Riparian Mercury Biosentinels for the San Francisco Bay Area

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17 October 2012
Presentation Outline

Background: WRMP project, Hg in riparian food webs

Study design: Choosing and testing a biosentinel species

Study results: Hg levels observed in biosentinels
Wetlands Regional Monitoring Program (WRMP) Pilot of the 1-2-3 monitoring and assessment framework

Landscape-level tools:
Map-based inventories
Landscape analysis

California Rapid Assessment Method (CRAM)

Geomorphic protocols
Riparian biosentinels
Project Goal

To develop a monitoring tool that will be useful for protecting the environment in the San Francisco Bay Area by indicating methylmercury exposure in riparian food webs.
Mercury Risk

- Mercury is a problem in Bay Area aquatic and wetland habitats
- Little is known about exposure of wildlife in stream riparian areas
Lots of Riparian Area

Riparian Buffer Tool

www.ecoatlas.org
Biosentinels: “Carefully chosen species that are sensitive indicators of a condition (methylmercury bioaccumulation) over a specific area and time of interest.”

• Integrate over appropriate spatial and temporal scales

• Exposure can be interpreted in terms of effects
Local and national experts

- Mercury science
- Riparian wildlife natural history
- Riparian mercury bioaccumulation
- Biosentinels
- Mercury monitoring
Selecting a Biosentinel Species

- Represents the habitat of interest
  - Riparian associated
  - Year round residents
  - Small home ranges

- Feasible to capture
  - Widespread and abundant
  - Established mist netting methods

- Able to accumulate methylmercury to a range of detectable levels
  - Previous Hg studies
  - High trophic level
  - Adult survivorship not impacted by ambient Hg

Song Sparrow
(Melospiza melodia)
Conceptual Model

- **Total Mercury Contamination**
  - **HighHg-LowME**
  - **LowHg-LowME**
  - **LowHg-HighME**
  - **HighHg-HighME**

- **Worst Case Scenario**
- **Best Case Scenario**
Field Work!

- 20 sites, 1-2 days
- Field teams of 2-3 people
- Target $\geq$ 3 SOSP/site
- Blood and feather samples
- Birds were released after sampling

Photos: Tom Goodier
Success!!

- **Song Sparrows sampled at all 20 sites**
- **Samples sizes were 3-13 SOSP at 19 sites**
- **Range of Hg values: 0.01 - 2.7 ppm**
Reduced breeding success by
Song Sparrow Hg by Site
SOSP protective of other species

- 25 Species sampled
- Avg Hg by species of < 0.01 – 0.51ppm (0.26 ppm in SOSP)
- Hg highest in flycatchers, and lowest in finches (but small sample sizes)
Uses for this tool

• Establishing baselines or targets:
  • What is ambient?
  • What is best achievable condition?

• Site conditions:
  • Do riparian birds at a particular site have high methylmercury exposure relative to ambient?

• Stream projects and management actions:
  • Project performance
  • Before vs. after
  • Upstream vs. downstream
Summary

- Song Sparrows are a good biosentinel

- Exposure at some sites was above levels of concern

- Landscape level indicators of Hg and methylation environment were predictive
Acknowledgements

• Science Advisory Group
  Dave Evers  Biodiversity Research Institute
  Jim Wiener  Univ. of Wisconsin, La Crosse
  Michael Fry  American Bird Conservancy
  Geoff Geupel  Point Reyes Bird Observatory
  Alvaro Jaramillo  San Francisco Bay Bird Observatory
  Stephen Rottenborn  H. T. Harvey and Associates
  Carrie Austin  SF Bay Regional Water Quality Control Board

• SFBBO, PRBO Conservation Science, and volunteers who helped with fieldwork

• Prop 50 funding, Andree Greenberg SF Bay Regional Water Quality Control Board
Thank you

Questions?
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