DESIGNING A LANDBIRD MONITORING PROGRAM AT NORTH CASCADES NATIONAL PARK SERVICE COMPLEX:

SUMMARY RECOMMENDATIONS FROM A SEPTEMBER 2000 WORKSHOP

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U.S. Department of the Interior
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North Cascades National Park Service Complex, comprising North Cascades National Park, Ross Lake National Recreation Area, and Lake Chelan National Recreation Area, was established in October, 1968 and is located in northwestern Washington. North Cascades National Park was established to preserve certain majestic mountain scenery, snow fields, glaciers, alpine meadows, and other unique natural features in the North Cascade Mountains for the benefit, use, and inspiration of present and future generations. Ross Lake and Lake Chelan National Recreation Areas were established to provide for outdoor recreation use and enjoyment and to conserve scenic, scientific, historic, and other values contributing to public enjoyment of these lands and waters.

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BACKGROUND

In January 2000 the Wildlife Research Advisory Committee (WRAC) of Seattle City Light awarded North Cascades National Park Service Complex (NOCA) a grant to develop a long-term landbird monitoring program. The WRAC stipulated that NOCA use part of the grant to host a round-table meeting of landbird monitoring experts to produce recommendations for the plan.

We held our meeting on September 12-13 at Baker Lake Lodge, Washington. Participants included representatives from North Cascades, Mount Rainier and Olympic National Park, as well as recognized avian monitoring experts and statisticians from federal agencies, universities, and the non-profit sector. The complete list of participants was as follows:

Jonathon Bart, USGS
David DeSante, The Institute for Bird Populations
Steve Fancy, NPS Inventory and Monitoring Program
Bruce Freet, North Cascades National Park
Kurt Jenkins, Olympic National Park
Bob Kuntz, North Cascades National Park
Kathy Martin, University of British Columbia
John McLaughlin, Western Washington University
Jim Petterson, Mount Rainier National Park
John Sauer, USGS
Rodney Siegel, The Institute for Bird Populations
David Wallin, Western Washington University

This document summarizes the committee's formulation of program goals as well as its recommendations for methods and sampling strategies. It should be noted that on several key issues, full consensus was not obtained by the group. Therefore, the recommendations presented here do not necessarily represent the opinion of all committee members, but instead describe

what we perceived to be the 'majority opinion'. For the more important disagreements we have also attempted to summarize dissenting 'minority opinions' as well.

GOALS AND OBJECTIVES

Our discussion of goals and objectives for the landbird monitoring program began with a review of the overarching goals of the NPS' Long-term Ecological Monitoring Program, which are stated as follows:

"…to track and understand how communities and habitats respond to natural processes; to be able to distinguish differences between human-induced disturbance effects and those caused by natural processes; to provide early detection of environmental impairment using sensitive receptors/indicator organisms through extensive surveys; to utilize existing methods and incorporate new methods that integrate monitoring parameters in such a manner as to determine and track "Ecological Integrity"; to apply monitoring information throughout the park complex, adjacent land area, and areas with similar landforms and resources; to develop management recommendations for addressing park-specific concerns regarding ecosystem issues; to integrate the monitoring program with other regional programs concerning ecosystem issues (e.g. habitat fragmentation, biodiversity, air quality, global climate change, threatened and endangered species, etc.); and to provide a reference of high quality resources and intact naturally functioning systems for interpretation of data, impact assessment, and formulation of management guidelines at impaired sites, both within and outside of the park complex."

After some discussion, we agreed that providing park personnel with information relevant to park management issues should be a goal of any avian monitoring program, but certainly not the only goal. Rather, the program should also aim to collect information of value in a regional context, as a 'reference of high quality resources' for comparison with data gathered outside the park. Along these lines, the committee felt strongly that whatever form our plan took, it should be 'exportable', perhaps with minor modifications, to other parks in the region.

The group also agreed that NOCA's first priority for landbird monitoring, given the limited funding likely available, should involve some kind of spatially extensive survey, incorporating a single methodology that would adequately sample a large suite of species. However, some participants expressed reservations about focusing efforts on a single survey that would likely be tailored around detecting breeding landbirds; they suggested equal attention should be allotted to other groups of birds, such as raptors or aquatic species. Some discussion was also devoted to whether it would be appropriate to focus solely on monitoring during the breeding season, rather than allotting some effort to spring and/or fall migration. It was agreed that migration studies should be considered lower priority, because of the difficulties involved in relating changes in numbers of transient migratory birds with management practices or environmental conditions *within the park*. The group agreed in principle that the spatially extensive survey should be complemented with a more intensive demographic study, to elucidate the proximate causes of detected population changes. The group seemed to agree, however, that should funding be limited, the spatially extensive survey component should be considered a higher priority than the demographic component, at least for the initial inventory effort.

The committee adopted the following mission statement for NOCA's bird monitoring program:

The program should be designed to gather improved information about the status and trends of breeding landbirds that will assist the Park in achieving its mission.

