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Monitoring and Evaluation Plan For The Albeni Falls Wildlife Mitigation Project

(BPA Project Numbers 199206100 and 19910600)

Prepared By:

Albeni Falls Interagency Work Group

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Table of Contents

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Introduction

Background

Congress passed the Northwest Power Planning and Conservation Act on 5 December 1980. Section 4(h)(10)(A) of the Act directed the Bonneville Power Administration (BPA) "to protect, mitigate, and enhance fish and wildlife to the extent affected by the development and operation of any hydroelectric project of the Columbia River and its tributaries in a manner consistent with the Northwest Power Planning Council's (NPPC) Fish and Wildlife Program." In 1986 the Idaho Department of Fish and Game (IDFG) formed the Albeni Falls Interagency Work Group (Work Group). Under the direction of the Northwest Power Planning Council's Columbia River Basin Fish and Wildlife Program, the Work Group used U.S. Fish and Wildlife Service (USFWS) Habitat Evaluation Procedure (HEP) methodology (U.S. Fish and Wildlife Service 1980a, 1980b) to calculated the wildlife impacts caused by the construction and operation of Albeni Falls Dam, and developed a mitigation plan (Martin et al. 1988). Construction of the dam resulted in the loss of 6,617 acres of wetland habitat and the inundation of 8,900 acres of deep-water marsh. Estimated wildlife losses were 28,587 habitat units (HUs) for a variety of target species (Martin et al. 1988). The goal of the mitigation plan is to provide benefits equal to the HEP target species habitat units lost due to development and operation of the Albeni Falls Dam. In lieu of annualizing HU losses the NPPC has decided to mitigate losses at a 2:1 ratio. That is, for every 2 HUs protected the HU ledger will be reduced by 1 HU. The principal mitigation strategies forwarded by the plan are the protection of in-place, in-kind habitats through fee-title acquisition or the purchase of conservation easements, enhancement of those habitats with restoration potential, and maintaining the long-term quality of these habitats.

The Albeni Falls Wildlife Mitigation Project was developed to protect, restore, enhance and maintain the long-term quality of wetland and riparian habitat in northern Idaho and eastern Washington (Figure 1) as on-going mitigation for the construction and inundation of the Albeni Falls hydroelectric project (NPPC 2000, NPPC 1995 program measures 11.2D.1, 11.2E.1, 11.3D.4, 11.3D.5). The long-term conservation potential of implementing the NPPC Fish and Wildlife Program through the Albeni Falls Wildlife Mitigation Project is principally the protection of existing high quality wetland habitats and associated target species, but also includes protection and development of habitats with high restoration potential.

The NPPC Fish and Wildlife Program addresses the need for monitoring and evaluation (M&E) to ensure that mitigation goals are attained (NPPC 2000). Section 3.1B (NPPC 1995) calls for evaluation that "will monitor overall program implementation, evaluate the effectiveness of actions taken, and judge their scientific merits." Section 11.4 (NPPC 1995) states that the Council is interested in ensuring that mitigation actually occurs on the ground, and accordingly, is providing for monitoring to determine if projected benefits to wildlife result from the Program. The Program calls for an independent scientific review group to evaluate the progress and success of wildlife mitigation efforts (NPPC 1995, Section 11.4A.2). Consequently, the Independent Scientific Review Panel

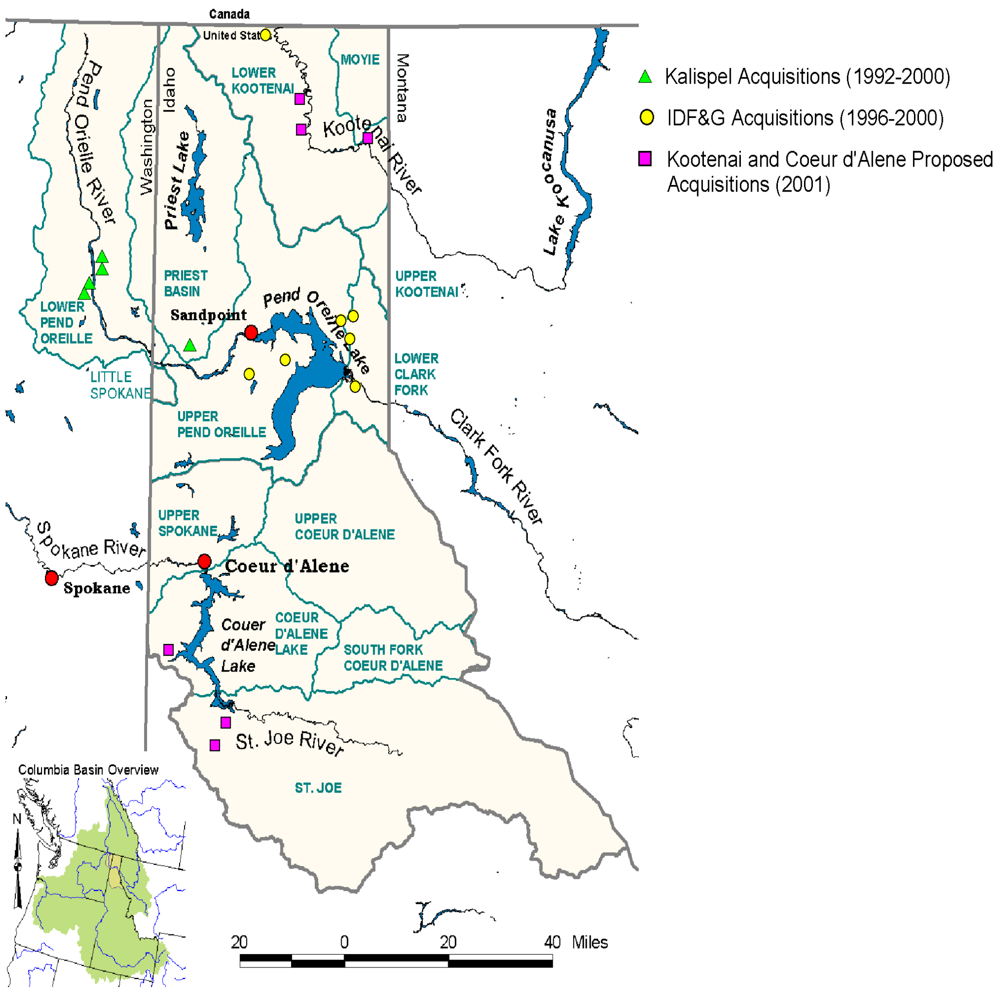

Figure 1. Location of the Albeni Falls Mitigation implementation area and existing and proposed project locations.

