

USDA Forest Service Goals and Programs for Monitoring Neotropical Migratory Birds

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Abstract — The USDA Forest Service (USFS) developed goals, objectives, and guidelines for monitoring neotropical migratory birds (NTMB) on National Forest System lands in response to the Neotropical Migratory Bird Conservation Program Partners in Flight. A USFS task group developed a hierarchical monitoring framework designed to define priorities for type of monitoring data. Three levels of monitoring were defined to provide options because funding levels typically vary from Forest to Forest, and monitoring standards were defined for each level of monitoring. In addition, responsibilities for each level of the agency were identified.

INTRODUCTION

The USDA Forest Service (USFS) has participated in the Neotropical Migratory Bird (NTMB) Conservation Program Partners in Flight from its inception. The USFS began allocating funds (\$325,000 nationally) for NTMB activities in 1991. Funding grew substantially (to \$2,100,000 nationally) in 1992 when the USFS began in earnest to develop NTMB programs in each of its nine Regions. Funding was targeted to support activities in three main emphasis areas: (1) establishing cooperative monitoring programs with research and non-government partners; (2) providing training for USFS biologists about NTMBs and monitoring techniques; and (3) participating fully in Partners in Flight activities and initiatives. In this paper, I describe efforts by the USFS to develop a coordinated monitoring program for NTMBs.

A national NTMB Monitoring Task Group (the Task Group) was formed within the USFS to produce a document that outlined goals, objectives, and guidelines for monitoring NTMBs on National Forest System (NFS) lands. A final draft of the monitoring document is expected in October 1992. The information presented in this paper is a synopsis of the draft document.

MONITORING NEOTROPICAL MIGRATORY BIRDS

The USFS administers a large proportion of native habitats (191 million acres) in the U.S., and NTMBs comprise a large proportion of the breeding bird populations in these habitats. As a result, the USFS can make a significant contribution to conservation of NTMB populations. Conservation efforts directed toward NTMBs also fit into the new USFS policy on ecosystem management, an attempt to understand and address land management issues from an ecosystem perspective and to maintain or restore ecosystem integrity. Declines, extirpations, or extinctions of NTMBs would likely have major impacts on ecosystem functions.

The USFS typically monitors trends in habitat as a surrogate for the status of associated wildlife species. However, it is insufficient to monitor trends in habitat and assume that population levels are proportional to habitat quality (Van Home 1983). Many factors other than habitat affect populations, such as human disturbance, predation, competition, prey abundance, parasitism, adverse weather, disease, and, for migratory species, the status of wintering habitat. The number and distribution of reproductive individuals and their productivity and survivorship are key measures of an area's ability to support viable populations. These population parameters cannot be measured directly from habitat data, but must be determined through monitoring and research. Only through monitoring and research can we quantitatively assess population parameters to ensure that land-management activities are in compliance with governing laws, regulations, and policies.

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A list of goals was developed for monitoring on NFS lands. The goals reflect information needs within the agency and those identified in the Monitoring Work Group's Needs Assessment for Partners in Flight (Butcher 1992): (1) build an understanding of the influence of habitat changes resulting from USFS management activities on NTMBs; (2) provide insights into temporal dynamics and trends of local and regional populations of target NTMB species; (3) provide some clues as to cause(s) of trends; and (4) contribute to national and international Partners in Flight monitoring efforts.

The monitoring framework outlined in this document was motivated by concerns for NTMBs, but it will serve to monitor both resident and neotropical migratory birds. As a result, the NTMB program has potential to serve as a vehicle by which the USFS can obtain valuable information on status of bird species and bird communities on NFS lands. Bird communities provide a valuable barometer of ecosystem condition (Morrison 1986). Monitoring all birds will provide a context for interpreting changes in NTMB populations and further our understanding of the role NTMBs play on NFS lands.

