AUDIT OF WILDLIFE LOSS ASSESSMENTS FOR FEDERAL DAMS ON THE COLUMBIA RIVER AND ITS TRIBUTARIES

Project No. 73485

Prepared for:

Northwest Power Planning Council
851 S.W. Sixth Avenue, Suite 1100
Portland, Oregon 97204-1348

Prepared by:

Beak Consultants Incorporated
317 S.W. Alder St., Suite 800
Portland, Oregon 97204

Paul Whitney
Paul Whitney, Project Manager

Andrea Neal
Andrea Neal, Wildlife Biologist

Bill Baber
Bill Baber, Technical Reviewer

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PREFACE

The audit of the Wildlife Loss Assessments was inspired by Tom Trulove at the Wildlife Mitigation Public Hearing at Sea-Tac Airport September 20, 1989 when he said:

> "...but how would you react to spending a little money, not a lot, to hire some outside consulting firm that supposedly is very objective to sort of come in and audit these existing plans that have been submitted? I don't mean redo them but to come in and sort of spot check as an auditor would do and advise the Council and the region whether or not the methodology used was acceptable and in their sampling whether they think there was any bias that has been introduced one way or another. If they come in and say, Well, it's fine, there is no bias, that would ease my mind in going forward in the future. It would not remove all of the uncertainty but it would ease my mind. If they come in and say, Well, this land appears to be okay, but this other one appears to have some systematic bias along some line that they have described, then that would give me some ammunition to go to the tribes and agencies that worked on those plans and ask them if they wouldn't like to reconsider and perhaps go through a process to remove that bias. Would that be an approach?"

Subsequent to the Public Hearing at Sea-Tac Airport, the Council adopted a measure in the Wildlife Rule to conduct a third-party audit.

1.0 INTRODUCTION

The Northwest Power Planning Council (Council) selected Beak Consultants Incorporated (BEAK) to conduct a review (audit) of the "Wildlife Loss Assessments" related to the construction of Federal dams on the Columbia River and its tributaries. Most of the loss assessments were prepared about four to seven years ago in response to a request by the Council. This report outlines the procedure for conducting the audit, the results of the audit and recommendations on ways to move forward with the loss assessments and mitigation.

The objectives of the Council's Request For Proposals clearly state that the audit should be a spot-check rather than an in-depth review or restudy of all the loss assessments. The Council also directed the auditor to determine if there was any systematic bias in the way the loss assessment reports have been prepared. BEAK followed this direction by looking for errors and omissions. We assumed data was collected and analyzed as stated in the loss assessment reports. On occasion, we had to review raw field data and analytical techniques to determine if an error had been made. Most of the audit focuses on big picture concepts and assumptions the Habitat Evaluation Procedure (HEP) (U.S. Fish and Wildlife Service 1980) teams made during their studies. We support audit conclusions with data or strong inference, graphical analyses, or literature references.

Bias has several meanings depending on the arena where the word is being used. We base our definition on the ideas expressed by Tom Trulove, Washington Council Member, at a hearing in Seattle (see Preface). His concern was that the methods used to assess wildlife loss for the Federal projects may, in some way, systematically over- or under-estimated loss. Following Trulove's lead, we define bias as any method or result that could change the estimate of loss by more than 25%. We assumed variation less than 25% would be acceptable for loss assessments dealing with numerous wildlife species that use thousands of acres. Variation greater than 25% should be examined in more detail because of the potential to under compensate for loss to the resource or unduly tax the rate payer.

2.0 METHODS

2.1 GENERAL

The audit started in October 1991. The schedule in our proposal (BEAK 1991a) was revised to allow time to meet with each of the HEP teams that prepared the loss assessments. These meetings took more time than anticipated, which resulted in delays. The meetings allowed a constructive dialogue between the auditor and the team members. Many of our initial concerns were addressed by the various team members and as a result are not mentioned in this report. If we had not taken the time to meet with the team members before the report, it might have taken more time to resolve concerns presented in a draft audit report.

We have chosen to expand the format outlined by the Council in their Request for Proposals. The report format addresses the Council's concern for the pre-and post-construction HEP, existing mitigation, and annualization; it also addresses a variety of topics brought up by the public, agencies, and industries in the Wildlife Record (a Council file of public, tribal, industry, and agency comments responding to the loss assessments). Results presented in this report focus on possible errors, omissions, and biases associated with the loss assessment process. Based on the results, we offer three alternatives for proceeding with the loss assessments and mitigation.

2.2 REVIEW PROCESS

The spot-check audit of wildlife loss assessments follows a series of steps outlined in Figure 2.1. The audit was conducted primarily by Paul Whitney of BEAK. Several drafts were reviewed by BEAK staff, and Council staff offered editorial comments. Since the audit was mostly written by one person, it is presented in the first person. I can attest that the audit is an independent review of the chosen loss assessments. While I listened to a wide variety of views and opinions, the ideas expressed are the views of the author and BEAK.

The first steps of the audit involved a review of the Council's Wildlife Record to identify key issues that have been raised by the general public, tribes, agencies, and industry. The Record consisted of letters, hearing transcripts, newspaper articles, and a variety of other documents.

