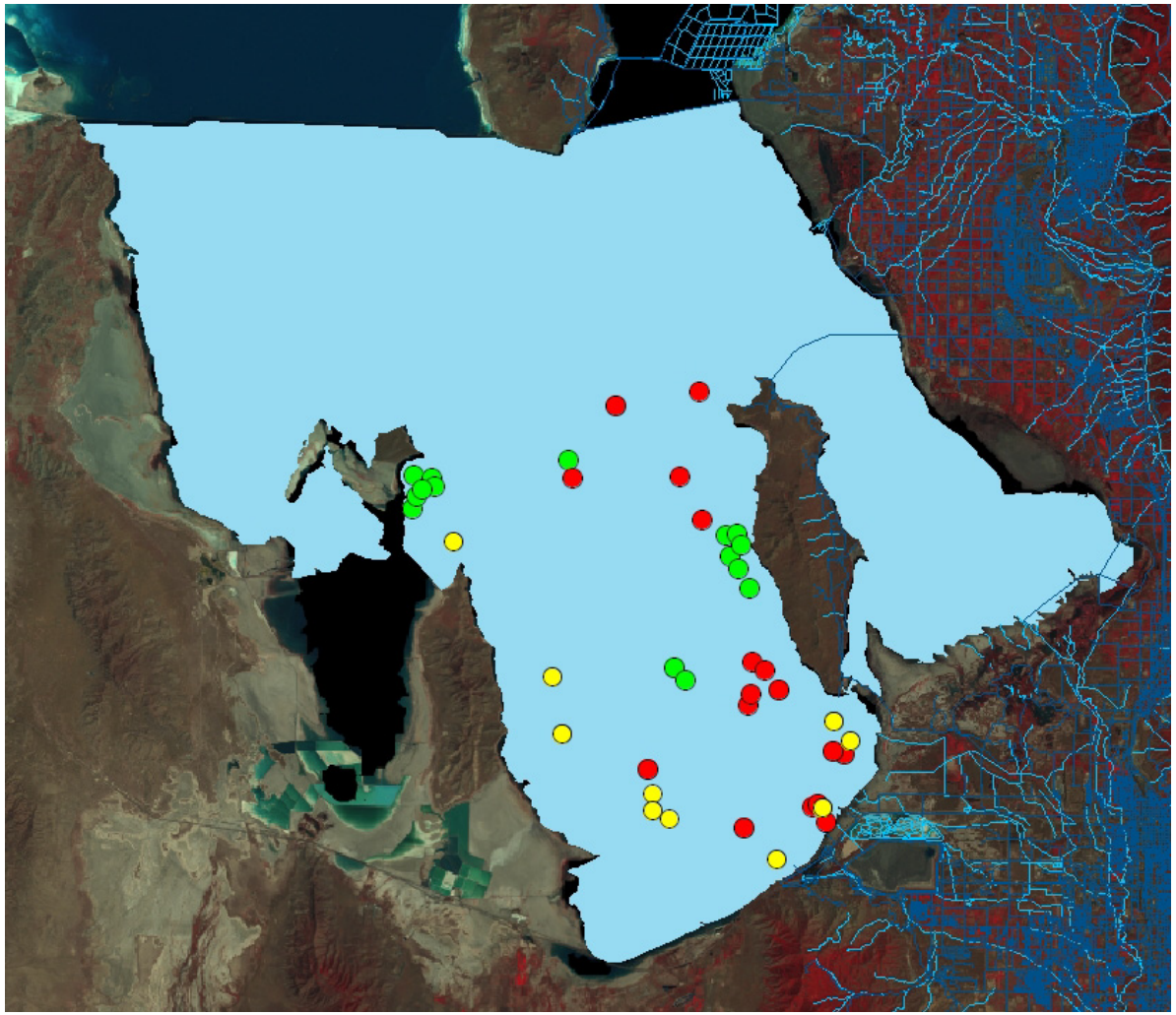


Brine Shrimp Sample Sites



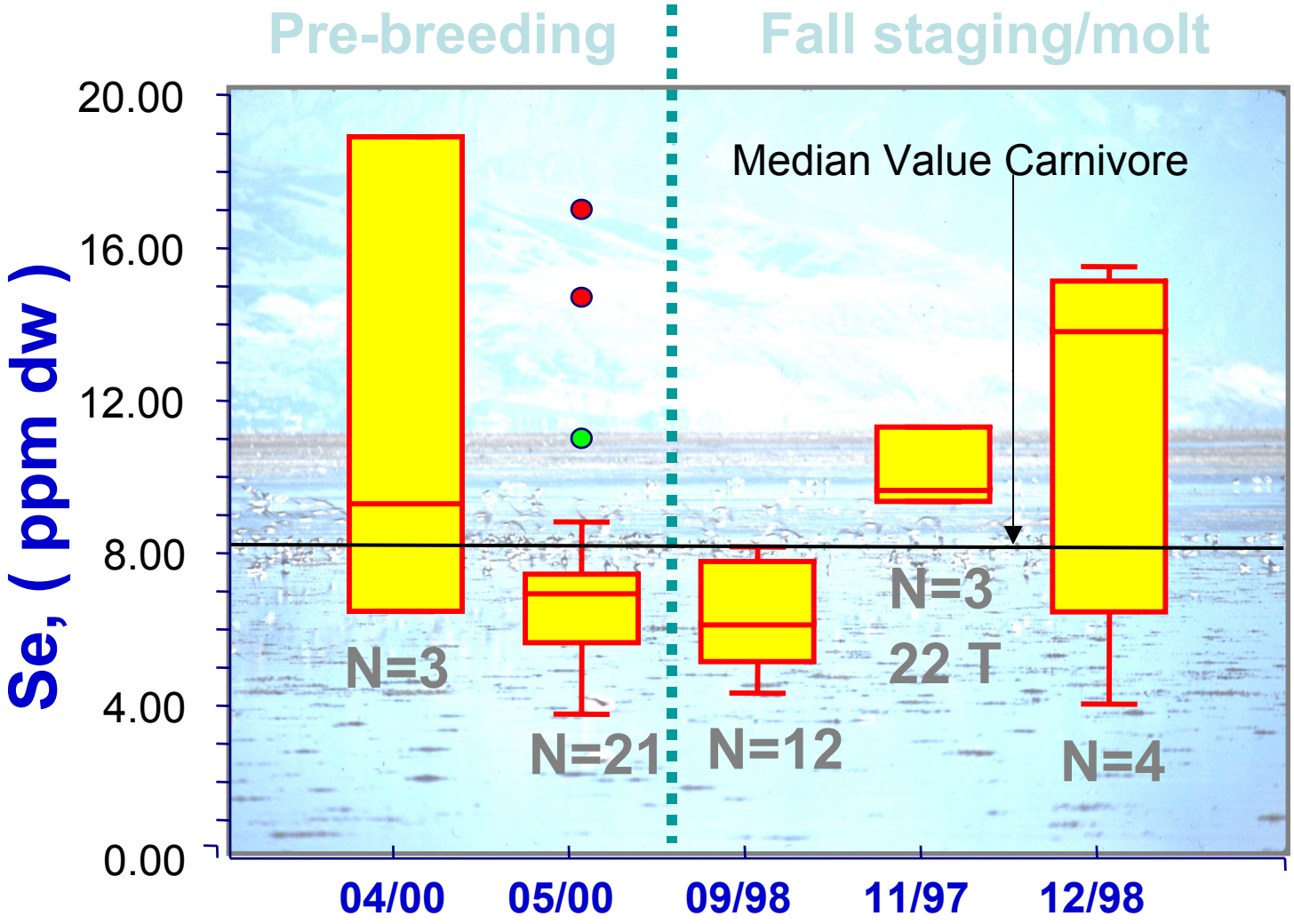

Selenium in Brine Shrimp
Selenium (ppm dw)
5.00
4.00
3.00
2.00
1.00
0.00
N=12
N=12
N=28
N=28
N=80
Lower Toxicity Threshold
Summer/Fall
Spring
1994
1996
1999
2000
ALL
Year

Eared Grebe Liver Collections 1997-2000



	N
1997	22
1998	16
2000	24

Se IN EARED GREBE LIVERS



Selenium in South Arm GSL Brine Fly Samples, 1994

- Brine Fly Adults:
  4 Near shore samples
  Geometric Mean: 1.22 ppm dw
  Range: 0.793 to 1.63 ppm dw
- Brine Fly Larvae:
  2 Near shore samples
  Geometric mean: 0.957 ppm dw
  Range: 0.81 to 1.13

Summary

Sediment

- 1999 Median concentration @ 4 X predevelopment and @ 3 X 1978 (Tayler et al. 1980) and similar to FB core 1980-1998
- 1999 Median concentration exceed 2 ppm dw (level of concern 1-4 ppm dw for freshwater, NIWQP 1998)

Brine Shrimp

- Median concentration just under lower toxicity threshold for bird reproduction, 3 ppm dw
- Median concentrations appear seasonally similar

