Audubon's niche
in the complex world of bird conservation is engaging people to find solutions to environmental issues. Citizen science is an important tool for Audubon, with huge global opportunities.

Think Local, Act Global

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In July of 2005, the world experienced the spectacle of Live 8, a global musical concert that engaged 10 concert arenas, 1 million spectators, and more than 3 billion remote viewers. The focus of the event was to mobilize people interested in music and world affairs in a unified call to remove debt from African countries and so help in the development of those states.

What if, similarly, we could bring together millions of birders from around the world, and focus their interests and influence on bird conservation? For some years now, Audubon has envisioned just that: the birding equivalent to Live 8.

Actually, we are on the path to realizing such a dream. Citizen science participants around the globe today are contributing records online for all taxonomic groups of plants and animals, building a global database that can help us become good stewards of the earth's biodiversity.

Mining Biodiversity

On a global basis, the natural world is under attack, and measures of biodiversity are in decline as habitats are destroyed, degraded, and sterilized: Just take a walk and look around your own neighborhood. Observations recorded by people and stored in various ways, be it a university computer or a naturalist's notebook, thus are especially important—becoming a real-time library of an area's biodiversity.

Citizen science can harness the unique power of birds to inspire individuals to care about and to act on behalf of nature. We can create a new culture of conservation—one in which people from all walks of life make informed decisions in their daily routines that positively impact their environment. Action is the goal, and citizen science provides one way for informed citizens to become engaged.

Birds and People as Indicators

By engaging people in counting, we can increase their appreciation of wildlife and in turn muster them to action in influencing wildlife conservation policy.

You contributed to bird conservation by taking part in the Christmas Bird Count. Through our partnership with the U.S. Geological Survey's Patuxent Wildlife Research Center, new methods of analysis continue to enable us to use long-term information from the CBC to give us population trend information on species not captured by any other monitoring program. Typically, these are northerly breeding species not covered well by the Breeding Bird Survey. For example, our new analysis of CBC data for Northern Shrike revealed a significant decline of 1.3 percent per year between 1966 and 2003. Likewise, our analysis for Harris's Sparrow shows a decrease of 1.8 percent per year over the same time period,

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while the results of our analysis of population trends for Rusty Blackbird are similar to those revealed from the Breeding Bird Survey, of 5.2 percent annually since 1965/66. This latter figure translates to a total decline of 86.4 percent over this period.

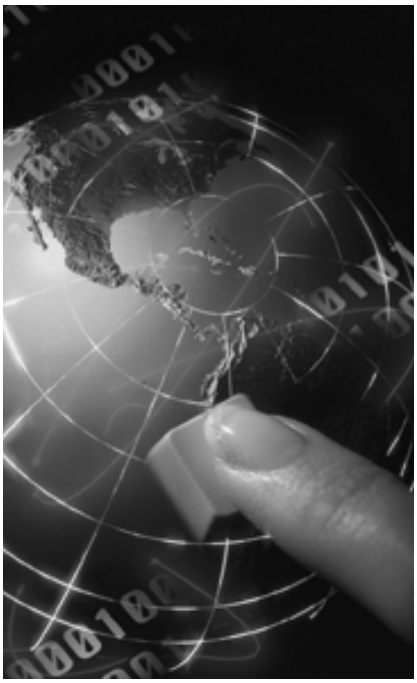
Such information can help us prioritize species for further research and conservation action. We can expect new findings in our next State of the Birds report, due in 2006, which will bring home a sense of how important your CBC activities are to assessing population trends in wintering species in North America. CBC data come from a broad geographic spread, from the North American arctic to the waters of the Drake Passage, and from Bermuda to Guam. The Internet greatly facilitates integration of data from a broad geographic spread.

The Utility of the Internet

The Internet already plays a part within the CBC. Compilers submit count information online, and increasingly the CBC web site facilitates analyses and provides easy access to results from the CBC, a role that will increase dramatically over the next decade. More generally, the use of Internet-accessible technologies explodes to a new scale the world of citizen science in its capacity, scope, and scale.

Internet technology can provide the *capacity* to receive enormous amounts of information about natural systems from a variety of sources and geographic locations simultaneously.

The Internet broadens our *scope* by allowing instant integration and display



of environmental data, permitting real-time comparisons against long-term patterns to detect subtle changes and, as necessary, to sound warning signals.

The Internet can draw on the observational power and abilities of millions of people worldwide to supply real-time biological monitoring at many *scales,* from our local woodlot to entire continents.

By engaging large numbers of individuals, we not only get the closest possible glimpse of the "heartbeats" of natural systems, but we pique countless individual human spirits in the process.

The Internet presents a powerful and constructive opportunity to unite a dispersed human populace with its natural landscape. Perhaps most importantly, the power of the Internet is its capacity for fast, meaningful, *two-way* transfer of information between dispersed consumers and a centralized server. In other words, not only does the Internet allow you to input your data, it also allows you to see the results of your work in an easy to digest form, and in the context of information sent in by others.

Finally, by facilitating the contributions of large numbers of citizen scientists, the Internet has important economic benefits, too, helping organizations achieve results they could not pay to have done by employing professional scientists.

Exploiting the Internet's Potential

To realize our global vision of citizen scientists contributing to a global knowledge base of bird information, a number of elements need to be in position. We need birders who are motivated to contribute to bird conservation. We need programs that structure information gathering to keep birders motivated. We need technologies to capture that information easily. We need people to develop and run the technologies. We need systems that can reliably integrate and then analyze this information together with the scientific structure to frame the important questions. Finally, we need systems that can take the processed information and use it to inform policymakers directly and indirectly and provide feedback to birders. All of this needs a global geographical spread.