(ISRP) was formed and, after a review of the NPPC Fish and Wildlife Program and implementation, made among others, the following recommendation: Monitoring, which is now based on HUs determined by HEP analysis, be expanded to include a requirement for some degree of direct monitoring of target (and perhaps some non-target) wildlife populations (III.B.25, ISRP Report 97-1, July 1997). Sponsors of the Albeni Falls Wildlife Mitigation project recognize and strongly support the need for a M&E program that goes beyond HEP, is based in good science and standard methodologies, can be applied in an adaptive management context, and balances the need for information with an appropriate level of effort when conducted in a management context. This monitoring and evaluation plan is a response to these Program and Project needs.

Monitoring Framework

Monitoring Scale and Intensity

The scale at which a monitoring program will be applied is a defining consideration in the development of a monitoring program. Spatial scales can be geographic (regional or local), ecological (landscape or habitat), or jurisdictional (Federal, State, Tribal). Biological scales may incorporate entire ecosystems or local populations of a featured species. Temporal scale may consider seasonal, annual or long-term variability/stability and outputs of a community. An ideal monitoring program would transcend all spatial, biological, and temporal scales. In reality, broad-scale extensive monitoring programs often lack the sensitivity to detect local level perturbations. Conversely, more intensive monitoring methods applicable to research on a site-specific basis are too costly and labor intensive to apply on a broad scale. This M&E plan attempts to balance both of these needs.

Monitoring can be conducted at three qualitative levels of intensity:

1) Tier I Trend monitoring is sufficient to answer questions about the trend in population or habitat condition over a broad scale. It has the advantage of being relatively inexpensive to implement. However, its lack of precision makes it relatively insensitive to local conditions or management actions. On a programmatic scale (the NPPC Fish and Wildlife Program) we believe that HEP analysis (U.S. Fish and Wildlife Service 1980a) falls into this category. Particularly for projects that endeavor to mitigate a finite ledger of HUs associated with losses from a specific hydropower project, HEP adequately meets the monitoring needs, at a programmatic level, to ensure mitigation goals are being achieved. Consequently, HEP will remain an integral part of our overall monitoring strategy.

2) Tier II Statistical monitoring is able to answer questions about population trends, community diversity, and species relative abundance in the context of local habitat condition or management action. Although more costly to implement, this level of monitoring has sufficient sensitivity to provide feedback on management actions in an adaptive management context. Additionally, by collecting site-specific data according to standardized protocols these data may be used across multiple spatial and biological scales. Consequently, they may contribute data points to regional, national, or international monitoring efforts. Conversely, by collecting data that contributes and are comparable to a broader data set the manager can better interpret results (e.g. declines in amphibian populations as a local verses more general biological problem). Most of the methods outlined in the M&E plan fall into this level of monitoring. A purposeful effort was made to select methods that are widely employed in field biology or to adopt appropriate monitoring protocols from national monitoring programs to maximize the utility of the data collected. A significant limit of this level of monitoring intensity is that it is not sufficient to evaluate the causes of change in habitat or population trends.

3) Tier III Research monitoring is the most sensitive level of monitoring. At this level we are able to answer questions about causal relationships between specific habitat attributes and population demographic parameters. The data demands to achieve the statistical power to answer these types of questions make this the most expensive level of monitoring to employ on a per area basis. Basically this is research and beyond the management context of this M&E plan. However, if Tier II Statistical monitoring suggests a management problem that can not be adequately addressed by a review of the literature and through the managers experience, nothing in this M&E plan constrains a manager from developing a site-specific monitoring program at this intensity level to address specific problems.

Monitoring Goals and Objectives

Monitoring and evaluation consists of assessing changes in habitats, populations, or communities that test the effectiveness of mitigation measures. Adaptive management is the process of using scientific information to evaluate and improve management decisions. Conceptually, adaptive management is based on the need to maintain operational flexibility to respond to monitoring and research findings. Hence, adaptive management is the practical application that links monitoring and management. The goal of any monitoring program is to provide information that verifies whether management objectives are being met. Therefore, monitoring goals are dependent on management goals. The Albeni Falls Wildlife Mitigation Project has two major management goals. The first goal is programmatic while the second goal is strategic. The primary project goals are:

1. To fully mitigate the wildlife habitat losses associated with the construction and operation of Albeni Falls Dam.

2. To protect, restore, enhance, and maintain wetland/riparian wildlife habitat within all of the Mountain Columbia Subbasins (except the Bitterroot, Flathead, and Blackfoot). Implicit in this goal is the maintenance or enhancement of wetland/riparian associated wildlife populations, maintenance or enhancement of wetland/riparian species diversity, and, to the extent possible, protection or restoration of native communities.

In support of these management goals the objectives of this monitoring and evaluation plan are to:

1. Track progress toward full mitigation of the 28,587 HUs identified in the Albeni Falls Dam loss assessment.

2. Evaluate the success or failure of mitigation management activities by:

    a. Monitoring secondary population parameters (relative abundance, distribution, and population trends) of selected target and non-target wildlife species, and their habitats as an indicator of management effectiveness.

    b. Monitoring trends in overall diversity of select wildlife communities.

    c. Comparing managed site data against reference site data and the literature to evaluate project movement toward meeting desired future conditions within each major cover type.

3. Adopt standardized monitoring methodologies that are compatible with monitoring at larger scales and the scientific literature. This will maximize the usefulness of the data collected within the NPPC Fish and Wildlife Program as well as at regional or national scales.

Program Sampling Design

Introduction

This wildlife-monitoring program is designed to provide managers with information on population and community trends through time that can be used in an adaptive management context. Monitoring is an ongoing obligation of management and should itself be viewed as an adaptive process. Currently the Albeni Falls Dam HU ledger is less than 20% mitigated. Consequently, most of the land base that will eventually be managed and monitored is not currently identified. Without good knowledge of the total land base, distribution, juxtaposition, block size, and condition (degree of restoration required) of mitigation properties it is difficult to design an efficient monitoring program that anticipates all future needs. Upon completing full mitigation of the Albeni Falls Dam HU ledger this monitoring program will be reviewed and revised. In the interim the managers of the Albeni Falls Interagency Work Group will be guided by this monitoring program's design and principals but retain the flexibility to modify it to meet individual needs and management challenges.

