



## **Genomics and Genetics Research at USGS Patuxent Wildlife Research Center**

The application of genetic and genomic methods to ecology and toxicology is transforming our understanding of the responses of avian and other terrestrial species to environmental changes. We can now measure both short-term and long-term (evolutionary) genetic responses in species



that are exposed to natural and man-made stresses. At Patuxent Wildlife Research Center (PWRC), a multidisciplinary approach combining high-throughput sequencing, genotyping, and gene expression profiling with laboratory experiments and field studies helps us understand the responses of organisms to their environment.

### **Contaminants Studies and Genomics**

Among the major challenges in evaluating ecosystem health is predicting the effects of pollutants in different species. Commonly, the effects seen in an easily tested species are also assumed to occur in other species that are difficult to study. We can now use molecular techniques to sample vulnerable species with only minimal disturbance of the organism, improving our evaluation of effects on susceptible populations. Current research at PWRC is focusing on the effects of DNA damage from exposure to contaminants and on genetic factors that account for species differences in sensitivity to pollutants. Mercury is found throughout our environment, both naturally and from human activities. Laboratory studies have shown that bird species differ in their sensitivity to mercury. We are identifying genes that respond to mercury exposure to help us evaluate the effects of this pollutant on the health of birds and improve our understanding of differences in susceptibility to mercury.

### **Molecular Systematics**

Our Biological Survey Unit at the Smithsonian Institution is using the tools of molecular genetics to re-examine the genetic distinctness of species and populations of birds, to determine if the current designations and distributions of species and subspecies are correct. Accurate understanding of these fundamental concepts is crucial. It provides both the biological and legal foundations for effective conservation action, whether by domestic resource management agencies or by other countries throughout the Hemisphere, connected to the United States by international treaties and common conservation threats. Molecular studies of birds from relatively pristine tropical environments, like the Amazonian antwrens pictured here, provide a rare opportunity to understand how natural forces shaped the evolution and distribution of species before human intervention. These insights will help us to better understand the degree of impact man has already had on bird species and how we can minimize such impacts in the future.

