

# The Utility of Waterbirds as Bioindicators: A Ptilochronological Approach

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# THE PROBLEM

- Coastal environments – user conflict
  - Contaminant accumulation (runoff; atm. deposition)
  - Coastal erosion (development)
  - Habitat loss
  - Food web impacts



# Individual Species for Ecosystem Management

- Focal Species for Landscape-level Conservation:

- Keystone
- Umbrella
- Flagship
- Indicator



# BIOINDICATION



- “...an organism or ecological community so strictly associated with particular environmental conditions that its presence is indicative of the existence of these conditions.” (Erwin and Custer 2000)
- Composition – perennial fidelity to site and community
  - Exhibit defined range of tolerance
- Condition – used to monitor habitat quality
  - Assessments over a range of stress
- Invaluable in Marine Environments

# COMPLICATIONS



- Higher trophic level indicator species integrate more variables - multicollinearity
- Logistically and economically feasible
- Reductionist vs. Systems Paradigm
  - Aggregation vs emergent properties

# RESEARCH GOALS I

– A test of the Reductionist Paradigm

- Hierarchical inference:
- Small scale aggregation
  - Economically feasible techniques
  - “Choose response variable that may be correlated with higher level characteristics.”



Photo: R. M. Erwin

# RESEARCH GOALS II

- Does the phenology/gustatory habit of the species diminish its utility as an indicator?

- Double-crested Cormorant

- Generalist
- Time lag response



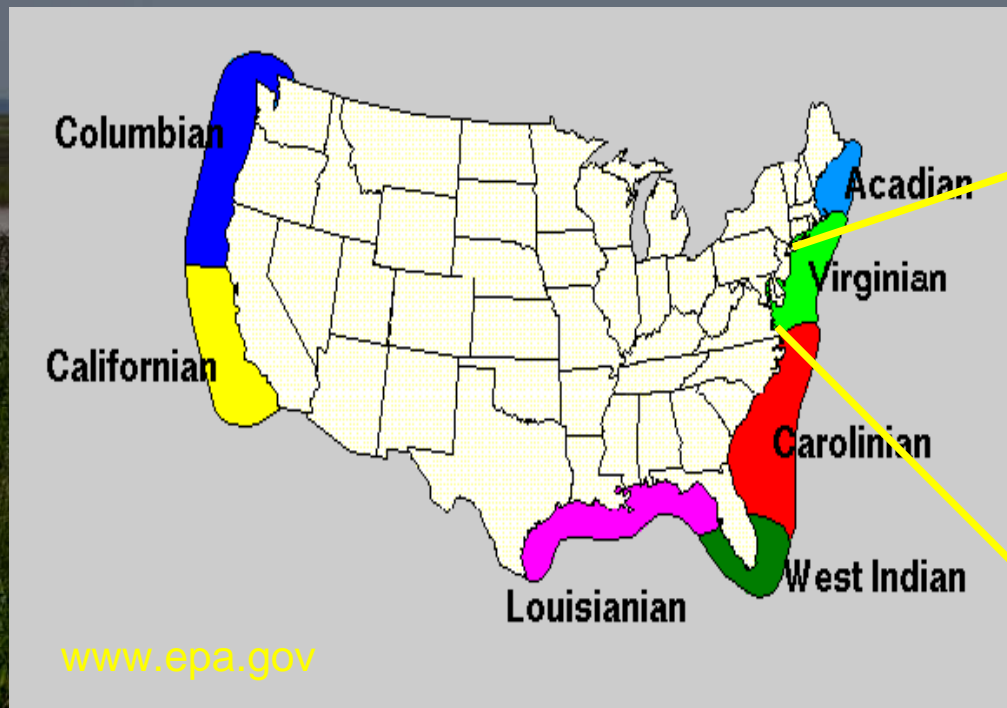
- Glossy Ibis

- Specialist
- Immediate response



# STUDY SITES

“...wide geographic ranges permit comparisons of responses among sites, setting up natural experiments.” (Kushlan 1993)



New York Harbor



VCR-LTER

# Nest-Site Observations

- Remote camera technology
- Observation blinds
  - Incubation
  - Parental visitation
  - Sibling dominance



# Ptilochronology

- Feather Growth indicates nutritional condition (Grubb 2006)
- Alternating light/dark bands represent 24-hour growth (Riddle 1908, Wood 1950)
- Nutritional stress slows growth
  - results in narrower growth bars
- Comparisons between individuals



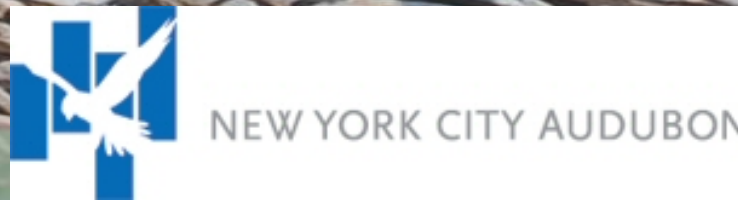
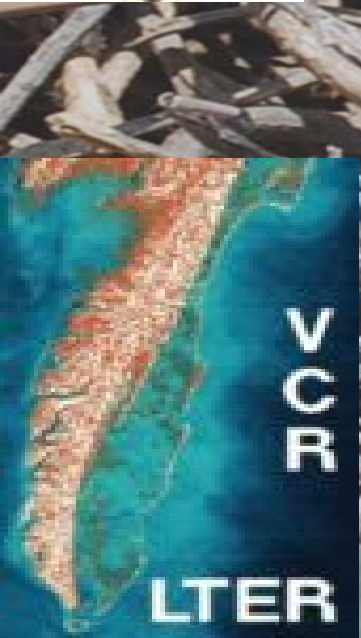
# Ptilochronology and Waterbirds

- Novel tool for bioindication
- Nestling nutrition result of known location
  - Better indicator of local habitat health?
    - Immediate response – natural selection favors rapid feather growth
- Habitat quality comparisons within and between colonies
- Inexpensive





# QUESTIONS?



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