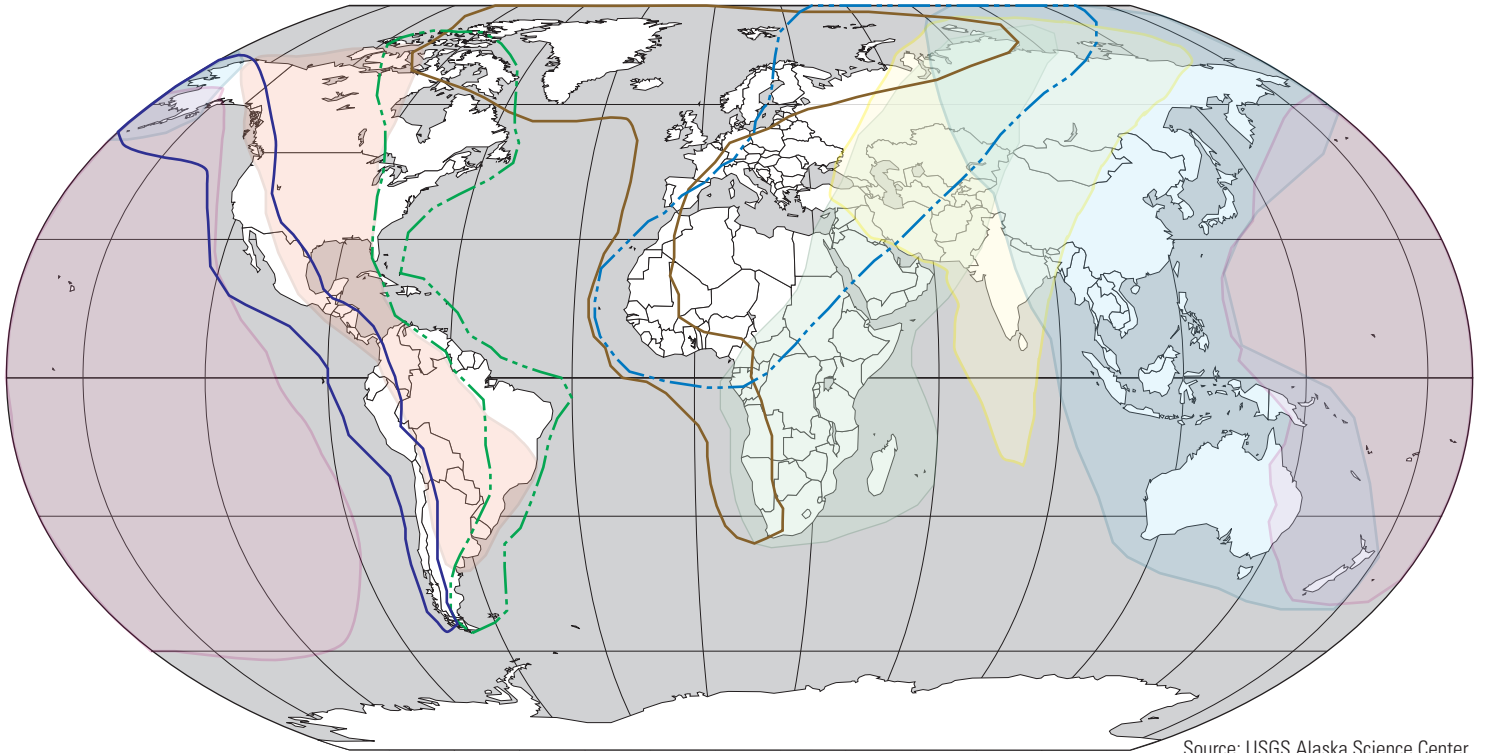


Report of the Federal Advisory Committee on the Bird Banding Laboratory



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Source: USGS Alaska Science Center

EXPLANATION

- | | |
|--|---|
|  Central Asian-Indian flyway |  East Atlantic flyway |
|  East Asian-Australian flyway |  Black Sea-Mediterranean flyway |
|  West Asia-East Africa flyway |  Pacific Americas flyway |
|  Central Pacific flyway |  Atlantic Americas flyway |
|  Mississippi Americas flyway | |

Cover photographs
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Bill Ferensen

Source: U.S. Fish and Wildlife
Service

John Tautin
(U.S. Fish and
Wildlife Service)

John Tautin
(U.S. Fish and
Wildlife Service)

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Survey

Report of the Federal Advisory Committee on the Bird Banding Laboratory

By Susan D. Haseltine, Paul R. Schmidt, Bradley D. Bales, David N. Bonter,
David F. DeSante, Paul F. Doherty, Charles M. Francis, Paul T. Green,
Lesley-Anne Howes, Daniel L. James, J. Jasper Lament, Richard A. Lancia,
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Prepared in cooperation with The Association of Fish and Wildlife Agencies,
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Bird Populations, Colorado State University, Canadian Wildlife Service, National
Audubon Society, Ducks Unlimited, The Wildlife Society, The Ornithological
Council, North American Banding Council, The Conservation Fund, U.S. Fish and
Wildlife Service, and Pheasants Forever

Circular 1320

U.S. Department of the Interior
U.S. Geological Survey

U.S. Department of the Interior
DIRK KEMPTHORNE, Secretary

U.S. Geological Survey
Mark D. Myers, Director

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Executive Summary

In the fall of 2005, the Directors of the U.S. Geological Survey (USGS) and the U.S. Fish and Wildlife Service (FWS) determined that to ensure that the Bird Banding Laboratory (BBL) of the USGS maintains and continues its important support of conservation and management of birds, it should be guided by a clear vision for the future. In order to carry out this task, they impaneled a fourteen-member Federal Advisory Committee (FAC) on the Bird Banding Laboratory. It was made up of representatives of the broad bird-banding community, public and private, and was cochaired by a senior representative from each agency. The Committee met four times and a writing subgroup met three times over the course of its work.

The Committee identified a new vision and mission for the BBL and identified six goals that it believes should be integral to the development of a strategic plan to achieve them. Those goals are:

1. Facilitate the identification of individual birds through marking. 
2. Create automated, electronic systems that efficiently verify, accept, store, and manage data associated with individually marked birds. 
3. Facilitate access to and use of data from marked birds for science, conservation, and management. 
4. Administer permits in an efficient, timely, and modern manner, and use them to ensure that bird welfare and data quality remain top priorities. 
5. Work closely with national and international partners to achieve the mission of the BBL. 
6. Manage the BBL in an efficient, cost-effective manner to maximize use of available resources. 

Most of the report is structured around these goals.

The Committee made 2 programmatic recommendations and identified 23 objectives and 58 specific recommendations. The programmatic recommendations are: (1) that the primary role of the BBL is and should continue to be to support the use of banding and banding data by researchers and managers engaged in science, conservation, and management of birds, and not to play a lead role in original research; and (2) that the BBL be managed nationally by USGS headquarters as a research and operational support unit and provided with the resources appropriate to its national and international functions and responsibilities; it should continue to be located physically at the Patuxent Wildlife Research Center (PWRC).