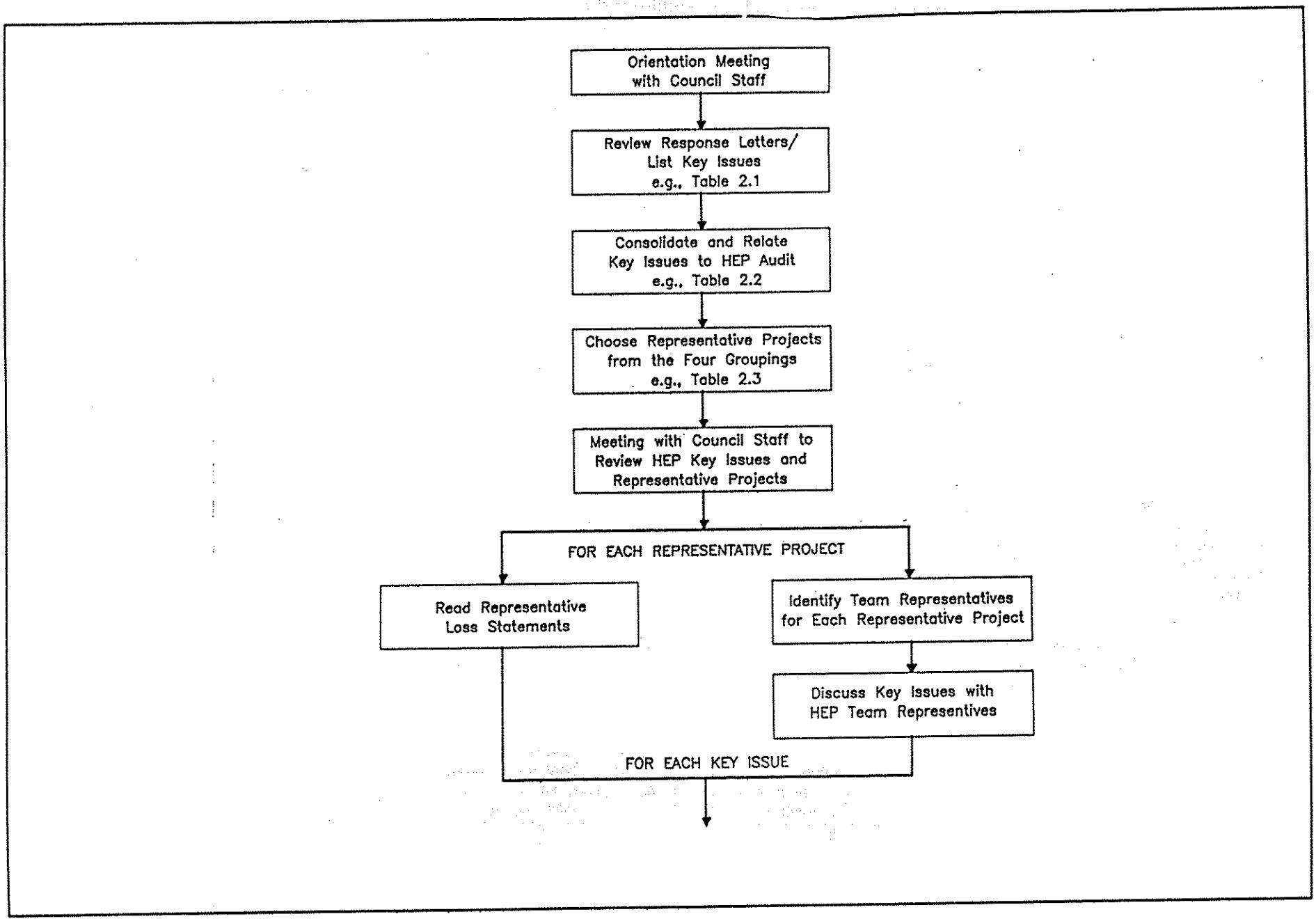


Figure 2.1. Proposed process for auditing Wildlife Loss Assessments.

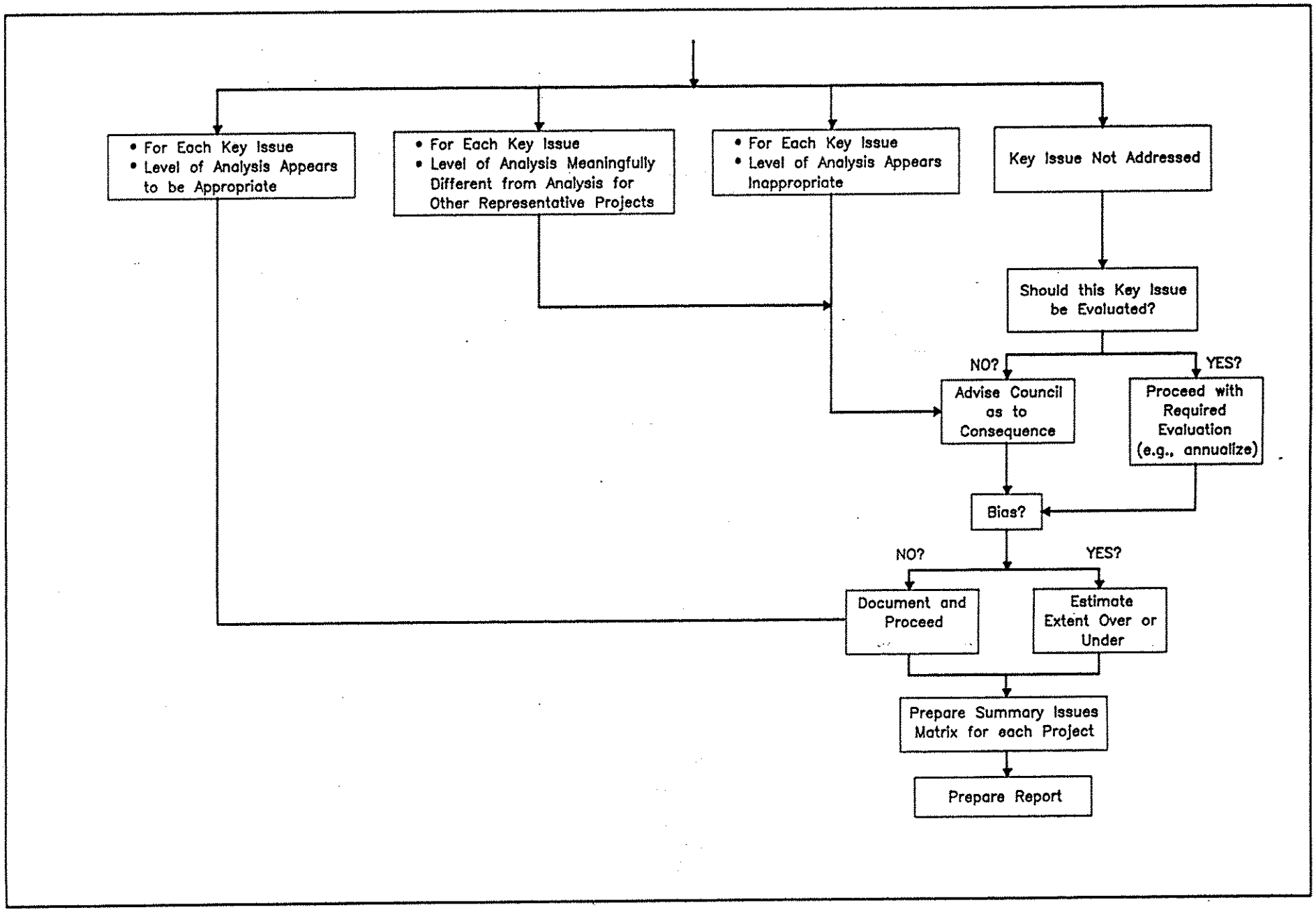


Figure 2.1 Proposed process for auditing Wildlife Loss Assessments. (cont.)

Identifying and selecting key issues was an iterative process. As I read the Record, many new issues with the wildlife loss assessments were mentioned. As new issues were identified in the Record, they were listed in Table A-1, (Appendix A). This list of issues is intended to be cumulative in that only new issues were added to the list (Table A-1) as I reviewed the Wildlife Record.

The Wildlife Record consists of hundreds of documents. I scanned each document. If the document appeared to be a form letter or a close repeat of a previous letter, I proceeded to the next document in the Record. If the document appeared to contain new information, I read the entire letter. Once I completed my review of the Record, the cumulative list of issues was reorganized according to major or key issues (Appendix A, Table A-2). The issues listed in Table A-2 helped identify issues of concern as I reviewed the loss assessments.

I also relied on the HEP Manual (USFWS 1980) as a guideline for determining whether or not the various teams followed the basic HEP procedure. Table 2.1 lists the basic procedures that a HEP should include. I note situations where a HEP team deviates from the basic steps.

