



American Pygmy Kingfisher
(*Chloroceryle aenea*)

SPECIES AND TAXA WE STUDY

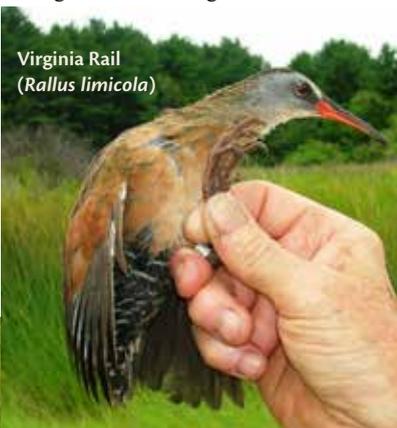
Freshwater and coastal wetlands are highly productive ecosystems that are home to a wide variety of species. Examples of species we study include:

- Estuarine birds such as Saltmarsh, Nelson's, and Seaside Sparrows, Clapper Rails, and Willets
- Emergent wetland birds such as Red-winged Blackbirds and Virginia Rails
- Bog birds such as Rusty Blackbirds
- River floodplain birds such as kingfishers
- Fish and invertebrates

Where We Work

BRI biologists work around the globe, including in:

- Canada
- Costa Rica
- Mediterranean Sea
- Mexico
- Nicaragua
- Panama
- Puerto Rico
- Russia
- United States



Virginia Rail
(*Rallus limicola*)



Above top: Kingfisher sampled and banded in Costa Rica.
Above: Virginia Rail sampled and banded in Maine. Left: Nonlethal sampling of a smallmouth bass for mercury monitoring in New England.

BRI's WETLANDS PROGRAM

Because wetland environments serve as “sponges” for pollutants, wildlife that depend on these habitats are often exposed to elevated levels of contaminants. For instance, wetlands including salt marshes promote the conversion of inorganic mercury to the highly toxic organic methylmercury. Birds and other organisms that occupy wetland habitats may be particularly vulnerable to methylmercury exposure—high concentrations can impair behavior, physiology, survival, and reproductive success.

In addition to mercury exposure, wetland bird populations are threatened by the loss of habitat associated with human development, sea level rise due to climate change, invasive species, and pollution. BRI's Wetlands Program investigates a wide range of issues, from ecological studies of fish and fish-eating birds, such as the Belted Kingfisher, to injury assessments of damage caused by contaminants.

Investigative Capabilities

- Contaminant analysis of:
 - Sediment/soils
 - Zooplankton and macro- and micro-invertebrates (marine and fresh water)
 - Fish (whole body and nonlethal tissue/blood)
- Bird and bat surveys
- Capture and nonlethal tissue sampling for contaminant exposure
- Health assessment, disease, and genetic studies
- Tree Swallow nest box monitoring (below)
- Wetlands delineation



Tree Swallow
(*Tachycineta bicolor*)



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BIODIVERSITY RESEARCH INSTITUTE WETLANDS PROGRAM



Saltmarsh Sparrow (*Ammodramus caudacutus*)



CONTAMINANTS MONITORING

Bird blood, feathers, and eggs provide direct insights into the short- and long-term exposure to contaminants through diet. Sampling broadly throughout the landscape helps biologists identify “hotspots” of contaminant exposure, and sampling annually helps us monitor contaminant levels over time. Such information has proven pivotal in guiding policy decisions to regulate pollutants.

BRI biologists have more than 20 years experience assessing heavy metal and PCB exposure in fish-eating birds, rails, shorebirds, and songbirds. Through BRI’s Toxicology Lab, we offer expedited service to analyze any tissue for total mercury. Our portable lead analyzer is available to measure lead concentrations in blood.

We sample freshwater and marine zooplankton, invertebrates, freshwater and marine fish, birds, and bats around the world for a variety of contaminants using appropriate capture methods.