In order to achieve its vision and mission, the Committee believes that the BBL must work towards achieving all of the recommendations in this report. Nevertheless, it identified five objectives that stand out as high priority, and they are as follows:

- Objective 1.1—to ensure a continuing, adequate supply of high-quality, Federally issued numeric bands of required sizes, materials, and types;
- Objective 2.1—to improve mechanisms for verifying, accepting, storing, and managing bird-banding data;
- Objective 2.3—to accommodate recapture data;
- Objective 4.1—to ensure through the permitting process that banders know how to safely handle birds, collect data accurately, and maintain birds in humane and healthful conditions; and
- Objective 5.3—to encourage the development of banding programs in Latin America and the Caribbean.

Finally, this Committee believes that the BBL will be well served if it continues to support a Federal Advisory Committee, composed similarly to this one, to continue offering guidance and direction from the broad bird-banding community.

Report of the Federal Advisory Committee on the Bird Banding Laboratory

By Susan D. Haseltine, Paul R. Schmidt, Bradley D. Bales,¹ David N. Bonter,² David F. DeSante,³ Paul F. Doherty,⁴ Charles M. Francis,⁵ Paul T. Green,⁶ Lesley-Anne Howes,⁷ Daniel L. James, J. Jasper Lament,⁸ Richard A. Lancia,⁹ Ellen I. Paul,¹⁰ C. John Ralph,¹¹ John G. Rogers,¹² and Richard E. Young¹³

Background and Introduction

The first bird banded in North America was in 1902. By 1909, the American Bird Banding Association had been formed to organize and assist the growing numbers of banders. In 1920, the U.S. Bureau of Biological Survey assumed responsibility for coordination of bird banding. Then in 1923, an international partnership was established with Canada to form the North American Bird Banding Program (NABBP). The Bird Banding Laboratory (BBL) at the U.S. Geological Survey (USGS) Patuxent Wildlife Research Center (PWRC) in Laurel, Maryland, administers the NABBP today in conjunction with the Bird Banding Office (BBO), Canadian Wildlife Service, Environment Canada in Ottawa, Ontario.

Over the years, the organizational position of the BBL has changed. In 1940, the BBL came under the newly formed U.S. Fish and Wildlife Service (FWS). In 1993, the FWS Research Region was moved to the Department of the Interior's newly established National Biological Survey (NBS). In October 1996, the NBS was transferred intact to the U.S. Geological Survey (USGS) as the Biological Resources Discipline (BRD) where it remains today. The BBL is currently administered by the Patuxent Wildlife Research Center of the Eastern Region of USGS.

Through time, as bird-banding methods and standards have evolved, as new technologies have developed, as the demand for analysis and need for banding data have changed, and as the administration of the BBL has changed, management has commissioned a number of formal and informal reviews of BBL activities. The most significant of these was

initiated in 1995, under the newly created NBS. A panel led by Paul Buckley, with broad representation from the banding community in both the U.S. and Canada, was established to review the BBL's activities. The report reviewed the value of the NABBP and presented recommendations to the BBL to advance its direction, management, and operations. The panel submitted its report to the PWRC Director in 1997. Subsequently, a synopsis of the report was published (Buckley and others, 1998).

The BBL has made substantial progress in implementing many of the recommendations of the Buckley report while progress on others has been slower. The BBL has made significant changes in its operations, including enhancements in band quality and supply, improvements in data management and delivery, as well as in its personnel. International interest in banding and coordination of banding has increased and the number of banders and requests for banding information continues to grow. At the same time, the BBL continues to work within the constraints of a static budget.

In light of these issues, the Directors of the USGS and the FWS determined that it was in their mutual interest to ensure the BBL was guided by a clear vision for the future. The Directors requested that the Secretary of the Department of the Interior establish a Federal Advisory Committee (table 1) composed of representatives from the broad bird-banding community, from both public and private sectors, to define a vision for the BBL and to identify priority actions that should be taken to ensure BBL excellence into the 21st century.



¹Association of Fish and Wildlife Agencies/National Flyway Council.

²Cornell Laboratory of Ornithology.

³The Institute for Bird Populations.

⁴Colorado State University.

⁵Canadian Wildlife Service.

⁶National Audubon Society.

⁷Canadian Wildlife Service (ad hoc representative for Charles M. Francis).

⁸Ducks Unlimited.

⁹The Wildlife Society.

¹⁰The Ornithological Council.

¹¹North American Banding Council.

¹²The Conservation Fund (facilitator/process manager).

¹³Pheasants Forever.

4 Report of the Federal Advisory Committee on the Bird Banding Laboratory

The Charter for the Committee was as follows:

“The Committee will develop a clear, concise report defining a vision for the BBL over the next 10 to 15 years, and recommend priority actions that should be taken to address the needs of the regulatory agencies, bird conservation, research, and banding communities to ensure BBL excellence into the 21st century. More specifically, the Committee will address, at a minimum, the following topics:

1. Bands and banding techniques, technologies, and sources;
2. Data and information acquisition, interpretation, analysis, use, management, and delivery;
3. Integration of a research component into the operational aspects of the Laboratory;
4. Opportunities to expand the utility of existing information to better address the needs of researchers, managers, regulators, and policymakers;
5. National and international partnerships, including the scope of an expansion (including the 1-800 telephone number for reporting band recoveries) of the cooperative international program to Mexico, Central America, and South America;
6. Enhancement of fiscal resources and human capabilities; and
7. The appropriate roles of the public and private sectors in future BBL planning, advice, and guidance.”



Photographs courtesy of Phil Thorpe and John Tautin, U.S. Fish and Wildlife Service.



Photograph courtesy of Jim Greer, U.S. Fish and Wildlife Service.

Table 1. Committee membership.

Bradley D. Bales Association of Fish and Wildlife Agencies/ National Flyway Council
David N. Bonter Cornell Laboratory of Ornithology
David F. DeSante The Institute for Bird Populations
Paul F. Doherty Colorado State University
Charles M. Francis Canadian Wildlife Service
Paul T. Green National Audubon Society
Susan D. Haseltine, Co-Chair U.S. Geological Survey
Lesley-Anne Howes Canadian Wildlife Service Ad hoc representative for Charles M. Francis
Daniel L. James U.S. Geological Survey Designated Federal Official
J. Jasper Lament Ducks Unlimited
Richard A. Lancia The Wildlife Society
Ellen I. Paul The Ornithological Council
C. John Ralph North American Banding Council
John G. Rogers The Conservation Fund Facilitator/process manager
Paul R. Schmidt, Co-Chair U.S. Fish and Wildlife Service
Richard E. Young Pheasants Forever



The Committee and its writing subcommittee met a number of times during the process (table 2). All meetings of the full Committee were open to the public. Various USGS and FWS staff supplied briefing materials and made themselves available to the Committee as its work proceeded.



Source: Cape May Raptor Banding Project.