Since the audit is intended to be a spot check, I didn't read all of the loss assessments that were prepared. Council staff in coordination with other interested parties such as the Pacific Northwest Utilities Conference Committee (PNUCC) suggested four appropriate loss assessments for the audit. The logic for selecting four projects is based on the assumption that each of the four teams (U. S. Fish and Wildlife Service (USFWS), Washington Department of Wildlife (WDW), Idaho Department of Fish and Wildlife (IDFW), and Oregon Department of Fish and Wildlife (ODFW)) that prepared loss assessments would be somewhat consistent in their technique. I assume that reviewing one assessment from each team will give me a good idea if the team correctly followed specific HEP methods and if the HEP method used is likely to be biased. Additionally, the projects selected represent a good ecological and geographical cross section of the Columbia River Basin. Reasons for selecting projects are as follows:

- Grand Coulee. Prepared by the Washington team. This is the largest project and was the first loss assessment conducted. As such, the loss assessment for this project has received a lot of comment. All persons contacted during the project selection

Table 2.1 Basic steps included in a HEP (modified from the HEP Manual, USFWS 1980).

1. Definition of Study Limits

    1.1 Definition of the Study area
    1.2 Delineation of cover types
    1.3 Selection of evaluation species

2. Calculating Study area Habitat Units

    2.1 Calculating total area of available habitat
    2.2 Calculating a Habitat Suitability Index for available habitat

3. Habitat Assessment Using Habitat Units

    3.1 Habitat Unit analysis for one point in time - Baseline assessments
    3.2 Habitat Unit analysis for multiple points in time - Impact assessments.

        - Use of target years for predictions
        - Predicting areas of available habitat
        - Predicting HSIs
        - Annualization of impacts
        - Calculating net impacts of an action

4. HEP Application to Compensation Analysis.

process agree that this loss assessment should be reviewed. Grand Coulee is representative of the Upper Columbia Basin Projects.

- McNary. Prepared by the USFWS team. This project is selected because it is close to several population centers and is associated with low-lying wetlands adjacent to the reservoir. This is a good project to examine how potential benefits of the reservoir were handled. It is representative of Lower Columbia River Projects.

- Dworshak. Prepared by the Idaho team. A negotiated trust agreement was being prepared when the audit began. PNUCC requested that this project be included in the audit. There is apparently a desire to see if there are any specific problems with the project. It is representative of the Snake River Basin Projects.

- Lookout Point. Prepared by the Oregon team. This project is along the highway and is familiar to many people. Familiarity with the project will help people relate to the type of habitat that was inundated. It is representative of the Willamette Basin Projects.

The lists of key issues and projects selected were reviewed by Council staff before I proceeded with the rest of the audit.

The next steps involved reading the loss assessments, preparing an informal list of questions for the HEP team that prepared the assessment, and submitting the list to the HEP team members. I then met with each HEP team to discuss my questions. These meetings were very beneficial, because the authors of the loss assessments provided a lot of additional information on the projects. Additional information included pictures of the study areas, cover-type maps, and raw data not presented in the assessment reports. The meetings also allowed me to review preliminary audit results with the teams. As meetings were being conducted with the various HEP teams, I met with PNUCC biologists and the Fish and Wildlife staff at the Bonneville Power Administration (BPA) to keep them informed of the process and preliminary results. PNUCC biologist(s) were consulted approximately once a month during the audit.

The scope of work for the audit as presented by the Council in the Request for Proposals does not include a review of the mitigation programs that were prepared for the various projects. The Council indicated they are only interested in knowing whether existing mitigation activities are adequately accounted for and whether this mitigation results in a gain for wildlife. Quite by accident, I read some of the mitigation plans proposed by the various HEP teams. Reading these mitigation plan reports gave me a sense of where the various teams were headed with their proposed mitigation. The diversity of approaches that are being considered for future mitigation was a concern. When I discussed this concern with Council staff, they indicated that the audit should address the concept of future mitigation and ways to avoid bias as the wildlife program proceeds.

Once the loss assessments were reviewed and HEP team meetings were completed, I reviewed the additional information provided by the various HEP teams. A complete list of all the topics, methods and data that were checked and deemed adequate is not provided in this audit. The substantive results of the audit are summarized for each loss assessment in a matrix which assesses key issues for each project reviewed (Tables A-3 through A-6). These matrices evaluate each key issue according to each of the following Audit Categories:

- Key issue is deemed by the auditor to be appropriately encompassing.
- Key issue or level of comprehensiveness is deemed to be significantly different from other representative projects.
- Key issue or level of comprehensiveness is deemed unacceptable.
- Key issue is not identified or missing.

Each cell of the matrices contains a few words that summarize the findings of the audit. It is beyond the scope of the audit to address every issue raised in the Wildlife Record or even the summary of these issues in Table A-1. Certain key issues in the matrices are discussed in more detail in the following section.

As I reviewed the loss assessments, I identified a variety of editorial items. While these items could be interpreted as errors, they are often of little consequence and as such are not listed. I focus my expanded discussions on those issues that are potential problems for the wildlife assessment process.

Key issues that are listed as a potential bias by the audit are summarized in a table at the end of the discussion for each project. It is hoped that the potential biases identified will allow those involved to focus on the potential biases, to reach resolution, and to move forward with the mitigation process. The Summary section of this audit outlines potential biases for all the projects reviewed. Recommendations for proceeding follow in the Summary.

3.0 RESULTS

Results of the audit are presented for each of the four projects reviewed. A summary table of potential biases is presented at the end of each project discussion.

3.1 GRAND COULEE DAM

The Grand Coulee Project loss assessment (Howerton et al. 1986) was the first impact report prepared for the Council.

3.1.1 Study Area

Defining the study area is one of the first tasks in a HEP analysis (Table 2.1). The size and location of the study area depend on the goals of the HEP. For example, if the goal of the HEP is to assess the value of impact and mitigation, the study area should include the impact area as well as potential mitigation areas. The potential mitigation area should be sufficiently large to include existing mitigation, proposed mitigation areas, and some alternative mitigation (in case the areas proposed are not available or as desirable as first thought). If the goal is to look at the impact of inundation, the study area should be limited to the area of inundation. Ideally, guidelines followed to determine this area should be presented (e.g., area determined by: elevation of spillway, highest recorded water level, mean high water, full pool, edge of permanent upland vegetation, or some other elevation).

The study area for the Grand Coulee project is limited to the area of inundation (70,000 acres), at full pool, and is the only study area (of the four projects I examined) that is so defined. As a comparison, the Lookout Point project along the Willamette River included the reservoir and lands adjacent to the reservoir. Limiting the study area to the area of inundation is a relative bias in the sense that the Grand Coulee loss assessment underestimates impact compared to projects that consider impacts of the reservoir and on adjacent lands (more acres). The extent of the bias could be significant (i.e., greater than 25%). For example, the study area for the Lookout Point project included adjacent lands that increased the study area by 37% (2535 ÷ 6290 acres). If the Grand Coulee project study area included impacts on a 37% (or ~~42,000~~ 25,900 acres) larger area, the loss

assessment results could have been much larger. Determining the extent of the relative underestimate is beyond the scope of work for the audit, but could be assessed by conducting a HEP for a larger study area that included adjacent lands. The BEAK (1991a) proposal to conduct this audit included a pilot HEP analysis to examine the feasibility of using earth satellite technology to assess the impact of the Columbia Basin irrigation that is on adjacent land and to some extent related to project operation. The irrigation portion of the scope was postponed.