More specifically, the group agreed that the combined goals of avian inventory and monitoring at NOCA should be:

a) for a large suite of species, elucidate <u>spatial</u> patterns of abundance across the park;
b) for a large suite of species, elucidate <u>temporal</u> patterns of abundance across the park (sampling at coarser spatial scale than for (a); and
c) study the demography of a smaller suite of target species, to elucidate the proximate causes of detected population trends.

METHODS AND STUDY DESIGN—SPATIALLY EXTENSIVE SURVEY

The committee spent considerable time discussing and comparing different multi-species survey techniques. We agreed from the outset that two primary criteria should drive our selection of an appropriate survey technique; NOCA should adopt a technique that

a) produces maximum scientific credibility, and
b) maximizes ability to compare results with present and future data collection efforts outside the park complex.

In fulfillment of these requirements, we agreed that whatever technique(s) we recommended must:

1) include some kind of adjustment for detectability, rather than simply providing raw counts, and
2) minimize bias in both population estimates and population trends. Sharp disagreement existed within the group as to which methods produce the least biased estimates, and whether any methods could produce completely unbiased estimates.

We debated the relative merits of three different survey techniques—variable circular plot (VCP) point counts, double-observer point counts combined with either distance estimation or 'effort-removal', and double sampling. After much discussion, the group ultimately achieved near-consensus that **NOCA should proceed with an annual, spatially extensive survey based on VCP point counts.** One participant strongly disagreed, however, suggesting area searches or point counts implemented in a double sampling context (where a subset of study plots are intensively studied to provide an unbiased estimate of bird abundance, and by extension a correction factor for area search or point count results) would be the best choice for producing unbiased estimates. This participant felt that the park should devote most of the first few years of data collection to comparing the biases associated with different methods. Others felt that such validation studies would be very time-consuming and expensive, might not stand a good

chance of yielding definitive results, and perhaps were outside the mandate of NOCA's I & M efforts.

The group spent considerable time discussing possible sampling schemes. One option considered, but ultimately rejected, was co-locating bird survey points with Forest Inventory and Analysis (FIA) points that have already been established throughout the park. This approach initially seemed appealing because of the obvious advantages of co-location—the park could make use of the extensive vegetation and other data collected by the FIA. Upon closer consideration, however, working with the FIA points seems quite difficult. Of the approximately 105 FIA plots scattered throughout the park, the majority are extremely difficult to access and/or located on dangerously steep slopes. When the most inaccessible sites are eliminated from consideration, only about 40 points remain -- too few to meet the objectives of our monitoring program. Additionally, the remaining points are inconveniently scattered throughout the park complex. A fairly small number of points, scattered throughout the park with no deliberate 'clumping' will make for a very inefficient survey, as observers will have to spend an inordinate amount of time traveling between points. Preliminary work surveying vertebrates at FIA points in Olympic National Park has proven to be extremely inefficient, for all these reasons. **The group therefore recommends selecting a new set of sampling plots across the park for bird surveys.** The sampling plots should be selected in some manner that has a component of randomness (so that inference to unsampled areas is permitted), but also ensures that plots are distributed relatively evenly across the park, or across strata within the park. Several ways of selecting plots so as to fulfill both these requirements were discussed.

We agreed that for practical reasons, the sampling scheme must take into account the following factors:

a) **distance from the trailhead**: Much of the park's trail system lies within a one-day hike from a trailhead, but there are some stretches of trails, particularly in the northern portion of the park, that may require as much as two full days of hiking to access. This certainly does not prevent surveying these areas, but it does mean that extra time may need to be spent accessing survey locations, rather than conducting surveys. If several

survey points are clustered together in the more remote regions of the park, than two days of hiking may allow numerous backcountry surveys to be conducted on the same trip.

b) **distance from the trail:** Off-trail hiking in rough terrain is much slower than trail hiking. The proportion of person-days on which bird surveys are actually conducted (as opposed to days devoted entirely to hiking toward survey points) will be substantially reduced if observers must hike long distances off-trail. Even more importantly, the risk of crew members being injured increases dramatically when they are working off-trail. We therefore suggest selecting most points from within an access buffer zone that would only include areas within 2 km of park roads or trails. However, large areas of NOCA are inaccessible by trail, as are several important habitats. For these reasons, we recommend that a small number of points from outside the trail buffer should also be selected, so that inferences can be made to these areas and habitats as well.

c) **slope:** Slopes greater than about 35° are best considered unsafe for off-trail hiking; many of NOCA's steep slopes are much steeper than this, and indeed, are altogether impassable. Approximately 42% of NOCA consists of slopes greater than 35°, so if we exclude these areas, our sampling frame includes, at most, 58% of the park. Any algorithm we adopt for selecting study plots will have to disallow a) plots located on prohibitively steep slopes, and b) plots that may be on safe slopes but can only be reached by crossing prohibitively steep slopes.

d) **streams:** Crew members must be explicitly prohibited from attempting dangerous stream crossings. Many of the park's trails are directly adjacent to streams. In large areas of the park, this is likely to mean that either a) our effective sampling frame is nearly cut in half (crew members can only access portions of the park that are on the trail-side of the adjacent stream), or b) traveling time to points on far sides of streams will be much increased and will involve long off-trail hikes. Additionally, point counts should not be conducted directly adjacent to larger streams, as they pose a noise interference problem that may drastically reduce detectability.