Table 2. Date, location, and purpose of Committee and subcommittee meetings.

Date	Location	Purpose
November 29–30, 2005 ¹	Patuxent Wildlife Research Center, Laurel, Md.	Initial briefing, identification of issues
March 22–23, 2006 ¹	Ducks Unlimited, Memphis, Tenn.	Development of issues
April 10–11, 2006 ²	The Conservation Fund, Chapel Hill, N.C.	Preparation of draft report
June 13–14, 2006 ¹	Ducks Unlimited, Rancho Cordova, Calif.	Review of draft report
July 26–27, 2006 ²	USGS, Reston, Va.	Review and incorporate Committee comments into next draft
September 12–13, 2006 ²	USGS, Seattle, Wash.	Prepare Committee review of draft #2
November 7–8, 2006 ¹	Hillsboro, Oreg.	Review of final draft

¹ Full Committee.

² Writing subcommittee.

The Value of Bird Banding

The basic justification for individual marking of birds, whether using standard metal bands or alternative technologies, is to provide data for scientific research into bird populations and for the conservation and management of those populations. Some of the uses that have been made, and types of data gathered through individual marking of birds, include:

- **Tracking movements of birds**—For example, migration routes, rates and timing of migration, and linkages between breeding and wintering ground.
- **Delineating populations**—For example, determining whether populations are separate or mixing, tracking range expansions, and measuring dispersal within and among populations.
- **Estimating demographic parameters of birds**—For example, age-dependent annual survival rates, recruitment rates, and productivity indices.
- **Aiding ecological and behavioral research requiring individual recognition**—For example, estimating territory size, habitat selection, dominance hierarchies, molt patterns, or parasite burdens of individuals; and examining importance of migrant stopover areas through individual stopover times and weight gains.
- **Monitoring populations and individuals**—For example, estimating population sizes through mark-recapture models, estimating population trends, and monitoring endangered or threatened species.

These data have been used, both directly and indirectly, to conserve and manage birds. The following are but a few examples of management programs that benefit from banding data:

- **Game bird management**—For example, delimiting flyways, estimating harvest pressure by geographic region, modeling the impact of hunting on demography, and estimating impacts of changing hunting regulations.
- **Songbird management**—Determining linkages between wintering and breeding grounds, identifying potential causes of population declines through demographic studies, and habitat modeling.
- **Protection of endangered species**—Tracking individuals of rare species to determine habitat requirements, identifying wintering grounds, and estimating effectiveness of conservation actions.
- **Wildlife diseases**—Understanding bird movements to track and (or) model the spread of diseases that affect both wildlife and humans, such as Avian Influenza, West Nile Virus, or tick-borne diseases such as Lyme disease.

- **Climate change**—Measuring and modeling changes in phenology and demography in relation to climate as indicators of environmental impacts.
- **Building public support for bird conservation**—Education programs involving banding have introduced tens of thousands of people to birds, thus reinforcing stewardship responsibilities.

Many of these uses of banding data are based on analyses drawing from many different projects, often going far beyond the goals originally envisioned by the banders collecting the data. These uses can only be realized if the data are collected accurately using appropriate protocols; if they are well managed in a central location; and if they are made available to analysts and researchers. This will help ensure that the data can be used and the results published.

The Role of the BBL in the North American Bird Banding Program

Prior to recommending a specific mission, vision, and goals for the BBL, the Committee considered the most appropriate role of the BBL in the overall North American Bird Banding Program. Of particular concern for the BBL is whether or not it should have a role in conducting original research and analysis of bird-banding data. The PWRC, within which the BBL is housed, has a primary research role; however, thousands of scientists throughout North America regularly use bird-banding data as part of their research or management programs, either in their own programs or through analyzing data collected by others. There is a large community of users, both within government and in the research community at large, with expertise in the design and analysis of banding data. Although the Committee recognizes a continuing need for research using banding data, the Committee believes it is not an appropriate use of the BBL's limited resources for it to play a primary role in this research at this time.

The NABBP is one of the larger and more complex banding programs in the world, in terms of geographic scope, numbers of banders, number of birds banded, and extent of computerization of data. The BBL is vital to the success of the NABBP, and must be careful not to engage in activities that could diminish support of this important program.

Vision, Mission, and Goals for the Bird Banding Laboratory

The Committee discussed the current and future vision and mission for the BBL, as well as appropriate goals to achieve them. The general themes that carried through all the discussions are that the BBL must remain a world-class organization and to do so it must reflect the current state of the art

in understanding, evaluating, and recommending methods of recognizing individually marked birds. The Committee identified a set of core values that it believes will assist the BBL as it enters the next phase of its role in bird conservation. Those values are the following: scientific knowledge about birds; bird conservation; bird welfare; quality data; customer service; and efficient management and operations.

The BBL must also ensure that both legal and ethical issues related to handling and marking birds are considered. From a legal perspective, there are specific obligations under the Migratory Bird Treaty Act and associated regulations related to the permitting as well as handling of migratory birds. It must also follow other relevant Federal and State laws and regulations. Issues related to both handling of birds and use of data collected by others for scientific analysis impact the operation of the BBL from an ethical perspective.

The mission and vision articulated below are not entirely new, but they are intended to reflect these values, and provide a clear focus for the BBL to move forward.

Vision

“To enable a world-class bird-marking program in North America that informs avian conservation, management, and science with high-quality data and is well integrated with other programs in the Western Hemisphere.”

Mission

“To facilitate and encourage the collection, management, storage, and dissemination of information from marked birds to further bird conservation, management, and science.”

Goals

While the Committee has not written a strategic plan for the BBL, it has identified a series of goals that it believes should be integral to the development of such a plan to help achieve the mission and vision. These goals are also used to structure the majority of the recommendations in this report, as follows:

1. Facilitate the identification of individual birds through marking.
2. Create automated, electronic systems that efficiently verify, accept, store, and manage data associated with individually marked birds.

3. Facilitate access to and use of data from marked birds for science and conservation.
4. Administer permits in an efficient, timely, and modern manner, and use them to ensure that bird welfare and data quality remain top priorities.
5. Work closely with national and international partners to achieve the mission of the BBL.
6. Manage the BBL in an efficient, cost-effective manner to maximize use of available resources.

Achieving the Goals

The Committee identified specific objectives and recommendations that it believes will help the BBL to achieve its goals. In particular, less emphasis is placed on activities that the BBL is already undertaking well; these remain important and should be considered in a strategic plan. Instead, the focus here is on areas of concentration that require new or enhanced action for the BBL to move towards the future. Although the Committee has identified a larger number of specific objectives and recommendations within some of the goals that follow than within others, it believes that the BBL must work towards achieving all of the goals listed in this report in order to achieve its mission. Within each of these goals, there is some variation in the priority of the individual objectives and actions. The Committee has given suggestions for priorities at the level of objectives. Those objectives that the Committee feels are of highest priority are designated by the word “**HIGH**.” Nevertheless, those objectives not so designated remain important to the ability of the BBL to accomplish its role in bird conservation.