3.1.2 Team Members

Several letters in the Wildlife Record indicate that there was not adequate participation by PNUCC. I reviewed the record of PNUCC involvement and found a letter from Diana Snowden (PNUCC Executive Director) to John Palensky (BPA) indicating PNUCC agreed that the planning effort should be productive and should proceed according to the study proposed with certain listed conditions (Snowden pers. comm., 29 July 1985). PNUCC selected Paul Feilder of Chelan County Public Utilities District (PUD) as a representative in the HEP planning activities. Meeting minutes from the HEP meetings indicate Paul Feilder played an important role in the Grand Coulee HEP. For example, Mitigation Planning Notes indicate he assessed gains and losses of this project on secure goose nest sites on islands.

Katheryn Kostow, also a PNUCC representative, attended the March 4, 1986 meeting of the Oversight Committee for the Grand Coulee HEP (meeting minutes available from Brent Renfrow, WDW). She pointed out that PNUCC did not support or agree with any of the wildlife loss data, nor the use of HEP or any similar process. PNUCC representatives did not attend the final Oversight Committee meeting on August 13, 1986. In their absence, Jack Howerton (1986, Washington Department of Wildlife) led an item-by-item discussion of comments on the Final Draft Report that were submitted by PNUCC.

It appears that PNUCC was initially involved in the process but that as the studies progressed, their needs were not being met. While every effort was made to assess PNUCC comments on the Final Report, it appears that the report was produced without final consensus from PNUCC. Failure to reach consensus with PNUCC is viewed as an omission. Data are not available to determine whether or not this omission is a bias.

3.1.3 Annualization

The Grand Coulee HEP team, as the other HEP teams, realized that annualization, or accounting for changes in the habitat value over time, was an important aspect of HEP. For example, on page 20 of the Grand Coulee loss assessment report Howerton et al. (1986) recommended: "Consideration should be given to the likelihood that the number of Habitat Units (HUs) within the project area might have declined to some extent even without the project." Another example of the teams concern for annualization is presented on page 46 (Figures 6, 7, and 8) of their loss assessment report (a copy of these figures is presented in Appendix B-1 of this audit). These figures illustrate three annualization analyses. Each figure is a summary of many issues (e.g., both impact and mitigation are considered in a single figure), and is somewhat difficult to understand at first reading. My discussion of the figures starts out by dealing with the issues one at a time. It is hoped that my approach will help the reader understand the annualization concept as well as the issues that are relevant to the audit. As preparation for a review of the figures on page 46 of the Grand Coulee loss assessment (Howerton et al. 1986), I encourage the reader to review the Habitat Evaluation Procedures (HEP) Manual, ESM 102 (USFWS 1980, Chapter 5). A copy of this chapter is provided in Appendix B-2 of this audit report.

The HEP studies in the Grand Coulee and the other loss assessment reports assess impact by comparing HUs with the project, to HUs without the project for each species. The first question I asked when reviewing the annualization issue is: when was impact assessed? Was It: (a) between Year "0" (pre-project or 1941 before Grand Coulee was built) and Year "1" (post-project or 1942)? (b) between Year "0" and Year "45" (i.e., 1987 when the HEP was conducted)? or (c) in Year "45", with and without the project? The Grand Coulee HEP team indicates on page 20 that losses were calculated between Year "0" and Year "1" or between points D1 and C1 (Figure 3.1). Point D1 is the sum of all the HUs for species utilizing the area of inundation, before the project was inundated (i.e., 1941). Point C1 is the sum of all the HUs for species utilizing the area of inundation after completion of the project (i.e., 1942, the project was not actually completed in one year). Since the HEP team was not present before and during project construction, they had to estimate (hindcast) pre-project habitat suitability indices (HSI) based on information available to them in 1987 (46 years later). The assumption that the HEP team could accurately "hindcast" from 1987 to 1941 is a

concern expressed in several letters in the Wildlife Record. Below I assess if and how the HEP team estimated the accuracy of points C1 and D1.

The HEP team addressed the validity of their hindcast of pre-project (point D1) habitat suitability. They assume (Howerton et al. 1986, p 6) that structural diversity of vegetation in 1941 was positively correlated with suitability of habitat for wildlife, and justify (page 16) why structural diversity of the area inundated was greater in 1941 than remaining surrounding lands in 1987. While the justification provided makes biological sense, there is no data that support their justification or describe the pre-project conditions. Therefore the assumption that pre-project conditions were better than present (1987) conditions cannot be validated.

The lack of a cover type map(s) also makes it difficult to assess with and without project habitat value. Only one-third of the vegetation in the reservoir area was actually cover typed. The cover type maps prepared are a series of individual photos with tracing paper overlays. The lack of a complete cover type map and HSI data to evaluate the concept of structural interspersion for the entire pre-reservoir area is a concern. Unless cover type maps of the entire area with and without the project are prepared and correlated with oblique photos, habitat data and historic land use information, it will be difficult to assess the validity of the assumption that structural diversity (i.e., wildlife habitat value) was in fact higher in 1941 than it is today.

During the audit, several agency and tribal biologists suggested ways the past habitat values could be evaluated. Suggestions included talking to ranch families and other residents that have personal knowledge and photos of past cover types, comparisons of habitat variables associated with lands adjacent to the reservoir to values assessed during past studies (e.g., Rogers 1941) and review of past land use plans as well as discussions with county and city planners. These are good suggestions, and if implemented will require extensive study. Data gathered from such a study could be used to validate assumed habitat values and if appropriate retrofitted into the existing loss assessment HEPs.

The accuracy of Point C1 (Figure 3.1) is also a concern expressed in several letters in the Wildlife Record. These letters indicated there was no net benefit given for species that use the reservoir. Since this issue appeared several times I reviewed the appropriate data in the project file.