MONITORING FRAMEWORK

The Task Group developed a hierarchical monitoring framework designed to define priorities for various types of information. The hierarchical framework defines monitoring options that build on one another. Monitoring options range from extensive surveys of population trends, requiring a minimum investment of time and funding, to intensive monitoring of population demographics requiring more time and effort per unit area. The framework consists of monitoring standards and three levels of monitoring effort: (1) level 1 entails monitoring population trends; (2) level 2 evaluates habitat relationships or management impacts; and (3) level 3 monitors factors affecting species' demographics. In addition, the framework defines roles and responsibilities at each level of the agency. The hierarchy is intended to encourage each National Forest or Grassland to participate in at least one and hopefully multiple levels of monitoring

A cadre of standardized protocols for a variety of avian survey and monitoring methods now exist. Field methods are not discussed in detail in this document because they are already well described in other documents. Standardized roadside point counts have been employed for the Breeding Bird Survey (BBS) since 1965 (Robbins et al. 1989). A number of other standardized protocols have recently been developed. Standardized protocols for point counts were developed at the Point Count Workshop held in Patuxent, Maryland, on November 6-7, 1991 (Ralph et al. in press). In addition, methods for obtaining demographic data have been detailed in protocols by DeSante (1991) and Martin and Geupel (in press). The following monitoring guidelines simply reference these

standardized protocols, and emphasize some aspects of implementation where they are critical to success of the monitoring effort.

Monitoring Standards for All Hierarchical Levels,

Monitoring activities at each level in the hierarchy should comply with set standards listed below.

1. Monitoring proposals should be prepared and then undergo review by a research scientist (or other qualified individual) and a biometrician for sound design and statistical validity before monitoring begins.
2. All monitoring efforts should have trigger points identified which quantify one or more resource conditions that, if reached, will launch some described research or management action. Resource conditions for which trigger points could be developed include population trends, habitat conditions, threats to special habitat requirements, changes in reproductive success or survival, etc.
3. All point counts should be at least 5 minutes in duration. The first three minutes of each count should be indicated on data sheets so the data can be compared to BBS data. Any counts conducted for longer than 5 minutes will mark the 5 minute point in the count so the first 5 minutes can be extracted from the data.
4. The point count standards call for recording all birds seen and heard inside and outside a 50m radius of the counting station. In narrow habitats such as riparian areas, a smaller radius band of perhaps 25m may be added to the 50m radius band to identify birds occurring within the habitat of interest.
5. Point counts should be conducted by multiple observers. The number of observers required should be determined using local or habitat specific information on potential observer bias. Habitats will vary in the relative difficulty they present in accurately counting birds. Differences between observers will also vary, depending upon criteria used to select observers. If local data on biases associated with habitats and observers is not available, they should be pursued through research. In lieu of local data, a minimum of 3 highly skilled observers should be used on each monitoring effort each year. Using three observers each year will help to average out individual biases within a year and reduce the likelihood that between-year differences are attributable to biases of an individual observer (Verner 1987). If possible, each observer should collect data at each point, thereby spreading the bias of each observer equally across all data points.

6. The number of counting stations required to meet Forest or Regional objectives should be evaluated with pilot or first year data to determine sample sizes that will yield the desired level of confidence. If preliminary data are unavailable to estimate minimum sample sizes, local researchers should be consulted to estimate an appropriate sample size. If data are unavailable, establish at least the minimum number of counting stations suggested for each level of the hierarchy. As soon as preliminary data become available, minimum sample size requirements should be calculated. A biometrician should be consulted when calculating minimum sample sizes or when making inferences about minimum sample sizes using local data sources.
7. Counting stations should be marked permanently and the same stations used each year.

Level 1 Monitoring

Level 1 monitoring is the most basic of monitoring efforts. Level 1 monitoring includes two distinct efforts.

1. Cooperating with U.S. Fish and Wildlife Service to ensure that the USFS is doing all it can to see that states, regions, and physiographic provinces each have enough BBS routes surveyed annually to characterize population trends.
2. Monitoring population trends of NTMBs at a Regional or Forest level via off-road (and possibly on-road) point counts. BBS methodology is well documented (Robbins et al. 1986). NFS could contribute by proposing new BBS routes, recruiting volunteers to survey the routes, and providing support services for volunteers.

The task group designed the second component of level 1 monitoring to provide population trend data for a Forest without stratifying counting stations by environmental parameters (e.g., vegetation types). This design will provide information to Forests on NTMB population trends, but will not yield information on trend interpretation since sampling is not stratified by environmental parameters. Stratifying by environmental parameters would require larger sample sizes and may not be achievable on all Forests. Level 1 monitoring should be achievable on all NFS lands within the next 3 years. Guidelines for implementing level 1 monitoring are outlined below.

