Birds as Indicators of Long-term Environmental Change:

National Bird Monitoring Recommendations (2010-2020)

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Purpose: This document represents a collaborative effort by federal, state, and non-governmental partners to identify many of the bird monitoring challenges facing Landscape Conservation Cooperatives. It is an outgrowth of the recent *Partners In Flight Monitoring Needs Assessment* (2009) and is structured around the goals and recommendations of NABCI's *Opportunities for Improving Avian Monitoring* (2007) to make specific recommendations for advancing the national and regional implementation of bird monitoring. This document serves as an ideal starting point for prioritizing bird conservation issues among Landscape Conservation Cooperatives, as well as Joint Ventures, in their efforts to collaboratively address the greatest bird conservation needs by designing effective monitoring programs within a strategic national context. A fundamental need for successful Landscape Conservation Cooperatives is the ability to assess the response by wildlife to climate change and other stresses. These recommendations, while developed for birds, provide a strong foundation for a unified strategy to address the information needs for conservation and management decisions affecting all wildlife. Monitoring changes in wildlife abundance, distributions, and demography, as well as engaging the wildlife conservation community in collaborative action, are critical components of Landscape Conservation Cooperatives' and Joint Ventures' roles in understanding, managing for, and evaluating effects of climate change and other stressors on wildlife populations.

Recommended Immediate Actions:

- **Establish a national LCC wildlife monitoring committee, including members of the NABCI monitoring subcommittee, the authors below, and other regional representatives, as they represent a network of professionals that is actively collaborating to positively influence monitoring efforts by existing (e.g., JV) and emerging (e.g., LCC) partnerships.**
- **Secure financial support for national and regionally coordinated bird monitoring partnerships in order to facilitate the flow of monitoring information through varied spatial scales and partners to influence effective conservation and management.**
- **Sponsor a National LCC Monitoring Strategy Workshop to propose a prioritized set of actions for implementing the following recommendations.**

NABCI Goal 1: Fully integrate monitoring into bird management and conservation practices and ensure that monitoring is aligned with management and conservation priorities.

Recommendations:

- Create a fuller vision for monitoring that links conservation and adaptive management within the Strategic Habitat Conservation (SHC) context
    - Author guidance documents recommending organizational structures for national and regional partnerships that combine technical expertise in project management, ecology and behavior of target species, habitat management, field methods, statistical methods, geographic information systems, data management, and communication.
    - Provide clear, concise and objective guidance outlining how bird monitoring can best assess and iteratively evaluate habitat improvements (e.g., timber management) and environmental impacts (e.g., climate change, biofuels, collisions) at national, regional, and local scales, especially for species thought or known to be declining or are indicators of healthy ecosystem processes.
        - Develop monitoring programs to improve understanding of the mechanisms of climate change impacts on bird populations, as one of many stressors.
        - Increase the collection of bird monitoring data that are compatible with indices of ecosystem integrity at the local, regional, and continental scales to provide information about the capacity of ecosystems to renew themselves and continually supply resources and essential services.
        - Identify areas of new energy infrastructure that may pose high risk to bird populations throughout their life cycle, including migration, and establish national monitoring programs with sufficient statistical power to determine the effectiveness of regulations, practices, and mitigation.
        - Develop monitoring programs that can evaluate the success of conservation programs, such as the Farm Bill, at maintaining or increasing bird population sizes on private lands using measurable and transparent population descriptions.

NABCI Recommendation 1.1: Establish a policy level expectation that monitoring will be explicitly acknowledged as an integral element of bird management and conservation.

Recommendations:

- Author concise documents that clearly articulate the importance of bird monitoring to policy makers.
- Include monitoring as a required component of all projects impacting habitat on federal land or use federal funds.

- Use monitoring results to inform the national *State of the Birds Report* and other reports in order to direct annual funding at issues, habitats, populations, or regions of greatest conservation need.

- Develop better coordination among federal and state agencies, NGOs, and Joint Ventures, for example, with regard to how bird monitoring programs are implemented to inform conservation policies.

    - Incorporate analyses of monitoring data and other feedback from adaptive management schemes into updates of United States Forest Service (USFS) and Bureau of Land Management (BLM)'s Resource Management Plans, The National Park Service (NPS)'s General Management Plans, and National Wildlife Refuges' Comprehensive Conservation Plans, and United States Fish and Wildlife Service (USFWS)'s Memorandums of Understanding (MOUs) with federal agencies.

NABCI Recommendation 1.2: Broaden the scope of current monitoring for species that are most at risk, and for which we have inadequate information to make effective management decisions.

Recommendations:

- Fill gaps in status monitoring programs
    - Identity spatial and temporal gaps in monitoring networks.

    - Develop, test, and implement custom protocols for rare and difficult to detect species.

NABCI Goal 2: Coordinate monitoring programs among organizations and integrate them across spatial scales to solve conservation or management problems effectively.

NABCI Recommendation 2: Take specific steps to increase the appropriate coordination of monitoring programs.

Recommendations:

- Establish full-time national and regional monitoring coordinators to improve efficiencies among monitoring programs, define and advance regional monitoring data acquisition needs, and provide opportunities for collaboration among agencies and organizations.

- Develop consistency in habitat assessments

    - Establish habitat data collection protocols that measure variables at scales that are relevant to birds, management, and the classification of remotely sensed imagery.

    - Promote the use of standardized vegetation classification systems (e.g., USGS National Vegetation Classification System) for descriptions of sampling locations.

- Move from monitoring status and trends of bird populations within defined areas to attaining demographic perspectives (e.g., causation, limiting factors) across species' geographic ranges.