Examples of our contaminant monitoring projects include:

- Long-term mercury monitoring of fish at Fifteen Mile Falls on the Connecticut River
- Long-term mercury exposure monitoring, food web and demographic studies in Maine, Massachusetts, and New York, 2004-present. Taxa: Saltmarsh, Seaside, and Nelson’s Sparrows.
- Multidisciplinary assessment of mercury contamination in wetlands in Nicaragua and Costa Rica
- Sampling biota for mercury contamination in the Mediterranean Sea in collaboration with the European Union-Global Mercury Observation System



Red-winged Blackbird (*Agelaius phoeniceus*)



BRI’s wetland scientists conduct research with local, state, and federal agencies as well as other conservation organizations to examine the effects of habitat loss, sea level rise, and pollution on wetland bird populations.

Since 2003, the majority of Wetlands Program work has focused on U.S. Fish and Wildlife Service Natural Resources Damage Assessment (NRDA) projects to assess injury and risk.

Representative NRDA projects include:

- Pilot assessment of mercury exposure to songbirds in Pompton Lakes, New Jersey, 2014-2016. Taxa: passerines, focusing on Carolina Wrens and Spotted Sandpipers
- Mercury study in the Penobscot River estuary, Maine, 2006-2010. Taxa: songbirds, Virginia Rails, Nelson’s Sparrow, Belted Kingfishers, and Semipalmated Sandpipers
- Evaluation of mercury and PCBs in birds on Onondaga Lake, New York, 2008-2009. Taxa: passerines, Spotted Sandpipers, Killdeer, and Belted Kingfishers
- Assessment of methylmercury availability to bats and birds on the South River, Virginia, 2007-2009. Taxa: songbirds and Belted Kingfishers
- NYANZA Superfund Site: Mercury risk to biota, Sudbury River, Massachusetts, 2003-2004. Taxa: wetland songbirds, Tree Swallows, and Belted Kingfishers

Examples of other wetland projects include:

- Nonlethal surveillance of shorebirds for avian influenza in Maine and Massachusetts, 2009
- Assessment of mercury contamination in Nicaraguan and Costa Rican wetlands, 2010-2014
- Pilot study of environmental contaminants in Guerrero, Mexico, 2013

SURVEYS AND TRACKING

Conservation biologists are continually challenged to evaluate the status of bird populations. We prioritize collecting information needed to detect and measure changes in the stability of bird populations. In order to achieve this, we survey populations to document the number of individuals, breeding pairs, or young produced in an area.

Birds can be detected by direct observation (counting), acoustics (responses to playback calls), or by capturing and banding them.

In addition to surveys, we use tracking methods to learn valuable information about home range, habitat use, daily activities, migration, and other aspects of bird ecology. Tracking methods include:

- Radio tracking of Saltmarsh Sparrows, Carolina Wrens, and other species to locate hidden nests and monitor productivity and survival related to contaminants
- iButton® sensors that record temperature and monitor incubation behavior of nesting birds
- Geolocators on willets that document migration timing and help us identify stopover and wintering locations



Top: Eastern Willet fitted with a geolocator tracking device. Right: Red-winged Blackbird nest.



ABOUT BRI

Biodiversity Research Institute (BRI), headquartered in Portland, Maine, is a nonprofit ecological research group whose mission is to assess emerging threats to wildlife and ecosystems through collaborative research, and to use scientific findings to advance environmental awareness and inform decision makers.

BRI supports 10 research programs within three research centers including the **Center for Ecology and Conservation Research**, the **Center for Mercury Studies**, and the **Center for Loon Conservation**. Within the Center for Ecology and Conservation Research, BRI manages the following programs:

Taxonomic

- Mammal Program
- Marine Bird Program
- Raptor Program
- Songbird Program
- Waterfowl Program



Ecosystems

- Arctic Program
- Tropical Program
- Wetlands Program

Environmental Issues

- Wildlife Health Program
- Wildlife and Renewable Energy Program

BRI has been conducting scientific inquiries for private sector and government clients nationwide and globally since 1998. Using both traditional and innovative approaches, our researchers collect, analyze, and interpret scientific results on how ecological stressors affect living systems.

By incorporating regional data and developing strategies for collecting additional data, BRI has effectively modeled such stressors on species and community distributions, phenology, adaptive strategies and population viability across tropical, temperate, and arctic biomes.

BRI’s Toxicology Lab has the capacity to analyze various tissue samples for mercury concentrations.

For more information, visit:
www.briloon.org/services