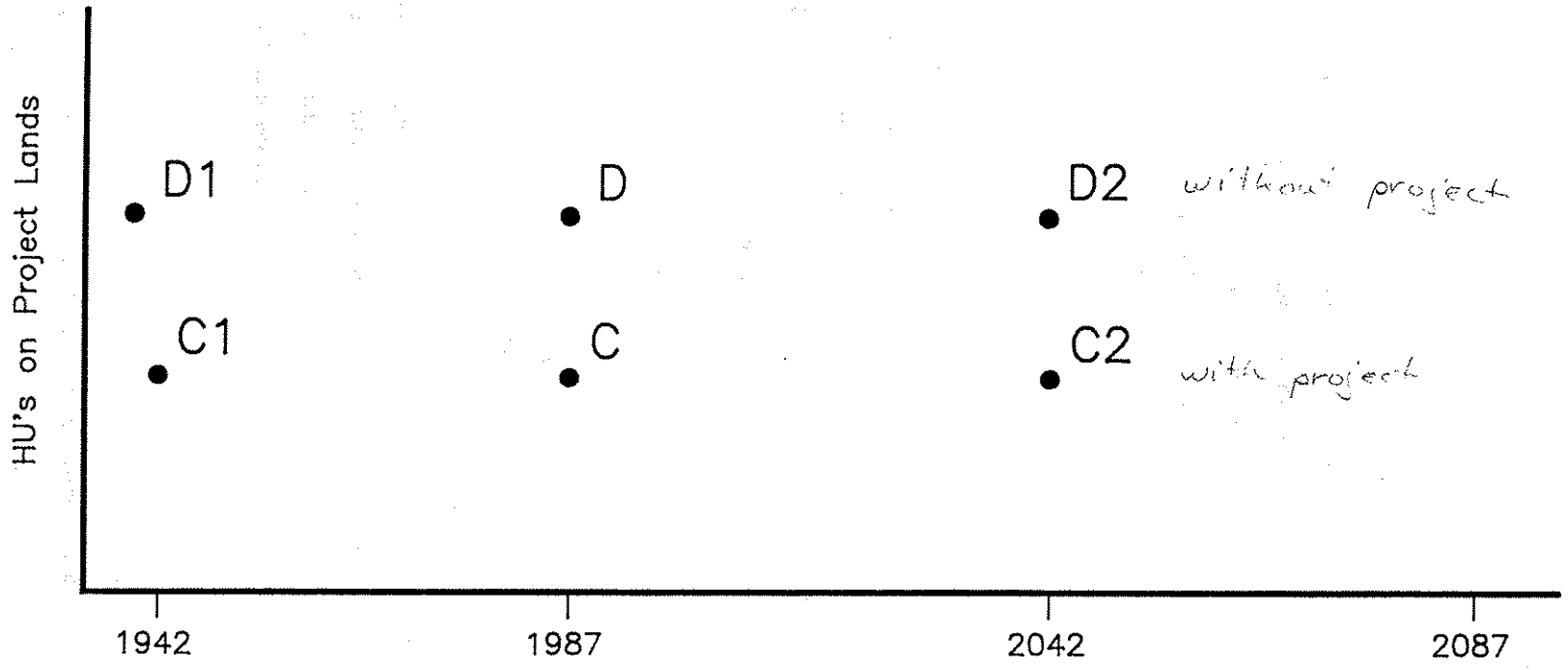


FIGURE 3.1. The Grand Coulee team assessed impact by comparing HUs between 1941 (pre–project, point D1) and 1942 (post–project, point C1). Other teams assessed impact between points C and D1.

I determined that the Grand Coulee HEP team gave post-project credit for the Canada goose, but no other species. The with-project credit was less than the loss and there was a net loss of goose secure nest sites. This seemed appropriate and is discussed further under the Reservoir Crediting issue. The goose was evaluated using secure nest sites as units of loss rather than HUs. Use of secure nest sites is unconventional according to the HEP manual. As a consequence, goose crediting for this project cannot be compared to the goose HUs estimated by the other HEP loss assessments.

None of the HEP teams decided to annualize their impact results. The Grand Coulee HEP team decision not to annualize makes the assumption that the project has been in place for a single year (between Year "0" to Year "1"). However, they also said that habitat values in the area of the project have decreased since the project was built and they imply that the value of project lands would have decreased if the project had not been built.

With annualization one can account for losses in habitat value or HUs over time with and without the project (Figure 3.2). As a result, estimates of impact will accumulate for each year (or selected target years, e.g., every 20 years) the project has been and will be in place, Figure 3.2. Annualization in its simplest form involves analyzing three or four target years during the project life. Two of these years are the same as used in the Grand Coulee wildlife loss assessments: Year "0" and Year "1". The additional years are ones that represent project duration. The Grand Coulee HEP team chose 1987 and 2042 as years to illustrate points about their thinking (no annualization was actually conducted) related to annualization. (See the loss assessment, Figure 8). Current conditions are represented as 1987 habitat values and 2042 was chosen to represent life of the project (100 years). For purposes of consistency, I plan to use the Grand Coulee HEP team format for discussing annualization for all projects assessed in the audit. The rest of the annualization discussion for Grand Coulee describes the annualization concept in more detail and evaluates the annualization-related assumptions made by the Grand Coulee HEP team.

Impact for the duration of the project is illustrated as a comparison of with- to with-out project lines (Figure 3.2). The area between the lines (Figure 3.2, shaded area) is the integrated or total impact over time. The average impact of all years assessed in Figure 3.2 is the average annual impact. The without project curve is an extension of point D1, in 1941, to point D2, in 2042, which assumes a project life of 100 years. This level-line extension into the future (Line D, without

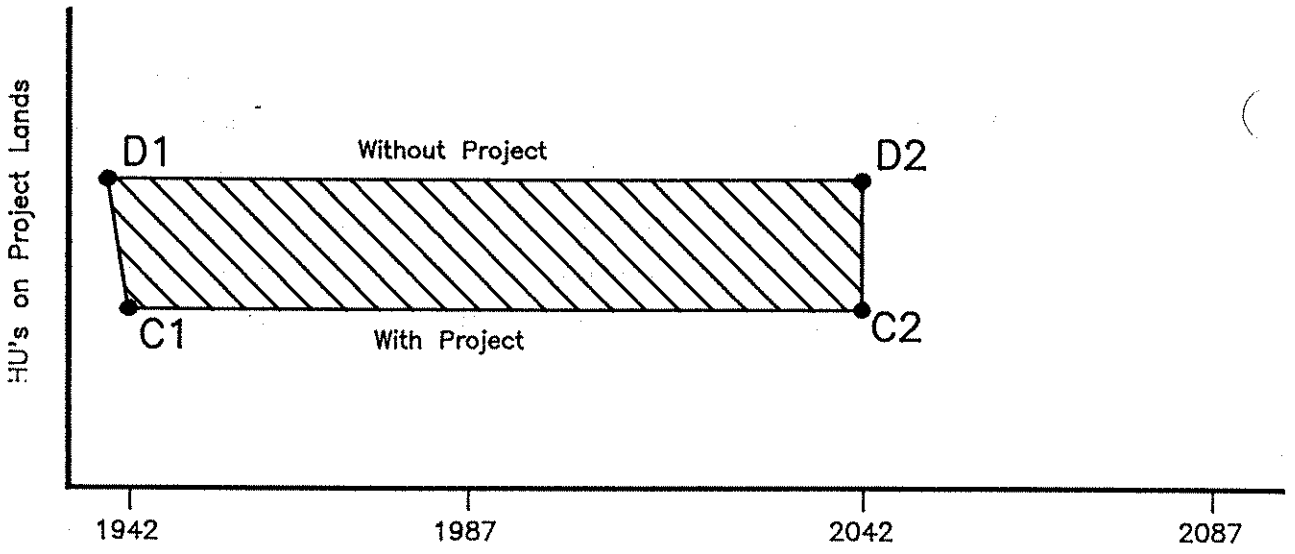


Figure 3.2. The shaded area illustrates the total impact over time (100 years) for the Grand Coulee project.