The long-term monitoring database for this project will be developed through both observational and quantitative monitoring. Observational monitoring includes the use of such things as photo plots and incidental wildlife observations that may suggest changes in plant or wildlife communities at a qualitative level. These data have the advantage of being relatively inexpensive to obtain but are limited because they depend on subjective interpretation. Quantitative monitoring depends on actual measurement of population or community attributes and these data are amenable to statistical analysis. The primary disadvantage of quantitative monitoring is that it is expensive and time consuming. However, quantitative monitoring can provide estimates of direction and magnitude of change before change is grossly evident, is less biased than observational monitoring, and is the most objective way to evaluate the success of our mitigation and management programs.

Monitoring and Evaluation Sampling Strategy

The focus of this project is wetland mitigation. Monitoring will focus on wetland/riparian habitats. For the purpose of this monitoring plan upland monitoring will be limited to observational techniques and documentation of weed control. However, nothing constrains a manager from doing more intensive monitoring of uplands as deemed appropriate. For example, a high disturbance upland prescription to selectively log and prescribe burn an upland site to improve white-tailed deer forage availability should include a site-specific monitoring plan.

Using the Universal Transverse Mercator coordinate system a permanent grid with spacing of 200 m or less will be established by each Work Group cooperator on each mitigation property they own and manage. By ownership, grid points will be sequentially numbered and represent potential monitoring sample points that can be randomly selected by use of a random numbers generator. The 200-m spacing is equal to the preferred sample point separation for land bird point-count stations (Huff et al. 2000), and yields one potential sample point for every 4 ha of habitat. Closer grid-point spacing decreases the probability that data from adjacent sample points are independent and increases the risk of double counting birds when using variable-radius point-count sampling techniques in particular. Three wetland cover types will be monitored: emergent herbaceous, shrub-scrub, and forested wetlands.

Drawing the sample of points to be monitored is complicated by the fact that we are still in the implementation phase and additional properties will be added on an annual basis for the next 10+ years. The sampling scheme must be cost effective, provide a data set that provides a long-term perspective on meeting management objectives, and is flexible enough to incorporate new properties as they are acquired. Consideration must also be given to the fact that cover types do not occur in equal proportions and that some habitats are intact while others require restoration. Taking these concerns into consideration we have devised the following sampling scheme:

Sampling will be done with a constant intensity of 10% of all potential sample points. As additional properties are purchased, additional permanent sample points will be identified to maintain a sampling intensity of 10% of all possible sample points. One-third of the selected sample points will be visited each year on a three-year rotating basis. The use of rotating panels of sample points will allow us to effectively increase the sample size while still meeting the objectives of long-term monitoring within time and cost constraints (McDonald et al. 1998). Permanent sample sites that are visited every three years are revisited at a sufficient frequency to capture long-term trends in population and community change.

A random sample of long-term monitoring sample points will be drawn from all possible sample points. Once identified as part of the sample to be monitored, these points will become part of a permanent subset of points to be used for long-term monitoring.

This random sampling design makes no *a priori* distinction between sample points that fall on intact wetlands where management is custodial and restoration sites where the management is active and community changes may be dramatic even in a short amount of time. At a programmatic and project scale this is appropriate to document the success or failure of conservation strategies from a long-term monitoring perspective. However, it may not provide managers with adequate feedback on the success of site-specific management prescriptions. Managers may choose to supplement this basic sampling scheme with additional sample points randomly selected from within a site-specific prescription area for Tier III Research monitoring. These supplemental sample points will not become part of the long-term permanent sample-point set. They may be revisited more or less frequently than every three years and/or dropped from monitoring altogether at any time at the manager's discretion.

Monitoring in an adaptive management context implies benchmarks or desired outcomes against which management success can be measured. The vegetative and wildlife community structure of intact wetland habitats can act as one benchmark for the effectiveness of restoration management. We will retrospectively (that is after the random sample has been drawn) identify a subset of the permanent sample points of intact wetlands from each cover type to serve as reference sites against which restoration management may be evaluated.

Additional reference sites, both within and outside of the project boundaries, may need to be subjectively identified to secure a minimum of three reference sites for each cover type. Sample points selected as reference sites will initially be sampled for three consecutive years to establish a strong baseline data set. Based on initial results permanent baseline monitoring plots may also be established (to the extent possible) within formally designated ecological reference areas (e.g. USDA Forest Service Research Natural Areas) that are located in areas adjacent to mitigation properties but are functionally independent of mitigation properties and associated management. When available and applicable the scientific literature will provide an additional source of reference benchmarks for project evaluation.

Habitat Evaluation Procedures

Introduction

The Habitat Evaluation Procedure (HEP) was developed in 1980 by the U.S. Fish and Wildlife Service (USFWS 1980a, USFWS 1980b, USFWS 1981). HEP uses a species-habitat based approach to impact assessment, and is a convenient tool to document the predicted effects of proposed management actions. The Northwest Power Planning Council endorsed the use of HEP in its Columbia River Basin Fish and Wildlife Program to evaluate wildlife benefits and impacts associated with the development and operation of the federal Columbia River basin hydroelectric system. The Albeni Falls Interagency Work Group used HEP in 1987 to evaluate wildlife habitat losses attributed to the Albeni Falls hydroelectric facility (Martin et al. 1988).

The objective of using HEP is two-fold. First, it provides an objective and quantitative assessment of the wildlife habitat value of land purchased for mitigation. This will be used to offset the Albeni Falls Dam HU ledger. That ledger accounts for the loss of wildlife habitat that resulted from the Albeni Falls hydroelectric project and the extent to which those losses have been mitigated. On a programmatic scale (the NPPC Fish and Wildlife Program) HEP analysis provides one useful tracking metric for the entire mitigation program, especially for projects that endeavor to mitigate a finite ledger of HUs associated with losses from a specific hydropower project. Secondly, the baseline HEP evaluation describes existing ecological conditions (limiting factors) on the property and may be used to assist managers in developing future management activities. On a gross scale, future HEP analyses will be used as a check to quantitatively evaluate the effectiveness of management strategies in improving habitat conditions.