The BBL should not play a lead role in original research. The BBL can best leverage its limited resources by assuring: an uncompromised and reliable source for bands; a stable repository for band data that provides for its long-term availability through the exercise of sound data management practices; and that it serves as a source for sound technical advice on banding techniques, technologies, and study designs. Rather than the BBL carrying out its own research program, the Committee encourages the BBL to play a significantly greater role than at present in encouraging more and better use of bird-marking data. This is discussed further under Goal 3 below.

The Committee strongly recommends that the primary role of the BBL is, and should continue to be, to support the use of banding and banding data by other researchers and managers engaged in the science, conservation, and management of birds.



Photograph courtesy of Don Des Jardin.

Goal 1: Facilitate the identification of individual birds through marking.

Central to the role of the BBL is the service of facilitating the use of markers to identify individual birds. Generally, this is done with the assignment of Federally issued metal bird bands. Some research projects require that birds be marked with auxiliary markers that facilitate identification of birds from a distance; in some cases these markers may only identify particular groups or cohorts of birds. The BBL plays a critical role in coordinating the assignment of unique and repetitive markers to birds.

Objective 1.1: Ensure a continuing adequate supply of high-quality Federally issued numeric bird bands of required sizes, materials, and types. **HIGH**

Projects that use banding rely on an adequate and timely supply of appropriate, high-quality bands. Interruptions in band supply can compromise research objectives. Low-quality bands result in loss of bands from the marked birds and can affect reporting rates and increase errors in encounter data.

Recommendation 1.1.a. Develop procedures to ensure that an adequate supply of high-quality bands of all types, materials, and sizes can be maintained in a timely manner and at a reasonable cost. These should include greater diversification of band suppliers, and development of in-house quality controls through random checks of bands.

Recommendation 1.1.b. Establish processes to determine the need for new band types and sizes, and ensure that appropriate band types are both available and used for each species (for example, ensure that hard-metal bands are available and used on species that regularly outlive aluminum bands, and that appropriate bands are available for birds that frequent salt-water environments).

Objective 1.2: Facilitate coordination of auxiliary markers.

Use of auxiliary markers is increasing in North America and will likely continue to increase into the future. Their use can be a valuable tool for enhancing the quantity and quality of data obtained through marking birds. However, unlike standard numbered metal bands, most auxiliary markers are not unique; thus, it is essential to facilitate coordination among projects to ensure that markers are not repeated across projects in geographic areas where the projects overlap.

Recommendation 1.2.a. Ensure effective coordination of the use of auxiliary markers amongst banders—regionally, nationally, and internationally—within the Americas. Develop tools, such as Web sites and Web-based databases, where projects can be registered to facilitate coordination. The tools should allow users (banders, public reporters, researchers, wildlife managers, and BBL staff) to independently send and retrieve information. As much as possible, implement through delegation to partners with expertise in particular bird groups, with BBL providing oversight for the resolution of disputes or other problems as required.

Recommendation 1.2.b. Require that all auxiliary marker data submitted to the BBL be in a format that can be incorporated into the BBL database so that the BBL can build an accurate, complete database. There are some species for which auxiliary marking is the primary and most effective way of collecting information. For these birds it is essential that the data be submitted in a specified format.

Recommendation 1.2.c. With regard to encounters of auxiliary markers, the BBL should: (1) emphasize maximum automation with little or no direct staff involvement, (2) focus on putting reporters directly in touch with banders to transfer and receive information, and (3) require large-scale marking projects (at a minimum) to assume responsibility for managing and coordinating their encounter data and (or) commit resources (for a Web developer) to BBL to offset costs incurred for these activities. To accomplish this, the BBL should: (1) provide a communication mechanism for information to be submitted by, and be available to, reporters of auxiliary marking encounters (“sightings”); (2) develop tools, such as Web sites, list servers, and Web-based databases, where auxiliary marker projects are registered, and reporters can be directed to file their sightings and obtain information about marked birds; and (3) design systems to accept all sightings of auxiliary-marked birds from the public and provide some level of feedback to the reporter, regardless of bander and (or) BBL interest.



Photograph courtesy of Fritz Knopf (U.S. Geological Survey).

Recommendation 1.2.d. Ensure banders and BBL can receive auxiliary-marking encounter information. Report to banders those auxiliary marker encounters that can be unambiguously linked with a unique band number and for which the bander who placed the auxiliary marker has an interest in knowing of public sightings. Encounters of markers that are not linked with a unique band number, or even to a specific bander, should be made available for consideration on a Web site or list server.

Objective 1.3: Accommodate new methods and technologies for marking birds.

Novel methods of marking birds are continually being developed, including new types of auxiliary markers; new types of unique markers, such as passive transponders or individual identification through DNA; and improved automated tracking methods, such as radio and satellite transmitters. Ongoing research also leads to increased understanding of the potential impacts of different markers on birds and of which types are most suitable for each species. New markers have the potential to greatly enhance the quality and quantity of data that can be obtained on marked birds; therefore, the BBL must be flexible and prepared to deal with permitting, coordinating, and capturing data from these new types of markers.

Recommendation 1.3.a. Remain cognizant of the development of new bird-marking techniques and technologies, including appropriate evaluation of their impact on bird welfare, and ensure that information on their safe use is accessible and appropriately disseminated.

Recommendation 1.3.b. Build capacity to store data from nonstandard bird markers, including data collected by automated means, such as satellite transmitters, if such centralized data storage is not otherwise available. Emphasis should be placed on data that may contribute to the management and conservation of birds through integration or coordination across projects.

Objective 1.4: Encourage development of new methods for capturing and marking birds in ways that improve bird welfare.

Recommendation 1.4.a. Develop appropriate guidelines that encourage banders to evaluate and develop new and innovative methods for capturing and marking birds. Encourage submission of reports on injuries or mortalities related to new methods, with clarification that banders will not risk permit revocation or suspension if mortalities or injuries occur, provided that appropriate guidelines are followed. However, restrict the use of capture methods or markers based on potential impacts only when those impacts are serious, long lasting or permanent, well documented, and unequivocal.

Recommendation 1.4.b. Develop mechanisms, potentially through partners, to gather information from banders on bird welfare issues associated with particular capture or marking methods.



Source: U.S. Fish and Wildlife Service.

Goal 2: Create automated, electronic systems that efficiently verify, accept, store, and manage data associated with individually marked birds.

The BBL has a critical role in storing and maintaining data on marked birds, particularly to facilitate coordination between banders and others who may later encounter the marked birds, as well as to ensure that the data are available for later analysis. The BBL should work towards increasing the types and amounts of data that are being gathered and stored, at the same time that it increases the efficiency of data collection and storage to reduce overall costs.

