

Regional Monitoring Program Forum: Science to Support Management of Methylmercury in Restored Tidal Marshes

Management Questions

For each of these management questions, there are scientific questions to address related to the appropriate sampling approaches and monitoring protocols, as well as to the selection of appropriate biosentinel species to use as part of a site-specific or a regional monitoring program.

1. What is the effect of increased tidal action and impact on mercury bioaccumulation in wildlife over timescales of about one year and longer than one year?
2. What are the local versus regional environmental impacts due to restoration projects?
3. Do managed ponds, e.g., salt ponds and duck clubs pose higher risks to wildlife than tidal marsh restoration projects?
4. What are appropriate thresholds of concern to apply in decision-making?
 - a. Do mercury concentrations in indicators exceed thresholds such that management actions are needed?
5. What do we know about designing restoration projects to reduce the risk of mercury impairment?
6. What is the net benefit of restoration (flood protection, habitat, protection against sea level rise, etc.) that can be weighed against the possible increased risk of mercury exposure for wildlife?
7. What is the cumulative impact of planned bay-wide restoration efforts? Should we be concerned about “tipping point” of system-wide increased mercury bioaccumulation resulting from large scale restoration over time?

Management Hypotheses

For each of these we are interested in knowing what information is already available, or could become available, to test the hypothesis, and what would be needed to confirm or refute the hypothesis.

Hypothesis 1: The effect of tidal action on restored sites will likely result in a local short-term transitory spike or increase in methyl mercury production but we are unlikely to see levels of concern in biota that warrant management action.

- a. What information is already available to test this hypothesis, or could become available?

Hypothesis 2: Methylmercury loading from wetlands and restoration projects is not a major factor in the observed Bay-wide mercury impairment (e.g., bird and fish tissue levels).

Hypothesis 3: We do not expect to be able to measure the regional impacts of tidal restoration projects on the food web.

- a. What would you measure to confirm or falsify this hypothesis?

Hypothesis 4: We do not have sufficient information to design tidal marsh restoration projects to reduce the risk of mercury impairment.

Hypothesis 5: It is possible to design or manage restored marshes to reduce methylmercury exposure.

Hypothesis 6: Foraging in managed ponds is a more important route of exposure to mercury for piscivorous birds like terns, than tidal marshes.

Design Principles

The Water Board envisions that two tiers of monitoring will be useful for providing information relevant to management of wetlands. The first tier of monitoring or surveillance should be closely tied to the beneficial uses to be protected. Thus, integrative measure like bioaccumulation in sentinel species constitutes a useful first step in detecting problems. Once problems have been detected, or problem-free areas have been identified, a deeper understanding of underlying processes may be needed in order to craft an effective management response to the detected problems or to try to replicate low-exposure habitats.

Design Principle 1: Biosentinel species are appropriate to monitor to provide information on management questions 1, 2, 3 and 7 above, and to identify areas where more detailed process studies should be done.

- a. what are the time and space considerations given our management questions and hypotheses to test?

Design Principle 2: Process studies should be done at only a subset of sites, which biosentinel monitoring can help to identify. Process studies can help to answer management question 5 above.