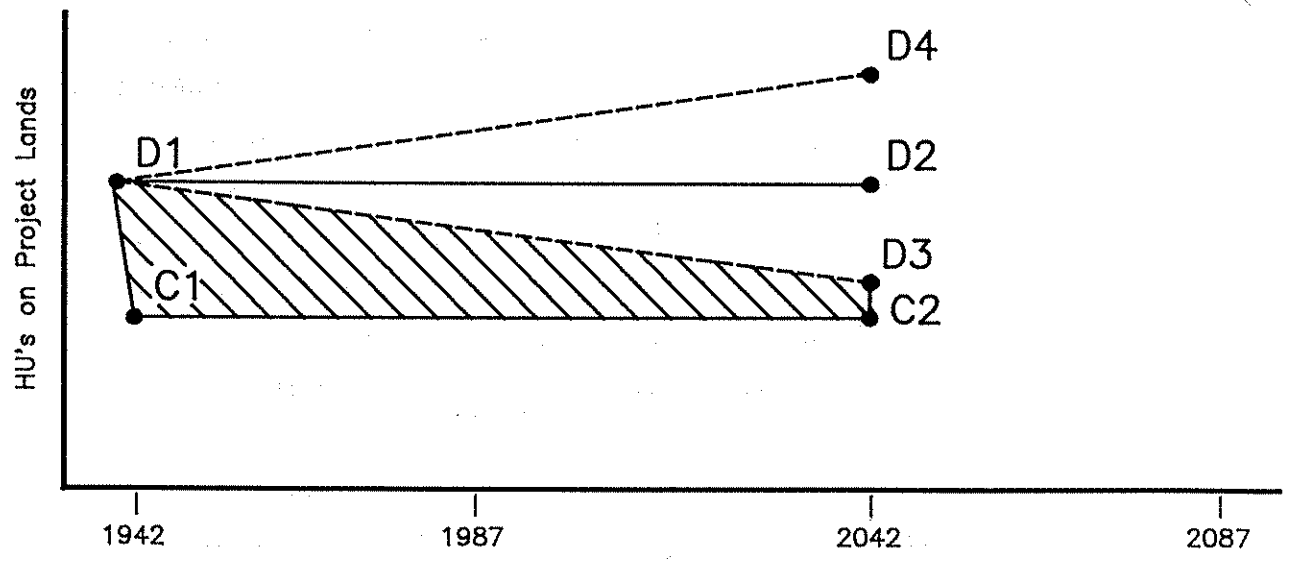


Figure 3.3. The value of wildlife habitat in the reservoir area can result in a change in the total and average annual impact. The shaded area shows a reduction of impact due to an estimated reduction in wildlife values without the project.

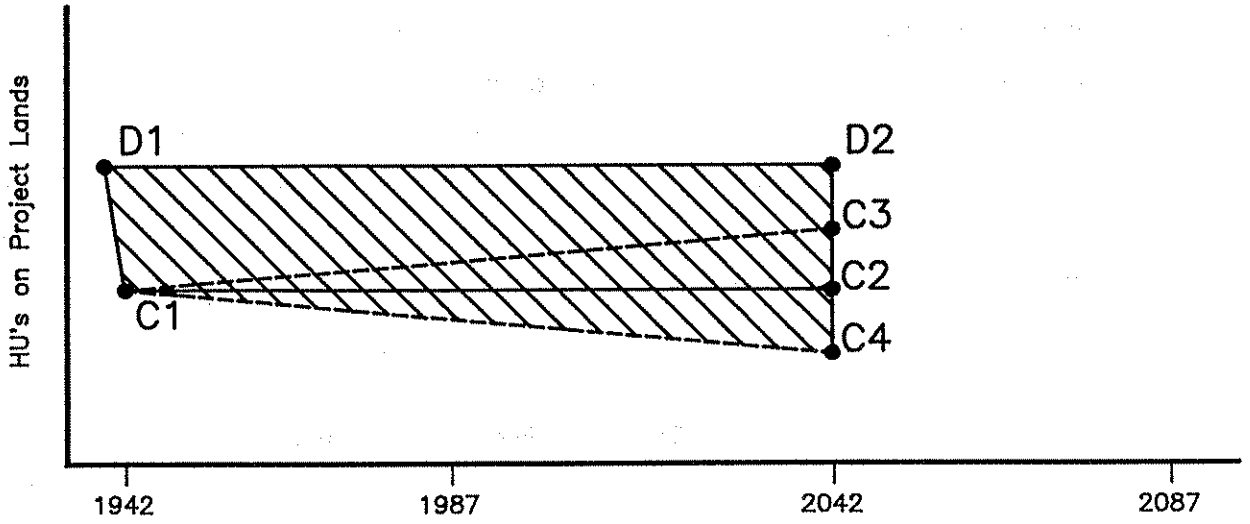


Figure 3.4. Changes in reservoir conditions for wildlife could influence assessment estimates. A decrease in reservoir value for goose nesting over time (curve C1–C4) would result in greater total impact (shaded area).

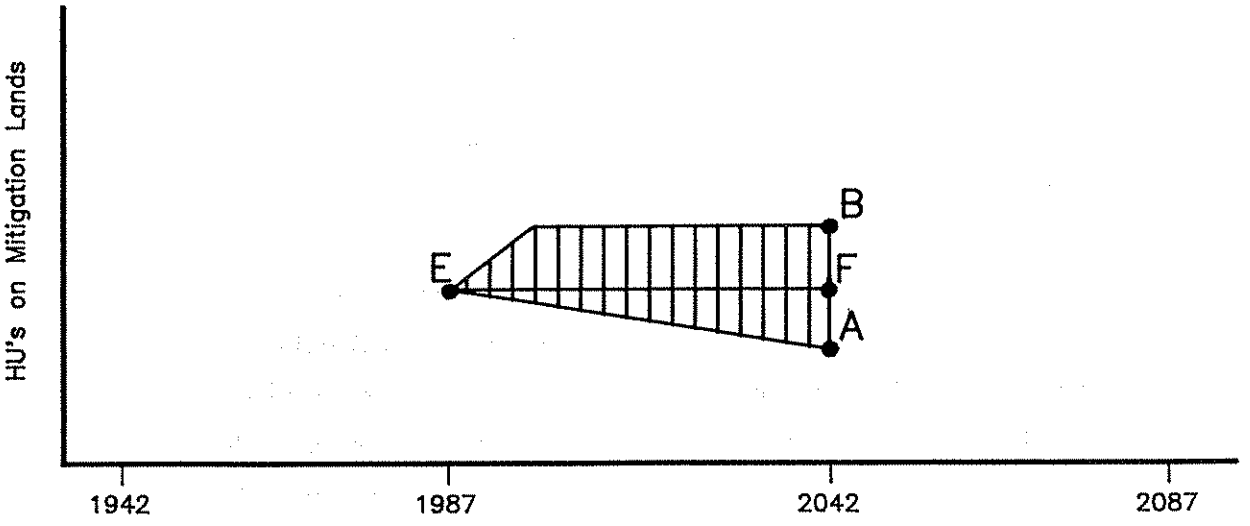


Figure 3.5. Mitigation is illustrated as enhancement (area above curve E–F) and preservation (area below curve E–F). Total mitigation is illustrated by the vertical shaded area.

project) assumes that the value of the project lands would have stayed the same into the future had the project not been built. The with-project curve (Line C) shows that HUs were lost when the reservoir was flooded (reservoir filling is assumed to have occurred in one year). Point C1 in 1942 is the value of HUs for wildlife utilizing the reservoir and is hindcasted from 1987 to 1942. As shown in Figure 6 of the loss assessment, this curve is level and does not include any benefits that might have accrued as the reservoir aged (i.e., assumes no change in value of the inundated habitat [e.g., wetlands], over time, with the project).