Methods

The HEP is based on the assumption that habitat for a selected species can be described by a Habitat Suitability Index (HSI). This value is derived by evaluating the ability of key habitat components (hiding cover, snag density) to supply the life requisites of selected wildlife species. Habitat quality, expressed as the index or HSI, measures how suitable the habitat is for a particular species when compared to optimum habitat. The HSI varies from 0.0 to1.0 (optimal). The value of an area to a given species of wildlife is the product of the size of that area and the quality (HSI) of the area for the species. This product is comparable to "habitat value" and is expressed as a habitat unit (HU). One HU is equal to a unit of area (e.g. one acre) that has optimal value (HSI=1.0) to the evaluation (target) species. Target species are used in HEP to quantify habitat suitability and determine changes in the number of HUs available. Consequently, a HEP assessment is only directly applicable to the target species selected. The degree to which predicted effects can be extrapolated to a larger segment of the wildlife community depends on careful species selection (USFWS 1980b). Target species selection in this analysis will follow that used in the Abeni Falls loss assessment (Martin et al. 1988).

HEP habitat data are collected along a 1000-foot transect within each cover type. Sampling transects are lengthened or occasionally shortened to achieve a 90% confidence level for our parameter point estimates. Adequacy of habitat sampling is determined using the formula (Zar 1984):

$$\frac{z^2 \text{ x } s^2}{e^2}$$

Where:

z= the critical normal value (p=0.1) from any standard statistical reference

s= standard deviation

e= tolerable error level

Shrub presence, species, and height data are collected at 2-foot intervals along the sampling transect. Percent herbaceous cover and percent herbaceous cover composed of grass are measured using a 0.5 by 1.0 m sampling frame (Daubenmire 1959) at 50 foot intervals along the transect. Height of the herbaceous layer is measured at 5 points within the sampling frame. A Robel pole (Robel et al. 1970) is used to determine the height-density of the herbaceous layer. Visual obstruction ratings (VOR) are determined by four Robel pole measurements, two parallel and two perpendicular to the transect, taken at 50 foot intervals along the transect. Deer hiding cover is estimated by taking two visual obstruction readings (both parallel to the transect) on a 1.5 m Robel-type pole from a standing position 50 feet from the pole at 50-foot intervals along the sampling transect. Tree height is estimated using trigonometric hypsometry (Hays and Seitz 1981) by subjectively selecting two "typical" overstory trees at 100-foot intervals along the sample transect. Canopy closure is measured at 10-foot intervals using a GRS densitometer. Trees recorded as "hits" with the densitometer have their species and DBH recorded. Snag densities are calculated using 0.1 acre plots at 100-foot intervals along the sampling transect. Distances to water, size of water bodies, ratios of open water to emergent vegetation, and road densities, are derived from a combination of field estimation and evaluation of aerial photographs and topographic maps. GIS will be used to estimate these parameters when accurate data layers are available.

Data Analysis

Habitat cover types are outlined on aerial photographs and a planimeter or dot grid is used to estimate the total acreage of each cover type. GIS will be used to estimate total acreage of each cover type when accurate data layers are available. The habitat units for each target species in each cover type are calculated using the formula:

HU= (cover type area)(HSI value).

Published and modified HSI models are used in this analysis. Where published models are modified to better reflect local conditions, modifications meet U.S. Fish and Wildlife Service standards (USFWS 1981). Habitat units are tabulated across target species and cover types to get total HUs for each species and each cover type for the project.

The NPPC Fish and Wildlife Program requires that a baseline HEP analysis be completed within two years of acquisition of a mitigation property and every 5 years thereafter. This schedule will be followed as part of the ongoing M&E efforts on this project. Some acquisitions are intact wetlands where management is largely custodial and significant increases in HUs are not anticipated. Other acquisitions require extensive restoration and substantial gains in HUs are the expected outcome. Results of HEP analysis must be interpreted in this context. For the purposes of adaptive management we expect to maintain, within the limits of normal temporal variability, at least the baseline number of HUs on every property. A 20% drop in baseline HUs will trigger a management response.

Land Birds

Introduction

Birds are important components of biological diversity in most ecosystems. Monitoring the health and long-term stability of bird communities can provide an important measure of overall environmental health (Morrison 1986). Birds are good environmental monitors for several reasons: many species can be monitored simultaneously with a single method, methods for monitoring are well understood and standardized, birds occupy all habitat types, and as a community represent several trophic levels and habitat use guilds. Monitoring species abundance, community diversity, and trends provides information that can be used to determine the effectiveness of management actions in moving towards conservation goals.

Perhaps more than any other species or community proposed for monitoring, land birds present the opportunity for standardized data collection that can be incorporated into national monitoring programs. Dovetailing our monitoring efforts with national monitoring efforts can be important in interpreting the results of our monitoring efforts. Many species of birds are neo-tropical migrants whose populations are effected by factors remote from the data collection point. Standardized methods allow for recognition of declines in abundance or diversity as a local phenomenon (triggering a change in local management) or a broader scale phenomenon that does not necessarily implicate failed management at the local level.

Methods

Point counts will be used to monitor land birds on this project. Point counts are the most widely used quantitative method used for monitoring land birds and involve an observer recording birds from a single point for a standardized time period (Ralph et al. 1995). The methodology follows the recommendations of Ralph et al. (1995) and is consistent with the methodology employed by the U.S.D.A Forest Service Northern Region Land bird Monitoring Project (Hutto et al. 2001) and recommendations for the Idaho Partners in Flight Bird Monitoring Plan (Leukering et al 2000).