Objective 2.1: Improve mechanisms for verifying, accepting, storing, and managing bird banding data. **HIGH**

Recommendation 2.1.a. Improve the efficiency of submitting banding schedules through use of appropriate Internet technology, and an automated system to vet submitted data for accuracy. This should include flags in the database that indicate the level to which data have been vetted, as well as user-friendly automated procedures to communicate with banders regarding questionable data and to receive input from banders. Inform banders that they have the primary responsibility for verifying data, initially through programs provided to banders (for example, Band Manager, Bandit, or MAPSPROG), and then subsequently through responding to automated reports from the banding office. Minimize the need for personal interaction between BBL staff and banders regarding questionable data.

Recommendation 2.1.b. Accept location information, including GPS data, to a higher level of precision than currently required by the BBL. The BBL should always require that the cooperator report the actual level of precision of the location data.

Recommendation 2.1.c. Collect and store auxiliary marker data, including appropriate metadata describing the types of markers used.

Recommendation 2.1.d. Ensure that all digital data, including archived data, are maintained in an appropriate, up-to-date format so that they will not be lost as technology changes.

Recommendation 2.1.e. Allow for flexible timing of submission of banding schedules as appropriate to meet the needs of the BBL and banders.

Recommendation 2.1.f. Build the capacity to store data from nonstandard bird markers, including data collected by automated means, such as satellite transmitters, if such centralized storage is not otherwise available. Emphasis should be placed on data that may contribute to the management and conservation of birds through integration or coordination across projects.

Objective 2.2: Develop appropriate systems to store and maintain metadata associated with banding data.

Metadata are data that provide further explanations for data within a database, and are essential for researchers to determine appropriate ways to use and analyze the data and to interpret the results. In the context of banding data, these can be considered at two levels. One is at the level of individual

banding records for which metadata are necessary to explain the different types of codes that are used (for example, the types of auxiliary markers used, the level of precision of the location information, and so on). For standard fields, such as age, sex, or status codes, such information is already available (for example, in the North American Banding Manual), but not necessarily in the format required to meet international metadata standards. The second level of metadata relates to the context of banding data and the program under which they were collected. These could include descriptions of protocols and objectives of programs (ranging from large-scale cooperative programs, such as MAPS or waterfowl banding, to individual research projects), as well as information on banding effort and techniques, habitat around the banding station, and so on. Both types of metadata are necessary to ensure appropriate and effective use of banding data.

Recommendation 2.2.a. Use FGDC (Federal Geographic Data Committee) metadata standards, as appropriate, for all metadata associated with banding records.

Recommendation 2.2.b. Consult with appropriate experts to determine the types of metadata about the context of banding (for example, project objectives, methods, effort, and so on) that could and should be stored centrally and how they should be recorded.

Recommendation 2.2.c. Develop a system to accommodate the metadata recommended in 2.2.b by providing training and educational materials and user-friendly tools for metadata submission in order to encourage banders to submit such data.

Objective 2.3: Accommodate recapture data. **HIGH**

Recapture data are valuable for estimating survival and other population parameters, such as dispersal rates, especially for songbirds for which very few recovery data are typically available. However, since the early 1960s, the BBL has discouraged submission of recapture data, particularly those from the same location as the original banding. As a result, very few such data are stored, and those that are available are atypical (for example, extreme longevity records) and not suitable for most analyses. There has been some recent discussion about whether the BBL should be selective in receiving recapture data, focusing on the highest quality datasets. However, the Committee believes that the BBL should work toward the BBL database serving as a repository for all recapture data that banders wish to submit. In order to most effectively accomplish this objective, the BBL will initially have to prioritize which data will be submitted and give guidance to banders as experience is gained in this realm.



Recommendation 2.3.a. Develop an automated system for submitting, vetting, and accepting all recapture data into the BBL database, and encourage all banders to submit recapture data, including historical data, through this system, unless it is already being submitted through another program such as MAPS. Concurrently, require banders to submit metadata associated with the recapture programs under which those recaptures were recorded (again, unless it is already being reported), as recapture data without associated metadata are of questionable value and can easily be misused.

Objective 2.4: Create an archive for storing voluntarily submitted ancillary and associated data.

Banders collect a variety of data at the time of banding and encounter, including information such as fat scores, biometrics, molt information, breeding condition, and so on. Ancillary data can be useful for verifying core data (for example, determination of age and sex) as well as for researching many issues relevant to bird conservation and management (for example, determining the quality of stopover locations based on rates of gain in body weight, estimating condition-dependent survival rates, studying changes in breeding phenology in relation to climate change, and so on). Other banding programs collect such ancillary data. Because there is no other central data storage repository in North America, these data are often lost.

Recommendation 2.4.a. Develop automated systems for submission, vetting, and acceptance of voluntarily submitted ancillary data (and associated metadata, including information on data quality control), noting that the responsibility for data quality control resides with the bander. Remind banders that these data will be available to the public.

Objective 2.5: Continue to improve the efficiency of methods for receiving encounter information to enhance the quality of information received and reduce the costs of processing encounters, while encouraging greater reporting.

Recommendation 2.5.a. Develop and promote Web-based, automated reporting of band recovery data, with appropriate checks to ensure that all required data are submitted, and provide immediate feedback to the person reporting the band. Offer finders the option of an electronic or paper “Certificate of Appreciation.”

Recommendation 2.5.b. Begin to include a Web address on bands to enhance Web-based automated reporting of recovery. Promote Web reporting to reduce errors and costs; however, in the near term, continue to support the use of toll-free numbers for reporting bands. Investigate the costs and benefits of an automated telephone system to capture data using touch-tone technology that could simultaneously handle English, French, and Spanish, to reduce the costs of processing calls.

Objective 2.6: Ensure the preservation and eventual computerization of historical (nondigitized) banding data currently stored at the BBL.

Most original banding records prior to 1955, as well as various other historical data, are recorded on paper or microfiche only. The preservation of these records is high priority; however, digitizing all of the details was considered by the Committee to be a relatively low priority for the BBL, unless additional resources become available for this purpose.

Recommendation 2.6.a. Arrange immediately for proper physical storage of the original records (in consultation with the National Archives and Records Administration) to ensure that they are adequately protected and do not deteriorate.

Recommendation 2.6.b. Investigate appropriate ways of making these data available digitally in the future, considering options such as digitizing the data through the BBL (perhaps in a cost-sharing program with interested users), or scanning the records as images so that they can be distributed to interested third parties to capture digitally.



Photograph courtesy of Randy Ritter.

Goal 3: Facilitate access to and use of data from marked birds for science and conservation.

To achieve its mission, the BBL must not only support banders and gather data, but also encourage the use of banding data for science and conservation. The BBL can do this most effectively by encouraging appropriate project design and data collection methods, by ensuring that banding data are readily available, and by promoting the use of appropriate data analysis methods. The BBL can play a significant role as a liaison between managers who require answers to particular questions, scientists with expertise in project design, field workers, and data analysts. The objectives and subsequent recommendations that follow might best be accommodated through the development of a comprehensive data management strategy.

Objective 3.1: Develop a Web-based, user-friendly system to provide full and open access to all banding data and information, except where such information may be of a sensitive nature (for example, exact locations of endangered species), along with appropriate guidelines for use of the data.