1. Establishing counting stations:
 - (a) counting stations should be located a set distance apart (see Ralph et al. in press) on transects, and the number of counting stations on each transect should be limited to the number that could be counted in one morning; and

(b) transects should be distributed randomly across the Forest to obtain a representative sample of habitats and ecotones.

2. Sample size requirements:
 - (a) minimum sample sizes required to detect trends should be calculated for each Forest, and should be adequate to detect approximately a 20% increase or decrease in population levels between consecutive years;
 - (b) if absolutely no local or applicable sample size information is available, establish a minimum of 200 counting stations per Forest (Verner and Kie 1988, Thompson and Schwalbach in press); and
 - (c) after the first and second year, the minimum sample size should be calculated and adjusted accordingly.
3. Count duration and visitation frequency:
 - (a) counting stations should be visited once during the breeding season for a 5 minute count; and
 - (b) the number of visits and count length is limited for level 1 monitoring to increase the number of stations that could be surveyed.
4. Observers:
 - (a) each observer should be randomly assigned an equal proportion of the transects to be visited.
5. Habitat measurements:
 - (a) habitat at each counting station should be classified using an ecological classification system that is applied throughout the Region; and
 - (b) habitat measurements are not crucial in level 1 monitoring because the objective and sample design are not intended to yield information on habitat associations or causes for trends.

Level 2 Monitoring

Level 2 monitoring relates species presence/absence or abundance trends to habitat conditions representing natural conditions and/or land-use practices. Level 2 monitoring encompasses a range of options, some requiring minimal additional effort over level 1, and some requiring much more effort. Options for level 2 monitoring range from a scheme that investigates the impact of a management action on a local population of one or more bird species to a scheme that monitors a variety of habitat types throughout a Region or a Forest. Guidelines for implementing level 2 monitoring are outlined below.

1. Establishing counting stations:
 - (a) counting stations should be randomly located throughout as many representative areas as possible for each habitat condition.
2. Sample size:

- (a) describing the species associated with a particular habitat condition requires that adequate sample sizes are achieved within each habitat condition;
 - (b) minimum sample sizes should be calculated based on preliminary data and desired levels of confidence (a set level of confidence can not be established here because level 2 monitoring encompasses such a wide range of monitoring objectives); and
 - (c) if preliminary or locally applicable data are unavailable to estimate sample size, an absolute minimum of 30 counting stations should be established within each habitat condition for the first sample season.
3. Count duration and visitation frequency:
- (a) count duration and visitation frequency affect the number of counting stations that can be sampled per unit effort, with the ultimate goal being to provide an accurate estimate of the presence/absence or abundance trends of bird species occurring in specific habitat conditions;
 - (b) if local data are unavailable, a pilot sample should be developed with the help of a biometrician; and
 - (c) species accumulation curves should be calculated for each counting station to determine how much time is required to detect the majority of species at each point and if the greatest variability occurs between points or at a point over the counting period.
4. Habitat measurements:
- (a) habitat characteristics should be measured at and around each counting station;
 - (b) each monitoring project should carefully consider the type of habitat information required to address the specific questions being posed;
 - (c) at a minimum, habitat variables such as plant species composition, canopy closure, vegetation structure, slope, aspect, and elevation should be quantified using standardized techniques (Block et al. 1987); and
 - (d) standardized measuring techniques should be used to ensure precise estimates of variables (Block et al. 1987), and visual estimates should be avoided.

Level 3 Monitoring

Level 3 monitoring obtains information on species demographics. Monitoring population demographics is recognized as an important element in the conservation of species. Monitoring the relative abundance of species over time may not be adequate to address cause and effect relationships of management activities or habitat quality (Southwood 1977,

Van Home 1983, and Hobbs and Hanley 1990). Demographic data will provide information needed to assess population viability and for interpreting population trends.