A ten-minute point count will be conducted at each of the randomly selected permanent sample points within a cover type. All points will be visited a minimum of two and preferably three times during the breeding season (mid-May to early July) with a minimum of 7 days between counts. Point counts should be started at 15 minutes after official sunrise and completed by 10:00 a.m. Weather conditions should be warm and calm enough for bird detection by sight or sound. All birds seen or heard within the 10-minute count period are recorded. During the count, data should be recorded in three time periods (0-3 minutes, 3-5 minutes, and 5-10 minutes). This will allow the data to be partitioned or pooled for comparison to the U.S. Fish and Wildlife breeding bird survey data, research data reported in the literature that commonly use 5-minute point counts, and 10-minute point count data recommended and collected by national bird monitoring programs. Field observers should be highly qualified to detect birds by sight and sound. Fixed-radius plots (where the radius is arbitrarily small) reduce the interspecific difference in delectability by assuming that: a) all the birds within the fixed radius are detectable; b) observers do not actively attract or repel birds; and c) birds do not move into or out of the fix-radius during the counting period. This allows for comparisons of abundance among species. Unlimited radius plots maximize the amount of data collected because they include all detections and are appropriate when the objective is to monitor population changes within a single population (Ralph et al. 1995). Birds should be tallied in two distance bands, one 0-50 meters from the point center and one >50 meters from the point center. This will maximize data collection while permitting interspecific analysis. If density estimation is desired then additional distance data must be collected. However, density estimation is beyond the scope of this monitoring plan. Additional information on establishing point count stations, data collection, and sample data forms can be found by referencing Ralph et al. (1993, 1995) and Huff et al. (2000).

Data Analysis

Data will be pooled both within cover types, and across cover types within land management units. The mean number of detections per point (by species) within a cover type will used as an index to species abundance. Abundance across cover types within a land management unit will be expressed as the grand mean of the individual cover-type data pooled across the land management unit and weighted by the proportionate areal extent of each cover type. Trend analysis on abundance data will be done by regressing abundance on time and testing the null hypothesis that the slope of the regression is equal to 0 (Zar 1984). Regression analysis will not be conducted with less than 6 data points. The Shannon-Weaver information function (H') will be used to measure land bird community diversity, and Pielou's equitability index (J') will be used to measure the evenness of species distribution with in the community (Hair 1980). Diversity indices will be compared using a t-test following methodology described by Hutcheson (1970) and Zar (1984). A species list will also be developed as a measure of diversity. The species list will be developed and supplemented with incidental sightings from throughout the year.

Waterfowl

Introduction

Waterfowl are comprised of a diverse group of birds with widely different habitat needs for survival and recruitment. Some goose populations have expanded in the face of extensive national wetland losses. Conversely many duck species, which are less terrestrial and more dependent on wetland quality and availability, have experienced substantial population declines. The Canada goose, mallard, and redhead duck are BPA target species that were used in the HEP analysis habitat loss assessment. Waterfowl breeding-pair and brood surveys are conducted to provide trend data for local breeding populations. Our survey protocols are modeled after waterfowl production survey methods developed and used by the U.S. Fish and Wildlife Service (Hammond 1970, Dan Pennington, Kootenai National Wildlife Refuge, pers. comm.).

Methods

All open water areas and associated uplands within and adjacent to mitigation acquisitions will be surveyed annually. Four different types of waterfowl production surveys will be conducted: goose breeding pair counts, goose brood counts, duck breeding pair counts, and duck brood counts. Because of differences in nesting phenology between geese and ducks some different surveys may be conducted concurrently on the same visit to a site (e.g. goose brood counts concurrent with duck pair counts). Surveys will be conducted as a combination of observation point counts, walk/wade surveys, and boat and motor runs as appropriate for the landscape.

Observation point counts are used where there is good visibility, especially from elevated positions, to observe open water areas. When using observation points, disturbance must be kept to a minimum. Observation points are best conducted with the aid of a spotting scope. After data are gathered via observation points a walk/wade survey may need to be conducted to observe additional open water areas that are not visible from observation points.

Walk/wade surveys are best applied to wetlands with shorelines having little emergent vegetation and can be walked efficiently. Small wetlands should be approached carefully and quietly because the broods of some species (especially mallards and pintails) may move overland to avoid detection by the observer. When properly conducted a high proportion of all broods may be seen with this method.

Boat and motor runs are most efficient on open shorelines. Two observers will see more birds than one observer will. However, a single observer is generally a more efficient use of manpower. Consequently, a single observer will always be used to minimize variability in the trend data. Boat speed should be moderate (5-10 mph) and consistent throughout the survey, stopping only to count broods or identify species.

Survey Timing and Frequency

Counts should be completed within the three-hour periods beginning either 15 minutes after sunrise or ending 15 minutes before sunset. Wade/walk surveys may be conducted throughout the day. All surveys will be conducted as close as practicable to the identified target dates for data consistency. Surveys should be conducted when temperatures are moderate and wind speeds are less than 10 mph. Excessive wind moves birds into protected areas. If practical, rain should be avoided.

Goose breeding pair surveys are conducted twice, once each on or near April 15th and May 2nd. Goose brood counts are conducted twice, once each on or near May 16th and June 6th. Goose brood surveys will be done in conjunction with second duck breeding-pair survey and the first duck brood survey.

Duck breeding-pair surveys will be conducted twice, once on or near May 2 for early nesters, and once on or near May 16 for late nesters. Although some protocols call for only two duck brood sampling periods. Three sampling periods provide a more adequate index than two sampling periods. Three duck brood surveys will be conducted on or near June 6, June 28, and July 26.

For waterfowl pair-counts the species and number of pairs should be recorded. For ducks both paired ducks and lone males representing indicated pairs should be tabulated for all species. During brood counts the observer should record species, number in brood, and the age class of the brood. Data will be summarized by species and land management unit and reported annually. Long-term local trends will be monitored against the national waterfowl surveys.

Bald Eagle

Introduction

Bald eagles are a target species of the Albeni Falls Wildlife Mitigation Project. Because of their status as a threatened species bald eagle nest monitoring is conducted under the guidance of the U.S. Fish and Wildlife Service (USFWS). Each member agency of the Albeni Falls Interagency Work Group participates in the annual (USFWS) bald eagle nesting survey. All member agencies will continue their cooperation with this long-term national monitoring effort without changes in current protocol.

Methods

Known nest sites are visited by ground, boat, or air at least once during the pre/egg-laying (3/1-3/15), incubation (3/15-5/1), nesting (5/1-6/20), and fledgling (6/20-7/20) periods and information on eagle activity and nest success is reported to the USFWS. Newly discovered nesting sites are reported as they are found and added to the annual nest survey. Eagle nesting data will be incorporated into periodic monitoring and evaluation reports. Should the bald eagle be delisted and the USFWS discontinue their eagle-nest monitoring program, we will continues to collect these data as part of the ongoing M&E effort of this project.