    - Address life-cycle 'bottlenecks' for species of conservation concern to identify opportunities for reversing declining trends. In particular, identify where to best implement monitoring to measure the effects of limiting factors on demography during the most sensitive stages of the life-cycle.

    - Establish demographic 'targets' for multiple focal species at local and regional scales.

    - Develop spatially explicit demographic models (e.g., lamda landscapes) that can guide conservation actions.

- Create a resilient forum for monitoring-related issues

    - Develop a web-based social networking and metadata nexus for partners to describe and promote their field monitoring projects, query for other projects with similar attributes (e.g., species, locations, site descriptions), and communicate with other partners.

    - Develop a 'monitoring objectives' information hub that includes recommendations for addressing specific objectives by using sampling protocols, data sources, and analytical methods, as well as links to resources for additional information.

NABCI Goal 3: Increase the value of monitoring information by improving statistical design.

Recommendations:

- Developing consistent sampling frames at the appropriate ecological scales independent of jurisdictional boundaries.
- Create a hierarchically structured grid system (western hemisphere in spatial extent) that can be used to distribute sampling locations for new monitoring programs and spatially integrate data from historical sampling schemes. The grid should also serve as a spatial indexing system for consolidating, finding, and accessing various map layers useful for sampling designs, predictions, and analyses.
- Develop conceptual models of species' annual cycles and threats to their populations that can be used to indentify critical variables to monitor at scales relevant to mitigating the impacts of threats.
- Increase the value of monitoring information by creating tools that can be used to improve statistical design and analysis.
- Design monitoring programs to be adaptive to evolving analytical and decision-making philosophies.

- Refine and promote efficient monitoring protocols that permit the quantification and adjustment of errors and biases and incorporate these protocols into new programs as well as existing programs like the Breeding Bird Survey.

- Support and promote workshops and training guides to teach monitoring coordinators about evolving techniques for quantifying and adjusting for biases and variable detection rates among observers, species, and locations.

- Establish multiple monitoring programs that use different methods to provide independent verification of results.

- Unify models for monitoring, by combining surveys for efficiency and effectiveness.

  - Establish a framework for consistent graphical representations (i.e., conceptual models) of important assumptions, inter-component flows, states, parameters, and uncertainties during the design of monitoring programs and evaluate those models after data have been collected.

  - Establish a framework of web services and open source applications that can be combined and extended to create decision support tools that use monitoring data to address specific conservation needs.

- Promote available tools that emphasize standardized protocols and identify weakness of existing protocols, for example.

  - Establish an information hub for obtaining permits to collect biological samples and one or more repositories for organizing and accessing these data.

  - Establish standard techniques for morphological measurements from captured bird and consolidate existing morphological data into a single database.

  - Create new maps, using data from multiple sources, that have functional relevance to the distribution and status of bird species.

- Design tools for evaluation of monitoring information.

  - Develop a list of evaluation tools that would be of use to the bird conservation community.

  - Establish user friendly data analysis tools, including web-based “black box” tools, that can accept preformatted data, run various analyses, and output intuitive reports.

  - Develop a list of objective questions to aid biologists and managers in evaluating their monitoring program’s effectiveness in advancing local and regional monitoring goals.

NABCI Recommendation 3: Every monitoring program should be designed and periodically reviewed in consultation with input from administrators, managers, and statisticians familiar with bird conservation and survey design.

Recommendation:

- Ensure adaptive management loop is closed by periodic evaluation of the utility of results obtained through monitoring programs.

NABCI Goal 4: Maintain bird population monitoring data in modern data management systems. Recognizing legal, institutional, proprietary, and other constraints, provide greater availability of raw data, associated metadata, and summary data for bird monitoring programs.

NABCI Recommendation 4: Develop a comprehensive plan for integrating and managing bird population monitoring data.

Recommendations:

- See Meeting the *Challenge of Data Management for Bird Conservation* that was developed in January 2010, following the NABCI Data Management Workshop.
- Develop monitoring registries that include existing data sets – eliminate redundancy and ineffective programs, increase coordination.
    - Encourage all federal and state agencies and their consultants to contribute bird monitoring and habitat data to regional nodes of the Avian Knowledge Network (AKN) and other collaborative data repositories.
    - Develop simple tools to facilitate the collection of project metadata in standard formats and store them in publicly accessible metadata repositories such as AKN and National Biological Information Infrastructure (http://www.nbii.gov) in perpetuity.
    - Create centralized GIS data libraries that are easy to access, search, and download.
    - Establish a coordinated on-line 'nest monitoring' database of the Avian Knowledge Network to monitor changes in phenology and nest success due to climate change and other factors.
    - Establish and maintain a large network of monitoring stations in Central and South America to better understand the spatial and temporal variation in overwinter survivorship for many migratory bird species.
    - Establish more data collection alliances with private partners including ecotourism companies, pet food industries, humane societies, green building associations, county planning, water districts, municipalities, and energy companies.
- Data accessibility – no more data black holes.

- Provide better access to data collected in Central and South America to the people in the countries in which the data were collected.

- Facilitate data contribution to the AKN and other repositories through the development of new user-friendly data entry tools.

- Promote the use of volunteers in data collection (e.g., eBird <www.ebird.org >) that can meaningfully engage the public and greatly enhance the volume and scope of bird data collection.

- Establish bird monitoring data portals for The National Phenological Network.

Additional recommendations:

- Encourage development and use of novel and new technologies for collecting and analyzing monitoring data.
  - Develop and test applications of new methodologies such as acoustics, radar, satellite tracking, radio tags, and data-loggers, for monitoring bird populations and movements.

  - Explore the use of remote and automated detection systems for bird monitoring.

  - Develop and implement new analysis tools, taking advantage of advances in computer science, machine learning, statistics, and data visualization.

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