Based on the above considerations, the group recommended that the sampling scheme incorporate three different strata based on ease of access:

1) frontcountry—comprised of a buffer around roads (and, by extension, trailheads)
2) backcountry/intermediate—comprised of a buffer around trails
3) backcountry/remote—comprised of areas not included in either of the above buffers

We tentatively suggest that 20% of sampling effort be conducted in zone 1, 60% in zone 2, and 20% in zone 3.

Much discussion was devoted to whether additional strata besides access zone should be specified, and if so, what they should be. Ideas suggested for strata included elevational zones, general plant community, specific plant community, east/central/west, and precipitation regime. NOCA's most reliable GIS data coverage includes 55 distinct (and very specific) habitat types. This lengthy list could fairly easily be collapsed down to a coarser but more tractable list of 15-20 major habitat types, or a still coarser list of 3-6 very broad habitats. Some experts have argued against stratifying by habitat, as successional and other changes, as well as changes is the habitat classification scheme, prevent it from being a permanent feature of the landscape. On the other hand, vegetative cover type is nevertheless an appealing variable for stratification, as it will likely be the best predictor of species occurrence; the best way to ensure that as many species as possible will be represented in survey results is to make sure that each vegetative cover type is adequately sampled. **The group tentatively agreed that sampling strata should be based on three access zones described above, and a small number of very general plant communities.**

The group also discussed the optimum number of study plots to include in the survey. Considerations include cost as well as statistical power to detect temporal trends and/or compare different habitats or regions within the park. One rule of thumb suggested was that, for a large suite of species, the survey should yield a 95% chance of detecting a decline of 3% per year, over 20 years. Repeating points during the initial two years of the study (the 'inventory' phase— see below) will suggest the magnitude of inter-annual variance in density estimates to be expected; the park can then proceed with power analysis and adjust the sampling scheme accordingly.

Based on cost estimates and anticipated funding levels, the group suggested annually conducting approximately ten point counts on each of 44 study plots each year. The group recommended devoting the first two years of the study to an avian 'inventory' that would produce habitat-specific, park-wide distribution and density maps for most species occurring within the park. The methodology would be identical to that of the long-term spatially extensive monitoring work, except a greater number of points, providing better coverage across the park landscape, would be included in the inventory survey. The group initially suggested the inventory might include approximately 180 unique study plots, about half of which would be surveyed in each of the two 'inventory' years. Subsequent to the meeting, it has become apparent that we over-estimated available funding, so the number of inventory study plots will have to be reduced accordingly.

We agreed that habitat data should be collected at each survey point, at least during the initial inventory period of the study, and then perhaps again every several years. We only cursorily discussed what specific data should be collected, agreeing that each point should be classified to habitat type with specificity at least equal to that in the park's existing GIS database, so that bird survey results can be used to project population density estimates across the entire park landscape. We further agreed that additional data on such factors as plant community composition and structure, canopy cover, slope and aspect should also be collected, but that the habitat assessment protocol needed to be one that could be implemented rapidly (perhaps well under 30 minutes per point?). It was also suggested that the protocol ensure collection of all data requested by the Partners in Flight Point Count Vegetation Database protocol currently under development by the USGS Patuxent Wildlife Research Center and the American Bird Conservancy.

Methods and Study Design—Demographic Survey

The committee also discussed methodological options for adding a demographic component to NOCA's avian monitoring plan. **Most of the group agreed that the Monitoring Avian Productivity and Survivorship (MAPS) methodology for constant-effort mist netting**

represented the best way to incorporate demographic monitoring into the park's plan, because:

-MAPS provides productivity indices and survival estimates for a large suite of commonly captured species;
-MAPS utilizes an established methodology that is widely used across North America (including stations in several other national parks); and
-data can be compared usefully with results from MAPS stations already in place on more heavily managed landscapes on the adjacent Willamette and Mt. Baker/Snoqualmie National Forests.

One participant disagreed, suggesting that the park spend a couple of field seasons developing and implementing a more rapid mist-net based assessment of avian productivity at numerous sites throughout the park. Others were concerned that such an approach would rely on an untested methodology, would be costly and logistically difficult to implement, and would focus solely on avian productivity, providing no information on survivorship.

Given likely budget constraints, the group agreed that the park should establish six MAPS stations, the maximum number that a two-person crew can realistically operate. We discussed several possibilities for locating the stations, and concluded that logistical constraints would prevent the stations from being sited completely randomly. Perhaps six stations could be chosen randomly from a larger pool of pre-selected locations, but all potential locations would need to be located fairly close to roads, and would need to contain habitat that would facilitate catching large numbers of birds. One possibility suggested was that three stations could be located in the Skagit River corridor along Highway 20, and three additional stations could be sited in the Stahekin Valley. The Skagit River stations might be located in habitat broadly comparable to that of the existing MAPS stations on the adjacent (and more heavily managed) Mt. Baker/Snoqualmie National Forest, while the Stahekin Valley stations would be similar to those already existing on the Willamette National Forest.

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