The BBL currently spends a significant amount of staff time filling data requests. These data could now be provided automatically online at a much lower cost. This would both free up BBL resources and encourage greater use of the data. An ongoing concern relates to protecting the proprietary interests of banders in the data that they have gathered. While these data are subject to release under the Freedom of Information Act, the rights of scientists who collected these data need to be protected. The most appropriate means of doing this appears to be through encouraging adoption of appropriate guidelines as a scientific code of ethics.

Recommendation 3.1.a. Develop a Web-based, user-friendly interface to allow for public retrieval of bird-banding data. All data, including recent data, should be available, with the exception that locations for biologically or commercially sensitive species should be limited to province or state. The database should be updated at regular intervals (once or a few times per year) but not continuously, so that the download is dated. Use methods such as a password-based login, with an e-mail-based verification, to gather information on who is downloading data.

Recommendation 3.1.b. Develop a system to notify banders when their data are accessed so they have the ability to contact the person who downloaded the data.

Recommendation 3.1.c. In consultation with banders and users of banding data, review and revise the current policy for use of banding data, and require all data users to agree to this policy. The BBL should also encourage the adoption of this policy by ornithological societies and scientific journals as part of their scientific code of ethics.

Objective 3.2: Encourage development, adoption, and sharing of best practices related to project design, data collection, and data analysis for banding projects.

Recommendation 3.2.a. Maintain an up-to-date Web site with resource information (including links to other Web sites) on best practices for data collection and data analysis. Encourage researchers to provide information for such a Web page. Ensure that users downloading data are aware of these approaches and methods.

Recommendation 3.2.b. Provide a technical assistance function within the BBL to advise banders and researchers on best practices in project design, field data collection, and data analysis when requested.

Objective 3.3: Encourage development of tools to make better use of banding data.

Recommendation 3.3.a. Work with partners to develop Web-based visualization tools that could be hosted on the BBL Web site to allow better use of banding data (for example, interactive Web-based mapping of band recovery data).



Photograph courtesy of John Tautin, U.S. Fish and Wildlife Service.

Goal 4: Administer permits in an efficient, timely, and modern manner, and use them to ensure that bird welfare and data quality remain top priorities.

The permit program should be designed and carried out to protect birds covered by Federal statutes and to enhance research and management efforts. It should assure that birds are captured and marked in an ethical and safe manner. BBL has a regulatory responsibility (50 CFR 13.41) to ensure that any wildlife possessed under a banding permit be “maintained under humane and healthful conditions.” The permit system must be efficiently administered and be consistent with legal regulations. The program should encourage new applicants to become associated with other organized efforts to band birds in order to prevent the proliferation of permit applications.

Objective 4.1: Without significantly increasing the number of master permits, base the decision on whether or not to issue master or subpermits on evidence that the applicant has the skills and knowledge to capture and handle birds of the requested species safely, to collect appropriate data (including age and sex) for those species, and to submit data timely and accurately to the BBL. **HIGH**

Recommendation 4.1.a. Ensure, through the permitting process, that applicants know how to safely handle birds, maintain birds in humane and healthful conditions, and collect data accurately.

Recommendation 4.1.b. Use a variety of tools to evaluate the qualifications of the bander, including the following:

- Recommendations of people who have worked with the bander
- Information on experience handling birds and numbers of birds handled
- Evidence of bander training
- Information provided by the applicant
- Online testing
- Demonstrated proficiency at identifying the birds to be banded

Recommendation 4.1.c. Develop an online, self-administered test to ensure that banders applying for permits are aware of and understand relevant regulations, animal welfare concerns, the banders’ Code of Ethics, methods for coding and recording data, and other matters that do not require physically handling a bird.

Recommendation 4.1.d. Use the permit renewal process to ensure that banders continue to be aware of current banding standards and practices, perhaps through updated Web-based testing, or completion of a questionnaire or checklist.

Recommendation 4.1.e. Require brief summaries of proposed banding projects, but do not use these to decide whether or not to grant a permit. Instead summaries should be used to:

- Provide appropriate advice, if requested by the applicant, on project design or marking technologies to enhance the scientific data that will result from their project, including encouraging participation in organized, cooperative programs such as MAPS
- Determine likely band requirements
- Ensure that the applicant has the necessary knowledge and skills to safely handle those species identified in the project summary

Objective 4.2: Streamline the permit application process to reduce costs and increase efficiency.

Recommendation 4.2.a. Develop a streamlined, online application system, including online submission of information on qualifications and letters of recommendation.

Recommendation 4.2.b. Issue permits for 3 years, and require all banders to actively renew their permits. As a prerequisite for renewal, demand up-to-date submission of all required banding data (for example, schedules).

Recommendation 4.2.c. Establish, if feasible, a link with the Law Enforcement Management Information System (LEMIS) to determine if an applicant has been found guilty of a violation of a Federal wildlife law and use this information as a factor in determining whether or not to issue a permit.

Objective 4.3: Update regulations, policies, and guidance using best practices (including providing opportunity for public notice and comment) and clearly communicate the regulations, policies, and guidance to the community in writing.

Recommendation 4.3.a. Identify regulatory gaps (for example, use of radio and satellite transmitters, PIT tags, and issuing of subpermits) and revise regulations as needed. Regulations should allow the BBL to issue banding permits authorizing the taking of blood, feather, and cloacal samples.

Recommendation 4.3.b. Review and revise the North American Banding Manual to ensure that it clearly includes information on all policies, guidance, and regulations relevant to banding.

Objective 4.4: Ensure consistency in written regulations, policies, and practices regarding revocation and suspension decisions.

The Federal regulations (50 CFR 13.27 and 13.28) specify a number of reasons for revocation of banding permits, but these are not currently reflected in BBL’s written policies or practices.

Recommendation 4.4.a. Develop and implement policies for revocation and suspension of permits that reflect the current regulations and that protect the proprietary interests of banders, while ensuring that banders follow best practices.

Recommendation 4.4.b. If feasible, use available information on convictions of violations of wildlife laws to inform revocation and suspension decisions.



Source: U.S. Fish and Wildlife Service.

Goal 5: Work closely with national and international partners to achieve the mission of the BBL.

The BBL can benefit from working closely with others to achieve its mission and to become more effective and efficient. The primary role of the BBL is to provide support to banders and users of banding data. Conversely, others can help the BBL to operate more efficiently and effectively. Some of the important elements of the banding program fall to partners. In turn, the BBL helps partners meet their own bird research, conservation, management, and training goals. Some BBL partnerships, such as those with the Canadian Bird Banding Office and Federal and State Government agencies, are structured by formal agreements. Other partnerships, such as those with other banding management programs, NGOs, universities, and private contractors, are less formal.

Objective 5.1: Work with partners to achieve shared goals and leverage available resources.

Recommendation 5.1.a. Involve partners in the creation of products and tools to meet the needs of the BBL and the partners and to deliver BBL messages.

