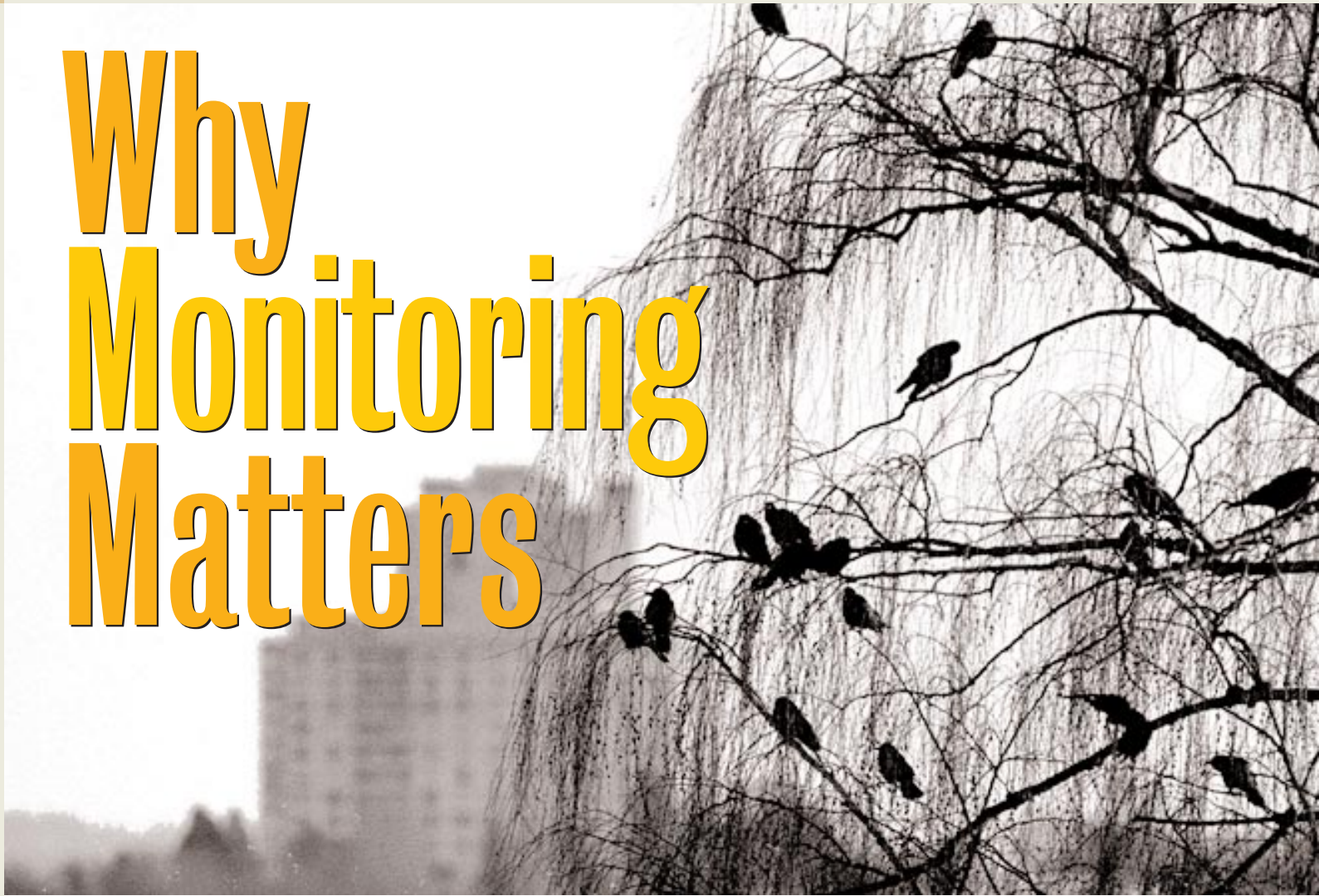


Why Monitoring Matters



COUNTING BIRDS IS HARD. Have you ever tried something simple, like counting the number of chickadees or hummingbirds coming to a feeder? Or the number of sandpipers in a flock, or the number of warblers breeding in a patch of woods? Not as easy as you might think, right? How about

changes in the size of a population of a species whose range spreads over many thousands of square miles? Not a trivial matter.