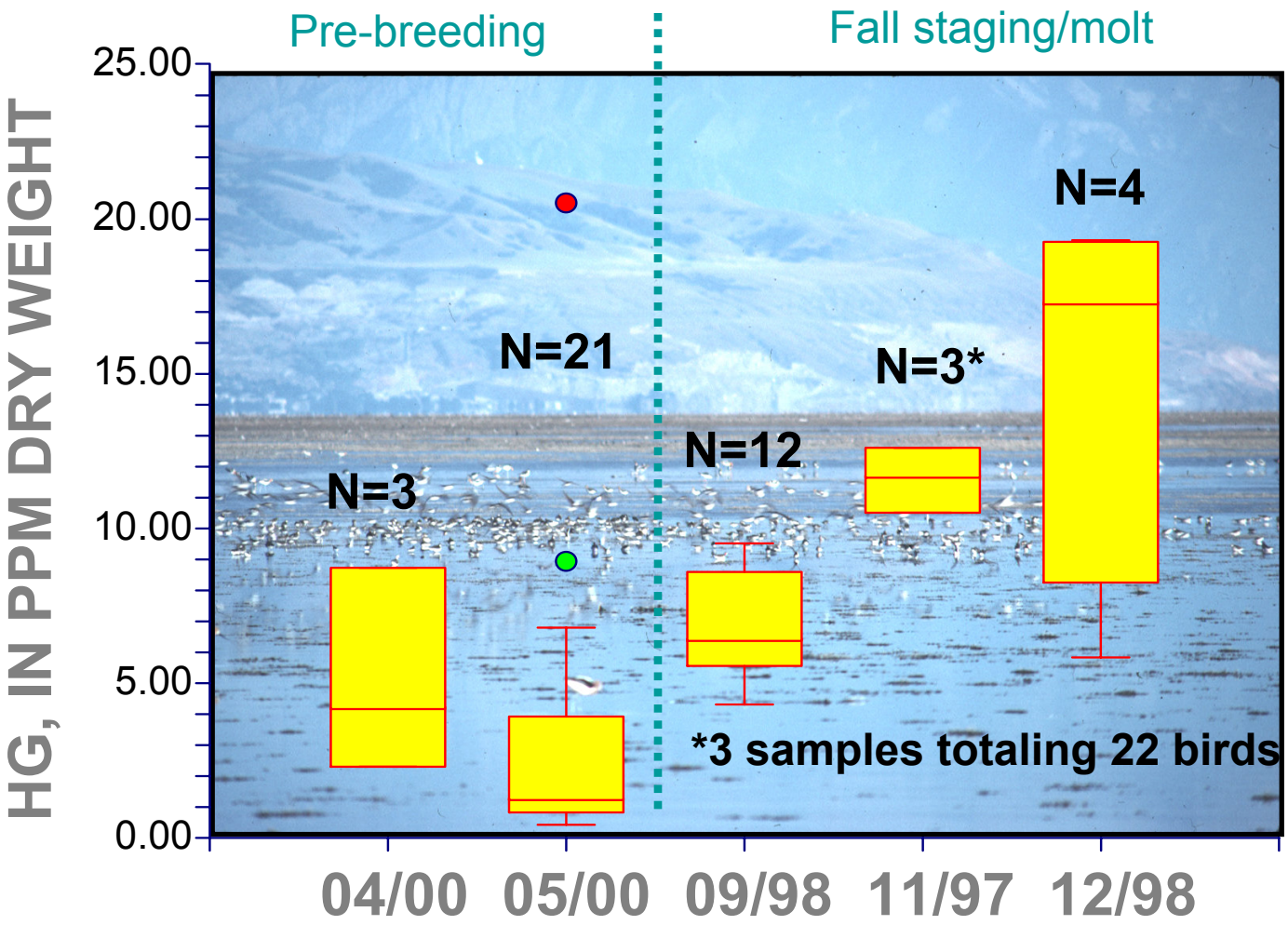
Summary (continued)

- Brine shrimp whole cysts were low in Se
- Eared grebe selenium
  - liver concentrations more than doubled during the fall
  - May concentrations were similar to background for avian carnivores, but limited April grebes as well as May outliers show some birds have high Se
- Brine fly larvae and adults low for Se in limited samples

Data Gaps

- Concentrations of Se post-molt before continuing migration south
- Nesting success of birds that stop here during spring migration
- Relationship of Se to die-offs, if any
- Interrelationship with Hg as Hg also increases substantially in birds during the fall
- Partitioning of Se and Hg in tissues of the eared grebe

Hg IN GREBE LIVERS FROM GSL



Data Gaps (continued)

- Effects of drying/oxidizing of Se in exposed sediments and redistribution during rain/snow events
- Rate of biomethylation loss to atmosphere from sediment exposure
- Se and Hg in other species and tissues, especially waterfowl breast meat potentially consumed by people