Recommendation 5.1.b. Maintain active interactions with banding schemes and organizations elsewhere in the world, such as EURING, AFRING, and the IOC standing committee on bird ringing, and develop schemes in Latin America and the Caribbean to exchange and share experiences, expertise, and products.

Recommendation 5.1.c. Work with partners to identify key materials that promote ethics and bird welfare and proper capture, handling, and banding techniques for distribution by BBL. Use MTABs, the BBL Web site, permitting processes, workshops, and other communication tools.

Recommendation 5.1.d. Seek opportunities to augment BBL staff and resources through partnerships that further BBL's mission.

Recommendation 5.1.e. Where appropriate, use formal agreements, reviewed and updated from time to time, to document intra- and intergovernmental partnerships and to define clear roles and responsibilities.

Objective 5.2: Develop and implement a process that involves partners in advising the BBL.

Recommendation 5.2.a. Maintain and strengthen relationships with key Federal partners (for example, FWS).

Recommendation 5.2.b. Maintain a FAC composed similarly to but not necessarily the same as the current one, to monitor and advise the BBL on implementation of the recommendations of this report, and to maintain and enhance communication with and relationships between the BBL and its partners, stakeholders, and the broader bird-banding community.

Recommendation 5.2.c. Establish and maintain an open-door policy for partners and stakeholders. Consult to the extent possible with affected partners and stakeholders while making major operational decisions.

Recommendation 5.2.d. Provide for BBL presence at key partner and stakeholder meetings.

Objective 5.3: Encourage development of banding programs in Latin America and the Caribbean. **HIGH**

Many birds that breed in the U.S. and Canada migrate to Mexico, the Caribbean, Central America, or South America during the nonbreeding season. Recent evidence from large-scale landbird monitoring programs suggests that population declines of Nearctic-Neotropical migratory landbird species appear to be driven primarily by factors that operate on the wintering grounds of these species and that affect the over-wintering survival and subsequent annual survival of young and adult birds. It is critical, therefore, that efforts be undertaken to assess the quality of wintering habitat for these species and to formulate management and conservation strategies for them that are based on conserving and restoring high-quality wintering habitat. Information on these birds gathered during the nonbreeding season



Photo courtesy of Don Des Jardín.

programs can contribute directly to understanding their ecology and benefit banding programs in the U.S. and Canada. Similarly, conservation and management activities in Latin America will directly impact these “North American” birds, and, therefore, should be informed by best available data.

Recommendation 5.3.a. Play a central role in building capacity for bird-banding programs elsewhere in the Western Hemisphere. The BBL should be flexible in helping to develop Latin American and Caribbean banding schemes that are appropriate for the partners and feasible for the BBL, considering options ranging from independent schemes that exchange data, to expanding the NABBP to include additional countries with agreements similar to that between Canada and the U.S.

Recommendation 5.3.b. Allow the use of U.S. Federal bands on resident as well as migratory birds for projects within the American Ornithologists' Union (AOU) checklist area, in consultation with the affected countries, subject to the same terms and conditions as are currently applied to projects banding migratory birds in these countries with U.S. bands. Specifically, the bander must qualify for and possess a permit in the U.S. or Canada, and must obtain appropriate permits to capture and handle birds in the country where banding will take place. The BBL must modify its database to be able to receive, process, and store data on these resident birds (but without investing heavily in data-vetting procedures).

Goal 6: Manage the BBL in an efficient, cost-effective manner to maximize use of available resources.

The BBL is a key component of the North American Bird Banding Program, leveraging vast resources from bird banders across the continent to obtain data that benefit Federal Government mandates to conserve and protect birds. The program generates tremendous value for bird conservation, but at the same time it must operate within clear fiscal constraints, and ensure that it delivers value for money.

The Committee believes that the organizational location of the BBL within the Eastern Region of USGS may impact its effectiveness. Currently, the BBL is situated within a science center (PWRC) within a region (Eastern). However, it functions as a national organization, charged with supporting other DOI Bureaus, as well as States, universities, and international partners.

Committee Recommendations: The Committee recognizes that FWS is a major client of the BBL and has much expertise and overlap with BBL operations and that it could be argued that FWS is a logical administrative home for the BBL. Nevertheless, the BBL should be managed with a national perspective by USGS BRD Headquarters as a research and operational support unit, and be provided with appropriate resources to successfully address the scope of its functions. It should continue to be physically located at the PWRC to facilitate critical interactions with expertise in avian research and monitoring.

Objective 6.1: Ensure that all components of the program are delivered in the most efficient and cost-effective manner.

Recommendation 6.1.a. Continue to identify ways to improve the efficiency and effectiveness of BBL operations by looking at opportunities to outsource noncore functions.

Recommendation 6.1.b. Work towards automation of BBL data-handling tasks to the highest extent possible, including passing responsibility for many tasks, such as data checking and data entry, to users. Specific areas for improvements are suggested elsewhere in the document. Priority for implementation should be determined based on an assessment of current staff time requirements and on areas where maximum gains in efficiency can be obtained.

Objective 6.2: Maintain or enhance the financial foundation of the BBL to ensure that it can continue to meet its mandate.

Recommendation 6.2.a. Develop a business plan for the BBL that considers all costs and benefits of the program, while recognizing the primary mandate of the Department of Interior for the conservation of migratory birds.

This business plan is intended to be used by the BBL as a vehicle to reexamine the flow of fiscal and human resources to achieve mission requirements. The plan should identify current levels of funding and costs and projected future funding and costs. The plan should also include an analysis of potential future revenue sources (fee for obtaining banding permits and

process to recoup band costs) and cost efficiencies (reduced staff costs due to online reporting and modernization efforts). While BBL is not in the business of generating fiscal profit per se, it still must be “profitable” in terms of meeting its mission and satisfying its customers in the most efficient and cost-effective way.

The analysis must look beyond pure fiscal accounting and acknowledge that the beneficiaries of the banding program reside throughout government (at regional, State, and Federal levels), as well as outside government. It should include in its analysis recognition of the benefits of the banding program as a whole to Federal agencies (who currently fund the program), including both direct benefits (for example, government use of banding data for waterfowl management) and indirect benefits (for example, use of banding data by partners to guide on-the-ground conservation programs). It must also identify the contributors to the program, including the huge in-kind contributions by banders and researchers of their time and resources for data acquisition and data analysis. The business plan should identify ways to improve the efficiency and effectiveness of the operation by guiding efforts towards gathering the most valuable data.

Objective 6.3: Ensure that the workforce at the BBL continues to meet the needs of an evolving organization.

Recommendation 6.3.a. Develop a staffing plan that recognizes the changing workforce needs of the BBL over time, as increased automation reduces the need for clerical staff but increases the need for more highly trained staff, such as computer programmers to maintain and develop systems, and biologists to develop standards and procedures and to serve as liaison between banders, data analysts, and conservation practitioners.