And yet, knowledge based on such counts is the very basis for all bird conservation actions. Because of the clever foresight of people like Chandler Robbins, we have been monitoring the continent's bird populations, assessing them for status and changes, for some time now, and the cumulative results are providing insights that would otherwise be unattainable. This is the only way we have of knowing that birds like Cerulean Warbler or Baird's Sparrow really need conservation attention. Without these data, we would not have known that Partners in Flight was needed to stem declines. Of all of the activities that make up the

whole of bird conservation, nothing is more central and critical than monitoring.

But many people involved in this field still do not fully recognize the importance of monitoring. This issue of *Bird Conservation* is dedicated to increasing this awareness and to thanking the scientists and amateur bird-counters whose great efforts over many years have brought the needs of birds the attention they deserve.

WHY MONITOR?

Monitoring is a lot of work. By definition, a monitoring program is a series of repeated surveys; to implement monitoring, surveys have to be designed, then actually conducted; data have to be entered into computer files, edited, and analyzed; and

then the survey has to be periodically repeated. When is it worth the effort? Why should policymakers, managers, and ornithologists support a monitoring program? If these questions are not answered, then the monitoring program has little chance for success. Here, I argue that monitoring data play an important role in providing credible information for use in policy development, management, education, and scientific research. Developments in adaptive management, data analysis methods, and publishing of monitoring data on the internet permit timely access to the information and better guidance regarding its use.

► *Monitoring provides critical information about population change that is used for setting priorities for conservation and management of birds.* By providing consistently collected and geographically extensive information on bird populations, monitoring programs such as the North American Breeding Bird Survey (BBS) and the Waterfowl Breeding Population Survey (BPS) permit summary analysis of population change in bird species at many geographic scales. Policymakers use this information to identify

species and species groups that appear to be declining, and can then devote resources to management of these species. Monitoring data thus provide quantitative evidence that can be used to argue the need for management actions. This scientific documentation of past population change has been a primary role of the BBS, as shown by its use by regulatory agencies such as the U. S. Fish and Wildlife Service in identifying species of management concern and by Partners in Flight to prioritize species conservation efforts.

Of course, a great deal of recent monitoring effort has been at more local scales, in National Parks, National Wildlife Refuges, Department of Defense lands, and other managed land areas. Monitoring at this scale should not be considered as simply providing data to national programs with little local relevance: a common misconception among local managers that often limits enthusiasm for monitoring. Ironically, local information does not necessarily provide insights into regional population change, but instead is most useful in providing a local context for regional issues. Land managers can use the local information to fulfill their responsibility to document the status of wildlife species on their properties and to incorporate bird distribution and change data into decisions about land management.

► *Monitoring tells managers the present population status of species.* All effective management of bird populations requires good information about present population status and historical changes in the population. Without this information, it is impossible to make informed management decisions or assess consequences of management.

Waterfowl harvest management provides the most sophisticated example of use of monitoring data in a management program. Waterfowl monitoring is based on a survey specifically designed to provide population data for management. The BPS is conducted each spring to provide information on the current population levels of ducks in the northern United States and Canada. Timing of the survey and data management ensure that results will be available for the development of regulations for the fall hunting seasons.

Unfortunately, clear management contexts do not presently exist for many monitoring programs, although they are occasionally used as supplemental information for management. For example, the BBS is now used in development of Mourning Dove harvest regulations. Developing these management uses for monitoring programs is important in ensuring the relevance and use of the information.

Local monitoring programs also provide

critical information on the status of populations. Land managers need to know both where populations occur, and how populations are changing, in areas to be managed. Unfortunately, this use of monitoring data is still poorly defined for most managers, as the Geographic Information System and georeferencing tools needed for area-specific management have only recently become routinely available to managers, and often the expertise and procedures to use monitoring data in land management are not available to land managers.