Small Mammals

Introduction

The small mammal community is an important component of biological diversity in most ecosystems. Small mammals act as seed dispersal agents, their burrowing disturbs soil and creates microsites for seedling development, and they provide a prey base for higher trophic level consumers. Monitoring species abundance, community diversity, and trends provides information that can be used to determine the effectiveness of management actions in moving towards conservation goals.

Methods

Small mammal populations will be sampled by snap trapping with museum special traps at the randomly selected sample points. Traps will be baited with a mixture of peanut butter and rolled oats. An array of traps will be laid out as follows. A 100-meter baseline transect centered at the sample point and running along a random compass bearing and its back azimuth will be established. From the baseline transect, five 50-meter long trap-lines that are centered on and run perpendicular to the baseline transect at 25-meter intervals will be established. Pairs of museum special snap traps will be placed at 12.5-meter intervals along the trap-lines. Trapping will be conducted for two consecutive nights yielding a total of 100 trap nights per sample point. Sample point, cover type, date of capture, and species will be recorded for each small mammal captured. Small mammals killed in snap traps will be disposed of off site.

Snap trapping will be the backbone of our small mammal sampling effort. However, snap traps are known to underestimate the relative abundance of shrews in the small mammal community (Mangak and Guynn 1987, McComb et al. 1991). Managers, at their discretion, may augment their snap trapping efforts with pit trap arrays. Trap night data from pit traps will be recorded separately from the snap trap data.

Data Analysis

Data be will be pooled both within cover types, and across cover types within land management units. An index of the abundance of each species within a cover type will be expressed as number caught/100 trap nights. Indices of abundance across cover types within a land management unit will be expressed as the mean of the individual cover type data pooled across the land management unit and weighted by the proportionate areal extent of each cover type. Trend analysis on abundance data will be done by regressing abundance on time and testing the null hypothesis that the slope of the regression is equal to 0 (Zar 1984). Regression analysis will not be performed with less than 6 data points. The Shannon-Weaver information function (H') will be used to measure small mammal community diversity, and Pielou's equitability index (J') will be used to measure the evenness of species distribution with in the community (Hair 1980). Diversity indices will be compared using a t-test (P=0.1) following methodology described by Hutcheson (1970) and Zar (1984). A species list of all mammals will be developed and supplemented with observations throughout each year.

Herptofauna

Introduction

Amphibians are important components of ecosystem biodiversity that are frequently overlooked by fish and wildlife habitat managers. There is growing worldwide concern about perceived and actual declines in populations of amphibians. Permeable skin and a life cycle that involves both aquatic and terrestrial habitats makes amphibians especially susceptible to altered conditions they may encounter in their habitat. They can serve as indicators of environmental health. Local management activities may disproportionately effect amphibians (and reptiles) because of their relatively sedentary lives in contrast to species with greater mobility such as larger mammals and birds.

Many wildlife mitigation properties, especially those not yet acquired, have never been intensively surveyed for herptofauna. We have designed this monitoring program to provide managers with information about what species presently occur on individual projects (the inventory phase) and to provide them with information about the effectiveness of their habitat management practices (monitoring phase) toward benefiting the species assemblages that occur there.

Methods

Amphibian activity and reproductive biology are closely tied to local weather patterns. Consequently, weather data is a necessary component of amphibian monitoring. Basic weather data should include daily min-max temperature and precipitation. Other information about microhabitats could include water temperature and other factors known to influence distribution and abundance of amphibians including relative humidity, substrate moisture, barometric pressure, wind speed and direction, water level at breeding sites, and water pH.

Heyer et al. (1994) suggest the use of several standard sampling techniques to monitor amphibians. Managers should not be constrained by these suggestions and further development of these and other techniques is encouraged.

Visual Encounter Survey (VES)

1. A trained observer walks through a defined area for a prescribed period of time searching for and recording the presence of animals.
2. Time searching is expressed in man-hours.
3. This technique yields species richness and species lists and count data can be used to estimate relative abundance.
4. Repeated VES surveys combined with marking-recapture techniques can be used to estimate animal density.

Audio Strip Transects (AST)

1. A trained observer moves along a strip transect and records all animals heard.

2. Transect width is approximately 2 times the maximum distance the target animals can be heard.
3. Linear habitats (shorelines) can be sampled by counting calling individuals with no need to determine detection distance.
4. Calling-male density is calculated as the number of calling males per linear unit of transect.

Surveys at known breeding sites can be done using VES and AST techniques. Breeding site surveys can be used to estimate effective population size and operational sex ratio but must be done over an extended period (several nights) because of nightly variation in breeding populations. Managers must keep in mind that calling (by frogs) does not necessarily indicate breeding. More explicit indicators such as amplexus, egg masses or larvae are needed to demonstrate breeding. Managers may, at their option, decide to augment VES and AST methodologies with larval traps and dip net transects to determine abundance and reproductive status.

Data Analysis

Data be will be pooled both within cover types, and across cover types within land management units. An index of the abundance of each species within a cover type will be expressed as number/man-hour effort. Indices of abundance across cover types within a land management unit will be expressed as the mean of the individual cover type data pooled across the land management unit and weighted by the proportionate areal extent of each cover type. Trend analysis on abundance data will be done by regressing abundance on time and testing the null hypothesis that the slope of the regression is equal to 0 (Zar 1984). Regression analysis will not be performed with less than 6 data points. The Shannon-Weaver information function (H') will be used to measure herptofauna community diversity, and Pielou's equitability index (J') will be used to measure the evenness of species distribution with in the community (Hair 1980). Diversity indices will be compared using a t-test (P=0.1) following methodology described by Hutcheson (1970) and Zar (1984). A species list to include all reptiles and amphibians will be developed and supplemented with incidental observations from throughout the year.