This plan should consider both optimal uses of existing personnel (including options such as retraining or redeployment), as well as guidelines for recruiting new personnel. This will ensure that all staff contribute effectively and continue to feel an integral part of the BBL team. Other options to be considered include seeking services from other USGS units or DOI agencies for short-term, time-limited tasks, and combining resources with the BRD’s Biological Informatics Office and (or) the USGS’ Geospatial Information Office (GIO) for tasks such as data management functions.

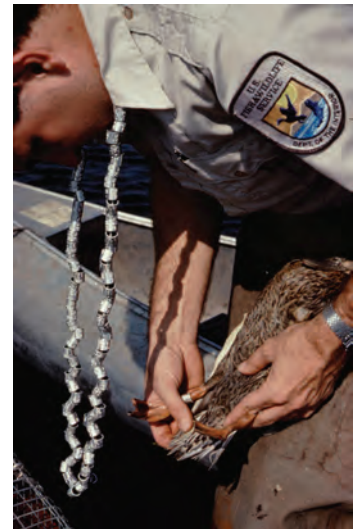


Photo courtesy of John Tautin, U.S. Fish and Wildlife Service.



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Photograph courtesy of Jenny Bryant, U.S. Fish and Wildlife Service.

Glossary

A

ancillary data All data about an individually marked bird, other than those currently required by the U.S. Bird Banding Laboratory and the Canadian Bird Banding Office. (Current data reporting requirements are: master permit number, name of master permittee, banding locations, band number, color marker code, alpha code, species number, age, sex, region, latitude and longitude, location suffix, and date of banding.) Examples include the following: fat scores and muscle development scores; biometrics (for example, wing, tarsus, and tail length, body mass); molt patterns (information used to determine age and sex), feather condition, and external parasites; breeding condition codes (for example, degree of development of a brood patch or cloacal protuberance); skull pneumatization (an indicator of age, based on the degree of development of the two layers of bone); genetic information; and stable isotopes (biochemical information, obtained from feathers, about the origin of food and other materials ingested by a bird, by comparison of the isotope ratios of various elements in the feathers to the isotope ratios found at different regions of the planet).

American Ornithologists' Union (AOU) Checklist

Area Includes North and Central America from the North Pole to the boundary of Panama and Colombia, including the adjacent islands under the jurisdiction of the included nations; the Hawaiian Islands; Clipperton Island; Bermuda; The West Indies, including the Bahama Islands, the Greater Antilles, and Leeward and Windward Islands in the Lesser Antilles (ending with Grenada); and Swan, Providencia, and San Andrés Islands in the Gulf of Mexico. Greenland is not included in the coverage of the Seventh Edition of the Checklist, although it was included in earlier editions and will be in the next edition.

AOU number The 4-digit numeric code used to identify species within the computer databases. The AOU no longer assigns numbers to species (this practice was discontinued in 1998), with the result that the BBL is now responsible for modifying numbers as the AOU checklist changes, particularly with the addition of species.

associated data All data, other than data about an individually marked bird, collected in the course of the project that involved banding the bird. Examples include weather, vegetation or other habitat conditions, or capture effort. Some associated data could potentially be captured through metadata.

auxiliary marker Any marker other than a uniquely numbered metal band issued by a banding office. These markers, which may include color bands, patagial markers, neck collars, radio transmitters, satellite transmitters, or small microchips called passive integrated transponder (PIT) tags, can be valuable for identifying birds without recapturing them. There is a need to avoid duplication of auxiliary markers across projects if duplication results in geographic overlap.

B

Bandit A computer banding data entry and verification program developed by the BBL.

band sizes Federally issued bands of appropriate size for a particular species.

band types Federally issued bands of appropriate style for a particular species. Specific aspects of band type include composition of metal and closure method.



Source: U.S. Geological Survey.

D

data verification The process of determining that data reported to the BBL are accurate.

E

encounter Resighting, recapture, or recovery of a marked bird, alive or dead, subsequent to the initial banding. Encounters may be repeats (same 10-minute block where the bird was banded, in the same season) or returns (same 10-minute block where the bird was banded, in a subsequent season).

F

Federally issued bands The metal bands issued by the U.S. Bird Banding Laboratory to permittees in the United States and Canada, each bearing a unique number.

L

local An age code indicating that the bird was banded when incapable of flight (that is, a nestling or a fledgling). The location of birds banded as locals is of potential concern in relation to the release of data, as it could increase the risk of take or disturbance for commercially valuable species (for example, falcons) or sensitive species, such as species at risk.

M

MAPSPROG A computer data entry and verification program developed by the Institute for Bird Populations.

marking technologies In addition to traditional physical markers, birds can now be identified with radio or satellite transmitters, PIT tags, or individual genetic data. Other technologies are likely to be developed in the future.

Metadata Standards, FGDC Metadata Standards Metadata comprise descriptive information about datasets. This information helps the data user to know if the data are appropriate to answer a particular question. In the case of banding data, for instance, the metadata might include the purpose for a particular banding effort or the manner in which the birds were captured. The USGS has established a set of standards for geographical data, via the Federal Geographic Data Committee (FGDC). The FGDC has developed not only metadata standards for geographical information, but has also developed a standard process for developing metadata standards. References in this report to FGDC Metadata Standards pertain to geographical information as well as to the standard process for developing metadata standards.

R

recapture A previously marked bird is caught again. If the recapture occurs within the same 10-minute block where the bird was banded during the same season, it is considered a “repeat.” In subsequent seasons, it is considered a “return.” If the recapture occurs outside the 10-minute block where the bird was banded, it is considered a “foreign recapture.”

recovery A previously marked bird is killed or found dead, and the band number and associated information is reported to the BBL, either by letter, by telephone, or electronically.

resighting An encounter of a live, previously marked bird during which the bird is not physically recaptured. It is generally accomplished by visually recording an auxiliary marker, and also by remotely reading a band number.



Source: U.S. Geological Survey.

Appendix 1. List of Abbreviations and Acronyms

AFRING	African Waterbird Ringing Scheme	GPS	Global Positioning System
AOU	American Ornithologists' Union	IOC	International Ornithological Congress
BBL	Bird Banding Laboratory (USGS)	LEMIS	Law Enforcement Management Information System (FWS)
BBO	Bird Banding Office (Canadian Wildlife Service)	MAPS	Monitoring Avian Productivity and Survivorship
BRD	Biological Resources Discipline (USGS)	MTAB	Memorandum to All Banders
CFR	Code of Federal Regulations	NABBP	North American Bird Banding Program
DNA	deoxyribonucleic acid	NBS	National Biological Survey (Department of the Interior)
EURING	European Union for Bird Ringing	NGO	nongovernmental organization
FAC	Federal Advisory Committee	PIT	passive integrated transponder
FGDC	Federal Geographic Data Committee	PWRC	Patuxent Wildlife Research Center (USGS)
FWS	U.S. Fish and Wildlife Service	USGS	U.S. Geological Survey (Department of the Interior)
GIO	Geospatial Information Office (USGS)		

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