Impact as presented in Figure 3.2 is based on a variety of assumptions. I will evaluate two of these assumptions: 1. Without project HUs are constant, and 2. With project HUs are constant. What is the likelihood that without project HUs would have stayed the same had the project not been built (line D)? Figure 3.3 illustrates the potential consequences of habitat deterioration as assumed by the HEP team (e.g., loss assessment, page 16). The HEP team makes reference to reduced habitat quality on adjacent project lands (e.g., loss assessment, page 14 and 20). They indicate adjacent project lands are similar to the inundated area and that reduction in habitat value on the adjacent lands is likely to be similar to the reduction in habitat value that would have occurred if the project had not been built. No information is given as to the extent (e.g., slope of the D1 to D3 curve of Figure 3.3) of habitat loss that might have occurred had the project not been built. The HEP team might be correct to assume that habitat on adjacent land has deteriorated since the project was built (line D1 to D3). However, I am not aware of any information that indicates wildlife habitat has deteriorated more than 25% (D2 minus D3 ÷ D2, Figure 3.3) since the project was constructed.

If the HEP team is correct and habitat has deteriorated to some extent, impact in the loss assessment, has been overestimated (by the amount of the deterioration) relative to other HEP loss assessments. The integrated (shaded) area under (Figure 3.3) with line D1 to D3 would be less than the shaded area in Figure 3.2 if habitat deteriorated as assessed by the HEP team. Since the HEP team did not account for this reduction in impact by annualization, they over estimated impact. As stated above, the over estimate is likely to be less than 25%.

If habitat improved without the project, one would express the improvement as curve D1 - D4 (Figure 3.3). While this concept does not apply to the Grand Coulee project, it will be addressed in the discussion of the Dworshak project.

With project (reservoir) HUs (line C1 - C2, Figure 3.4) were also assumed to remain constant. It is possible that more waterfowl used the reservoir as resident fish populations expanded and as riparian areas developed (albeit limited considering the topography and reservoir operation). If reservoir conditions did improve for waterfowl over time, line C1-C3 would have a positive slope and annualized impact would be less. If reservoir conditions deteriorated over time, line C1 - C4 would have a negative slope. For example, it is recognized that potential nesting habitat along the reservoir or on islands is hampered by extensive reservoir slumping (loss assessment, page 15). The HEP team informed me that reservoir bank slumping continues to occur and that the amount of goose nesting on islands is not increasing and may be decreasing. I received no information that indicates deterioration in reservoir habitat due to bank slumping would be a bias. The slumping area while extensive is small in comparison to the area of the reservoir.

Annualization is a good tool for examining what the Grand Coulee team calls cumulative losses (see page 20 of the loss assessment) and the mitigation effort required to off set cumulative losses. If impact is annualized and plotted to accumulate over the 100 years of the project as illustrated in Figure 3.2 (or Figures 6, 7, and 8 of the loss assessment, Appendix B-1), it can be viewed as a two dimensional area as shown by the shading. If impact is shown as a cumulative process (or all the shaded area), how much mitigation will be required to offset or compensate for the loss?

The Grand Coulee HEP team displayed two types of mitigation in their hypothetical assessment of annualization. Enhancement is shown as the area above curve EF and preservation is shown as the area below curve EF (Figure 3.5). The team assumed that mitigation could reach 100% sometime in the future when line AB (Figure 3.5) = line CD (Figure 3.2). In other words, when mitigation occurs on enough acres with enough benefit to equal losses between Years "0" and "1", the team indicated mitigation is adequate. The mitigation that occurs from 1987 to 2042, illustrated as a shaded area (Figure 3.5), is much smaller than the impact shaded area in Figure 3.2

and is not adequate to offset impact. Approximately four times the mitigation shown in Figure 3.5 would be required to compensate for 100 years of impact.

The amount of mitigation to compensate for 100 years of impact will be less if mitigation is modeled to run for 100 years (Figure 3.6). For example, the area of accumulated mitigation (Figure 3.6) appears to be more nearly equal to the area of the impact (Figure 3.2). However, mitigation as illustrated in Figure 3.6 is not equal (in area) to the impact in Figure 3.6 because as the mitigation accumulates between years 2042 and 2087, impact also continues to accumulate (see impact area under line D2 to D6, Figure 3.6). Mitigation implemented 45 years after the project was built does not catch up with the ongoing impact. To the extent that mitigation can't catch up, impact is underestimated. The extent of the underestimate is the amount of impact that has accumulated since construction (1987 minus 1942 or approximately 45 years or 45% of the 100 years of impact). This underestimate of impact, if not addressed with increased mitigation, is real and should be considered a bias against all projects, especially the older projects. Another way to look at the bias against older projects is discussed for the McNary project which compares losses for each of the projects assessed, assuming the projects are all the same size.

3.1.4 Goals

The HEP Manual (USFWS 1980, 100 ESM 1.4) stresses the need to document study objectives and assumptions. The Wildlife Mitigation Rule and Response to Comments (NWPPC 1989, p3) discusses the Wildlife Program Goals. The discussion of goals calls for developing wildlife loss assessments at each of the Federal hydroelectric facilities on the Columbia System. The loss assessments were to quantify the net impacts (positive and negative) to wildlife and/or wildlife habitat from the construction and operation of a hydroelectric facility. Once the loss assessments are completed, they are to be used as a goal for the mitigation process. Upon submission of the mitigation plans, the Council will consider long-term wildlife goals.