Vegetation

Introduction

Vegetation provides habitat for most fish and wildlife species. The primary issues regarding the conservation and restoration of vegetation and wildlife habitats are plant community composition, structure, and ecosystem function. Three broad vegetation cover types are targeted for monitoring within the Albeni Falls Wildlife Mitigation Project: emergent herbaceous wetland, shrub-scrub wetland, and forested wetland. Through a number of studies the targeted vegetation has been classified on the basis of composition and structure into plant associations and community types. Plant associations and community types provide groupings of similarity in composition and structure. Several different plant associations or community types may be present within each of these broad cover types. Methods appropriate for monitoring plant community composition, structure, and ecosystem function within these three broad cover types are both constant and variable.

Methods

Emergent Herbaceous and Shrub-Scrub Wetland

1. In initiation of the monitoring protocol plant associations (e.g., using classifications provided by Jankovsky-Jones 1997) present within each 4 ha stratified random sampling unit will be delineation to a detailed resolution of 25 m^2.

2. Coarse-scale composition and structure will be monitored by measuring the boundary between each plant association or community type along six 200 m transects; three each placed at 50 m intervals perpendicular to the opposing sides of the square 4 ha sampling unit. The boundary of changes in shrub height class will be measured along each of these six transects.

3. A comprehensive inventory of vascular (and to the extent possible, non-vascular) plant species present within each 4 ha sampling unit will be completed each monitoring cycle.

4. The abundance of species present within each 4 ha sampling unit will be sub-sampled on twenty 0.01 ha square (i.e., 10x10 m) plots located randomly within a 10 m grid and stratified to proportionally represent the plant associations or community types present. Ocular estimates of absolute percent cover will be recorded for each vascular (and to the extent possible, non-vascular) plant species present on the 0.01 ha plot.

Forested Wetland

1. In initiation of the monitoring protocol, plant associations (e.g., using the classification provided by Cooper et al. 1991) present within each 4 ha stratified random sampling unit will be delineation to a detailed resolution of 25 m^2. Plant associations will be identified to the smallest possible classification unit (e.g., the *phase*, in reference to Cooper et al. 1991).

2. Coarse-scale composition will be monitored by measuring the boundary between each plant association or community type along six 200 m transects; three each placed at 50 m intervals perpendicular to the opposing sides of the square 4 ha sampling unit. The boundary of changes in shrub height class and stand structural class (using classes identified by Hall et al. 1995) will be measured along each of these six transects.

3. A comprehensive inventory of vascular (and to the extent possible, non-vascular) plant species present within each 4 ha sampling unit will be completed each monitoring cycle.

4. Stand structure and the abundance of species present within each 4 ha sampling unit will be sub-sampled on 10 nested circular plots (a 0.04 ha plot nested within a 0.1 ha plot; using the method similar to Rust 1998). Plot center points will be located randomly within a 40-m grid and stratified to proportionally represent the forest structural classes present. Ocular estimates of absolute percent cover will be recorded for each vascular (and to the extent possible, non-vascular) plant species present on the 0.01 ha plot.

Noxious Weeds

Introduction

Noxious weeds are aggressive plants that are not native to an area. They frequently create a large monoculture of themselves. Noxious weeds degrade wildlife habitat; can choke streams and waterways; crowd out native beneficial plants; create fire hazards; poison humans, wildlife, or livestock; and foul recreational sites for use. The spread of noxious weeds can signal the decline of entire ecological watersheds (Morishita and Lass 1999). Noxious weed law requires landowners to control noxious weeds on their land. Control of noxious weeds is consistent with the management objective of the Albeni Falls Wildlife Mitigation Project to restore and maintain native wetland habitats. Noxious weed control will be a costly and annual management action on this project.

Methods

Effectiveness of noxious weed management will be tracked by providing estimates of total area of noxious weed invasion and percent cover of noxious weeds by species. Ocular estimation will be used to determine cover by species in five cover class categories: 0-20%, 21-40%, 41-60%, 61-80%, and 81-100%. A 1.0 by 0.5 meter sampling frame may be used to aid in cover estimation. GPS mapping will be used to calculate the area of large (>1 hectare) areas of weed invasion. Alternatively, if these areas are sprayed and the spray equipment has the ability to calculate total area treated this will be an acceptable area estimate. Smaller (≤ 1 hectare) areas of weed invasion may be mapped with GPS or by ocular estimation.

Photo Points

Although qualitative, photographic documentation of habitat change as it occurs over time can provide an intuitive and compelling record of that change. This record can be especially effective for relating a project's effect to administrators or the public who more easily identify with a picture than a theoretical mathematical function of community diversity. Consequently, a photographic record will be established for each long-term monitoring sample point. One or more photographs will be taken in the direction of each of the four cardinal compass directions at each permanent sample point during its triennial monitoring visit. Photographs will be cataloged and archived for future reference. A digital camera will be used for documenting photo points to simplify archiving and reproduction for reports and presentations.

Reporting

Habitat Evaluation Procedures

The NPPC fish and wildlife program requires that HEP analysis be conducted on each acquisition at 5-year intervals. This has been the backbone of the NPPC monitoring and evaluation program to date. No change in reporting procedures for HEP analysis obligations is proposed. Each work group member will submit HEP reports for properties under their ownership/management at the required time interval under a separate cover as a stand-alone document.

Expanded Monitoring and Evaluation

Permanent long-term monitoring sample sites are visited on a three-year rotating basis. A monitoring and evaluation report that describes the current year's monitoring activities and summarizes finding will be submitted annually. A complete analysis of these data including trend analysis, diversity indices, and comparisons to reference sites will be performed on a triennial basis to coincide with the 3-year rotating sampling scheme.

Each cooperating Agency/Tribe will be responsible for conducting the monitoring and evaluation program on their respective ownership. We have intentionally designed some flexibility into the program to make it adaptable to the needs and constraints of the local manager. Consequently, it will be important for the core data sets coming from each agency/tribe to be in a compatible format so that these data can be easily and appropriately combined for overall project evaluation and reporting. A common pool of data entry templates will be developed for the core data sets and used by all cooperators to facilitate combining data sets.

Supplemental Reporting

Where appropriate, Work Group members are encouraged to augment this monitoring and evaluation plan to address site specific problems or management actions. Supplemental reports will be written as stand-alone documents and attached to the annual report as an appendix.

Costs

Currently, moderate to high levels of monitoring intensity will require between $250 and $500/plot collecting data. These costs will be reduced over time as efficiency increases and base levels of staffing and equipment benefits are realized by increasing the number of sample points.