Two generalized procedures are currently being evaluated for their ability to yield demographic data: constant effort mist netting procedures and nest search and monitoring procedures. Demographic data consists of two components: (1) survivorship - the probability of survival from birth to age x ; and (2) reproduction - the expected number of female offspring for each female of age x per unit time. The monitoring methods described here provide proxies to one or both components of demography. Both approaches have inherent advantages and limitations that should be considered before use.

Constant-effort mist net procedures provide information on productivity and survivorship. As with the population trends obtained from point counts, the data do not provide information on environmental factors that might be affecting productivity and survivorship. Productivity data is obtained by comparing the adult/young ratio, and is only a general indication of productivity in that once the young fledge, many species move great distances (often moving up in elevation). Birds captured in the nets could be from the local area and/or from areas miles away. Productivity data provided by the mist net technique appears to be most useful in providing large-scale trend data that are best complemented by habitat or area-specific monitoring to contribute to a monitoring scheme that can affect land management in a timely fashion.

Nest search and monitoring provide information on productivity via nest success, in addition to information on habitat associations. The strengths of nest search are that: (1) productivity data can be directly associated with habitat conditions; and (2) factors affecting productivity, such as predation and brood parasitism, can be quantified. The nest search procedure can not provide information on survivorship, and it is labor intensive so study areas are typically small and few in number.

Most level 3 efforts typically should be conducted in conjunction with level 2 efforts. Additional methods of obtaining population parameters need to be explored as a large-scale monitoring tools to provide information where existing methods fall short.

ROLES AND RESPONSIBILITIES

Involvement in data collection, analysis, storage, and exchange will extend across all levels of the USFS. A scheme for assigning areas of responsibility to each level of the agency are outlined below.

1. Washington Office responsibilities:
 - (a) conduct periodic reviews of the national NTMB program within the NFS and research to determine if adjustments in program direction are needed;

THE IMPACT OF NTMB MONITORING IN THE USFS

The NTMB Program has the potential to have a significant effect within the NFS. The focus on monitoring species and habitats, and manipulating scientific data is unique within NFS, and the need exists for improved technical skills at all levels of the agency. The NTMB Program has enabled NFS to focus on improving technical skill levels within the agency, which will positively affect all USFS programs.

By far the most beneficial aspect of a successful monitoring program will be an increase in the quality of information upon which we base resource management decisions. It is clear that information about wildlife on NFS lands is inadequate for the kinds of land management decisions being made today. The NTMB program provides the NFS with an opportunity to develop information bases that are site-specific, current, and long-term.

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- (b) store data and conduct analyses necessary to describe multi-regional and national population trends; and
 - (c) distribute analysis results throughout the USFS and to other agencies and non-governmental organizations.
2. Regional Office responsibilities:
- (a) develop a monitoring plan for each Region that,
 - (1) spans a five year time frame, (2) meets local, regional, and national information needs, (3) clearly defines and documents monitoring objectives in detail, (4) establishes a NTMB monitoring program on every Forest that accomplishes at least level 1 monitoring objectives, and (5) is rigorously reviewed for technical soundness;
 - (b) provide the services of a Regional data center that serves as a repository for all monitoring data, provides standardized field and data entry forms and procedures, and conducts data analysis and interpretation of data collected within the Region;
 - (c) provide high quality, consistent training throughout the Region on data collection, data entry, and data analysis; and
 - (d) establish a Regional steering committee that is comprised of representatives from Forests, Districts, and research to help develop Regional direction for the NTMB monitoring program.
3. National Forest responsibilities:
- (a) develop proposals that will meet Forest needs for level 2 and 3 monitoring;
 - (b) provide Forest-wide coordination of data collection, storage, and analysis;
 - (c) conduct all data entry and proofing;
 - (d) for data sets that are unique to a Forest, the Forest will be responsible for structuring a data base format and analyzing the data through cooperation with research; and
 - (e) incorporate monitoring results into Forest direction, particularly when monitoring data indicate that a trigger point has been reached, and a change in management actions is indicated.
4. Research Responsibilities
- (a) conduct studies and experiments that investigate probable causes of troublesome population trends occurring within the Region;
 - (b) investigate the habitat relationships, productivity, and survivorship of populations of NTMBs; and
 - (c) design and test protocols for data collection, storage, and analysis to insure the desired quality and quantity of data are obtained.

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