The history of the CBC gives us an allegory for this development. In 1900, the first CBC united birders who were motivated to contribute to bird conser-

To find out more about global biodiversity, go to these web sites.

The Global Biodiversity Information Facility (GBIF) <www.gbif.org> is a coordinated international scientific effort that enables users throughout the world to discover and put to use large quantities of information on global biodiversity. In North America, the United States and Canada have their respective entry points to GBIF.

The National Biological Information Infrastructure (NBII) <www.nbii.gov> is a collaborative program that provides increased access to information on the biological resources of the United States.

The Canadian Biodiversity Information Facility <www.cbif.gc.ca/home_e.php> explores new ways to improve the organization, exchange, correlation, and availability of basic information on biological species of interest to Canadians.

The Avian Knowledge Network <http://avianknowledge.net> is organizing the rich data resources of the bird monitoring community and making these data available to the biodiversity community. Additionally, the Avian Knowledge Network is exploring new analytical techniques, which take advantage of new statistical, high performance computing, and machine learning applications to better understand the distribution and abundance of bird populations across North America.

vation in a program that gave some structure to the information gathered (birders, program). In 1999, the first web-based CBC data entry captured the information from CBC compilers easily (data capture, science framework). In 2004, the application of advanced statistical techniques analyzed the data to give reliable results (information). In 2006, our next State of the Birds report will incorporate the new information from the CBC to inform policymakers, and become available to anyone with access to the Internet.

A Thread in a Broader Tapestry

The example of the CBC is one thread in a broader tapestry of developments taking place around the world, and into which Audubon will need to become integrated. One of the germs of these new developments came about when Frank Gill asked the question in the 1990s: "If we built an online system and asked people to send us their bird data, would they do it?" We did not know the answer to this simple question so, partnering with the Cornell Lab of Ornithology, we developed some new programs and applications. The first of these was the Great Backyard Bird Count (GBBC, www.birdsource.org/gbbc). The answer to the question that this program provided was a resounding "Yes." Subsequent development of the eBird <www.ebird.org> application brought some qualifiers: Response is more positive if the program is structured (as in the GBBC) than if it is freeform (eBird). We continue to collaborate with our colleagues at the Cornell Lab of Ornithology to build on the early success of eBird to improve its use for birders and so populate the databases for conservation use.

Important Bird Areas

There are many other projects that bring birders to the table. For Audubon, perhaps the greatest is the Important Bird Areas (IBA) program, which focuses our conservation efforts on the most important sites for birds. The IBA program is a global initiative of BirdLife International; currently there are programs in 130 countries and more than 10,000 IBAs already identified. BirdLife is an organization of partners; Audubon, as the U.S. partner, is responsible for the oversight of the IBA program throughout the country, and is a supporter of programs throughout the hemisphere. The IBA program identifies sites by virtue of the bird species that use them, inventories species present, and then monitors those bird populations together with their habitat, threats to the site, conservation actions at each site, and the response of the birds to those conservation actions. State-based IBA coordinators log these data into Audubon's new online IBA database, and will log their raw bird data into eBird (or a data-storage system of their choice). The new version of eBird, available later in 2005, has tools that make it simple for IBA coordinators to download and summarize data trends for the IBA database. While IBAs are chosen because of the birds that use them, new evidence reveals that they are important in maintaining a broader biodiversity. For example, the Forest Department of Uganda has gathered comprehensive inventories of five taxa (birds, butterflies, large moths, small mammals, and woody plants) for all of Uganda's 50 forest reserves, and independently, Nature Uganda (BirdLife in Uganda) identified 13 IBAs that were also forest reserves. These were found to contain a very high proportion of the total number of species of each of the five taxa—not just birds—recorded for the full set of 50 reserves, illustrating the crucial role IBAs can play in protecting many kinds of wildlife and plants.

EBird is one of a family of online checklist programs that serve various parts of the world. Other nations that have their own programs include Britain and Ireland <www.bto.org/birdtrack>, Turkey <www.kusbank.org>, Kenya <www.worldbirds.org/kenya/Main.php>, Denmark <www.dofbasen.dk>, and Sweden <www.artportalen.se/birds/default.asp>. These programs are part of a growing family of BirdLife partners that can be explored through www.worldbirds.org.

Part of the excitement within the IBA community is how each locally coordinated program rolls up into something much bigger. For example, by using standard scoring for monitoring at IBAs, BirdLife can "roll up" its results to assess how it is doing at a country, continent, or global scale. Citizen science monitoring of birds at your local IBA becomes a global act <www.audubon.org/bird/iba/index.html>.

Since the work that Audubon and its BirdLife partners coordinate is just one small part of the complex world of bird monitoring, these data could one day feed into larger databases or could be queried across distributed locations. The Global Biodiversity Information Facility aims to facilitate such data access, and in North America we have our own nodes, the National Biological Information Infrastructure and the Canadian Biodiversity Information Facility. The North American continent also has an exciting program in development, the Avian Knowledge Network, for analysis and presentation of the results. (See sidebar on page 11.)

And Now for Birding

What all this means is that your observations during the Christmas Bird Count season and the Breeding Bird Survey, and your checklists submitted to eBird or its WorldBirds equivalent, could contribute not just to the results for that survey, but can feed through into larger data sets that will be used increasingly by statisticians, biologists, and other scientists of a wide range of disciplines. Researchers will use these data to answer questions on changes in population numbers and distributions, community changes, and biodiversity trends. The data will be used to try to pinpoint causes of these changes, such as global warming, pollution, habitat loss, and others.

So think locally about how you can become engaged in citizen science projects. Know that you'll be acting globally as your information feeds into larger datasets with broader access to answer questions about the greater world in which we live.