The level of monitoring and evaluation effort requested by the ISRP and described by the above plan significantly expands sponsor M&E obligations beyond the original Fish and Wildlife Program requirements. Consequently, the original budgets for M&E in the currently approved management plans are inadequate to meet these new requirements. Several of the proposed monitoring methods require specialized skills (such as auditory recognition of birds) and may be best performed by subcontractors who possess these special skills. Supplemental funding will be required if we are to implement this new obligation. Costs for the expanded M&E program will be addressed during the annual contacting process.

Literature Cited

Cooper, S. V., K. E. Neiman, and D. W. Roberts. 1991. Forest habitat types of northern Idaho: a second approximation. USDA Forest Service General Technical Report INT-236. Intermountain Research Station, Ogden. 143 pp.

Daubenmire, R. 1959. A canopy-coverage method of vegetation analysis. Northw. Sci. 33:43-64.

Hair, J. D. 1980. Measurement of ecological diversity. *In* Wildlife Management Techniques Manual. S. D. Schemnitz editor, The Wildlife Society, Washington D.C. 686 pp.

Hall, F. C., L. Bryant, R. Clausnitzer, K. Geier-Hayes, R. Keane, J. Kertis, A. Shlisky, and R. Steele. 1995. Definitions and codes for seral status and structure of vegetation. General Technical Report PNW-GTR-363. USDA Forest Service, Pacific Northwest Research Station, Portland OR. 39 pp.

Hammond, M. C. 1970. Waterfowl brood survey manual. U. S. Fish and Wildlife Service, Washington D.C. 43 pp.

Hays, R. L., and W. Seitz. 1981. Estimating wildlife habitat variables. U.S.D.I. Fish and Wildlife Service. FWS/OBS-81/47. 111 pp.

Heyer, W.R., M. Donnelly, R. McDiarmid, L. Hayek, and M. Foster. 1994. Measuring and monitoring biological diversity: standard methods for amphibians. Smithsonian Institution Press, Washington and London. 364p.

Huff, M. H., K. A. Bettinger, H. L. Ferguson, M. J. Brown, and B. Altman. 2000. A habitat-based point-count protocol for terrestrial birds, emphasizing Washington and Oregon. Gen. Tech. Rep. PNW-GTR-501. Portland, OR: U.S. Department of Agriculture, Forest service, Pacific Northwest Research Station. 39 pp.

Hutcheson, K. 1970. A test for comparing diversities based on the Shannon formula. J. Theoret. Biol. 29:151-154.

Hutto, R. L., J. Hoffland, and J. S. Young. 2001. USDA Forest Service Northern region landbird monitoring project field methods 2001 west side monitoring. University of Montana Division of Biological Sciences, Missoula, MT. 25 pp.

Jankovsky-Jones, M. 1997. Conservation strategy for Northern Idaho wetlands. Conservation Data Center, Idaho Department of Fish and Game. 35 pp. plus appendices.

Leukering, T., D. Faulkner, and M. Carter. 2000. Monitoring Idaho's birds: a plan for count-based monitoring. Colorado Bird Observatory, Brighton, CO. 23 pp.

Mangak, M.T., and D.C. Guynn. 1987. Pitfalls and snap traps for sampling small mammals and herptofauna. Am. Midl. Nat. pp. 284-288.

Martin, R. C., H. J. Hansen, and G. A. Meuleman. 1988. Albeni Falls wildlife protection, mitigation, and enhancement plan. Proj. 87-43. Bonneville Power Administration, Portland, OR. 123 pp.

McComb, W.C., R.G. Anthony, and K. McGarigal. 1991. Differential vulnerability of small mammals and amphibians to two trap types and two trap baits in Pacific Northwest forests. Northwest Science 65:109-115.

McDonald, L., T. McDonald, and D. Robertson. 1998. Review of the Denali National Park and Preserve (DENA) long-term ecological monitoring program (LTEM). WEST tech. Rept. 98-7. WEST, Inc. Cheyenne, WY 19 pp.

Morishita, D. W., and L. W. Lass. 1999. Idaho's noxious weeds. University of Idaho Cooperative Extension. Moscow, ID 74pp.

Morrison, M. L. 1986. Bird populations as indicators of environmental change. Pp. 429-451 in R. J. Johnston (ed.), Current Ornithology, Vol 3. Plenum Press, New York NY 522 pp.

Northwest Power Planning Council. 1995. Columbia River fish and wildlife program, 1995 amendments. NPPC, Portland, OR.

Northwest Power Planning Council. 2000. Columbia River fish and wildlife program. NPPC, Portland, OR.

Ralph, C. J., G. R. Geupel, P. Pyle, T. E. Martin, and D. F. DeSante. 1993. Handbook of field methods for monitoring landbirds. Gen. Tech. Rep. PSW-GTR-144, Albany, CA: Pacific Southwest Research Station, Forest service, U.S. Department of Agriculture; 41 pp.

Ralph, C. J., J. R. Sauer, and S. Droege. 1995. Monitoring bird populations by point counts. Gen. Tech. Rep. PSW-GTR-149, Albany, CA: Pacific Southwest Research Station, Forest service, U.S. Department of Agriculture; 187 pp.

Robel, R.J., J. N. Briggs, A. D. Dayton, and L. C. Hulbert. 1970. Relationships between visual obstruction measurements and weight of grassland vegetation. J. Range Manage. 23:295-297.

Rust, S. K. 1998. Inventory and evaluation of selected old growth ponderosa pine stands, Cottonwood Resource Area, Idaho. Unpublished report prepared for USDI Bureau of Land Management, Cottonwood Resource Area. 28 pp.

U.S. Fish and Wildlife Service. 1980a. Habitat evaluation procedures (HEP). Ecological Services Manual 102. Division of Ecological Services, Washington D.C.

U.S. Fish and Wildlife Service. 1980b. Habitat as a basis for environmental assessment. Ecological Services Manual 101. Division of Ecological Services, Washington D.C.

U.S. Fish and Wildlife Service. 1981. Standards for the development of habitat suitability index models for use in HEP. Ecological Services Manual 103. U.S. Fish and Wildlife Service Division of Ecological Services, Washington D.C.

Zar, J. H. 1984. Biostatistical Analysis. Prentice Hall, Englewood Cliffs, NJ. 718 pp.