► *Monitoring has scientific and educational applications.* Managers are beginning to see the role of monitoring programs in education and interpretive activities. The Internet availability of the BBS has provided schools and nature centers with an important resource for looking at population change of nearby bird populations, as well as supplemental information on bird identification. Teachers use the information as a tool in many innovative ways, including using technical information about population change to test the students' hypotheses.

Recently, when our BBS analysis web site was temporarily unavailable, I was astonished that teachers were actually calling to find out when the technical tools for estimating population change would be fixed! Scientists use the same data in (slightly) more sophisticated tests of hypotheses; many monitoring programs provide the only source of landscape-level bird data for the emerging field of landscape ecology. And, of course, conservationists use survey data to test predictions about population change in birds.

► *Monitoring provides necessary, but not sufficient, information for managers.* One thing that monitoring does not do is tell managers how to manage. Management involves (1) developing objectives and setting population goals; (2) assessing the status of the population relative to the goals; (3) predicting the consequences of alternative management actions, then taking management action, (4) assessing population status after the management actions, and (5) deciding on future management based on results of earlier management. Monitoring does little to assist managers in (3). This is a frustrating aspect of monitoring.

By themselves, monitoring results de-

scribe pattern of population change over time, but do not provide insights into causes of population change. Monitoring can increase our understanding of the system only when it is placed in an experimental design, with monitoring in controls and treatments, or in an adaptive management context. In adaptive management, the management is used in conjunction with monitoring to increase our understanding of the system.

Management involves manipulating some part of the environment (such as harvest or habitat) to influence population dynamics. Unfortunately, our ability to predict the consequences of most manipulations is often quite poor, hence there is uncertainty about the outcomes of management and controversy about what management action to take. Harvest regulations are a good example of uncertainty implicit in management; we cannot predict the consequences of moderate changes in harvest rates on population dynamics of waterfowl.

In an attempt to decrease the uncertainty and limit the controversy about hunting regulations, the Fish and Wildlife Service has recently begun an innovative program of adaptive harvest management. In this program, alternative models are developed to evaluate the consequences of harvest on waterfowl populations. These models are used to predict the consequences of a management action for population change, and range from predicting no effect of harvest on population change to a large effect of harvest on population change.

After management occurs our view of which model is correct is updated based on how the population changed, and that model is more influential in future predictions. In this way, our understanding of how the system works is increased by management. In adaptive management, monitoring data are used to assess the population size before and after management. An adaptive approach can also be applied to habitat management, and may provide a specific management context for area-specific surveys.

► *Monitoring data are becoming more relevant and accessible as our understanding of use of the data increases.* Often, use of monitoring data is limited by lack of access to both data and technical tools that allow users to actually incorporate the information into management. New technologies, better access to information, and method developments are all making monitoring

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Monitoring provides insights that would otherwise be unattainable.

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data much more relevant to managers. Geographic information systems and Global Positioning Systems permit incorporation of monitoring information in management at local scales.

Adaptive management procedures explicitly incorporate monitoring information into management decisions and provide a role for monitoring in increasing our understanding of the dynamics of the systems. Educational and scientific uses of monitoring data provide many opportunities to learn about bird populations and educate the public about birds. And, of course, the Internet is facilitating all parts of information accessibility and transfer.

A consequence of all these uses of monitoring data is increased scrutiny of monitoring programs. All monitoring programs have limitations, and must be constantly evaluated to document possible problems

New technologies are making monitoring data more relevant to managers.

and modified to minimize the consequences of the limitations. The BBS provides good examples of limitations imposed by the compromises needed to implement a monitoring program.

The BBS has been criticized for two limitations: (1) the point counts are not censuses, but miss some proportion of birds at each stop; and (2) the roadside counts may not adequately represent the landscape. These are valid criticisms, and as the BBS receives more intensive use by managers they require more investigation to evaluate their effects on the survey. Research at USGS Patuxent Wildlife Research Center is presently aimed at enhancing the credibility of the BBS by evaluating possible limitations of BBS data and developing alternative sampling methods that permit estimation of proportion of birds missed at sampling sites and minimize roadside bias.

—*John R. Sauer, USGS Patuxent Wildlife Research Center*



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