These general goals have been the guiding light for the various HEP teams as they embarked on the loss assessment process. Beyond the general goals stated in the Rule (above), I am not aware of any additional effort by the Council to outline study objectives, assumptions, or questions for the HEP teams. During my meetings with the various HEP teams, they were not aware of any

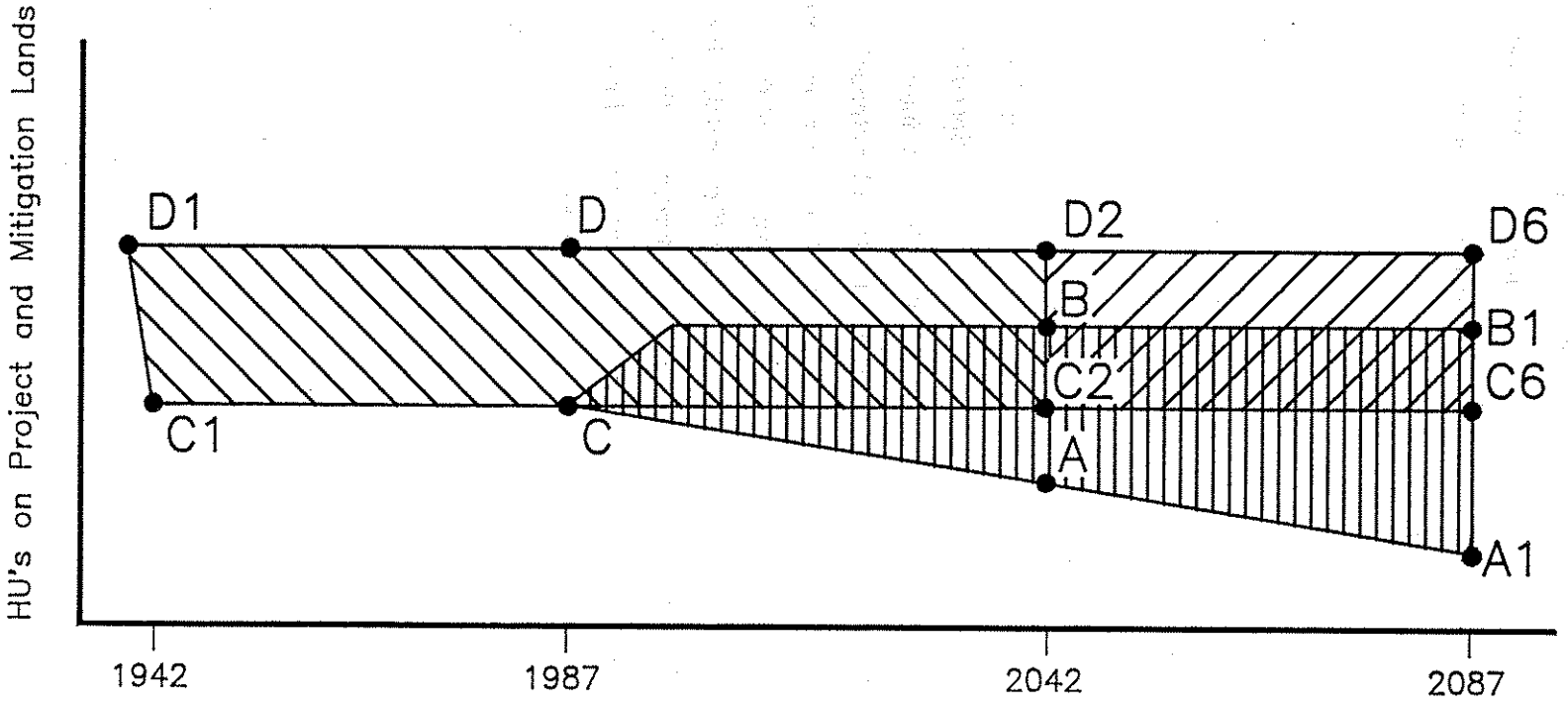


Figure 3.6. Total mitigation (vertical shaded area) for 100 years is less than total impact for 150 years (diagnal shaded area). Additional mitigation is needed to compensate for 45 years of ongoing impact.

additional guidance from the Council or BPA. For example there was no guidance as to what should be included regarding the study area, the number of HEP evaluation species, the method to choose evaluation species, or how to deal with endangered species. As a result the Grand Coulee HEP team conducted a study that is very different from the other HEP loss assessments. The Grand Coulee HEP team told me that their original proposal for a more conventional HEP assessment was rejected by the Council and that the Council directed the team to conduct an abbreviated and less costly loss assessment. The lack of well defined goals and direction has resulted in a series of assessments conducted in a variety of ways. As a consequence, it is difficult to relate one loss assessment to another.

The lack of well defined goals has also been a problem for other large environmental assessments. Cowling (1992) presents an audit-type report of the first ten years of the National Acid Precipitation Assessment Program (NAPAP, $530 million). Special emphasis is given to lessons for future environmental and ecological assessments. The most important lesson learned is the need to develop a Written Plan that: establishes the goals and methodologies to be adopted, identifies the context of work for the individual elements of the team, and provides a clear view of the questions being asked. Since this is the primary lesson learned from a major Federal assessment, I believe it would be prudent for the Council to ask if the wildlife loss assessments might benefit from a Written Plan that would add more standardization to the loss assessment and mitigation processes. Perhaps the Council should consider the need for a long-term wildlife goal and Written Plan as the mitigation planning starts. It is hoped that this audit will help the Council focus on some additional objectives that will provide a more standardized approach for meeting the general goals outlined in the Rule.

If a Written Plan is judged to be appropriate, it can be developed as an effort that runs parallel in time with ongoing mitigation plans. Once the Written Plan is developed, the Plan guidelines can be applied to the ongoing programs. I encourage people to think about a few of the potential consequences that might arise if a Written Plan is not developed. For example, without a Plan it might be possible that the Council will have to review up to 20 different monitoring plans each with different goals, success criteria, and level of detail. The potential for differing success criteria might jeopardize the accountability of projects that have criteria that are less stringent. One

might ask if the success criteria developed without a Written Plan will hold up should the Council be asked to document that the dollars spent on wildlife have resulted in on the ground benefits.

3.1.5 Species Selection

Criteria for species selection provided in the Grand Coulee loss assessment include: no exotic species, no endangered species and no waterfowl other than the Canada goose. These and other criteria used by the HEP team resulted in the selection of seven species and the riparian cover type. This selection process is documented, was agreed to by the HEP team and as such is adequate. The selection criteria for the Grand Coulee project differ from criteria developed for other projects. For example, the pheasant (an exotic species) was chosen for the Lookout Point project, the bald eagle (a threatened/endangered species) was chosen for the Dworshak and Willamette projects, and several waterfowl species were selected for the McNary project. While it appears that species selection was adequate for each project reviewed, the lack of similar criteria for the type and number of species selected indicates that the habitat units from one project should not be equated with the habitat units from other projects. For example, mitigation funding for 10,000 HUs on one project may far exceed funding needs for 20,000 HUs on another project. The summary of HUs lost as represented in Table 5 of the Rule (NWPPC 1989) should not be used as a guideline for funding mitigation. As will be discussed later, mitigation funding should be based on the cost to provide adequate mitigation design and implementation.

Two types of species selection occurred in this loss assessment: indicator species (11) and evaluation species (7). These two types of species selection lead to confusion. The HEP team told me that the indicator species (and the population-type analyses for these species) are part of the loss assessment but not part of the HEP. The indicator species should not have been included in the loss assessment.

The evaluation species listed in Table 6 of the Grand Coulee loss assessment are the HEP species. Other HEP teams selected several species (e.g., bald eagle, Canada goose, osprey, yellow warbler) that received some benefit from the reservoir. The Dworshak and Lookout Point teams each selected the osprey and bald eagle and both species received net benefit (i.e., more HUs with

the project than without the project). The with-project benefit for these species was 7% [4,851 ÷ 68,218 HUs) of the without project HUs in the Dworshak reservoir area.

I asked the Grand Coulee HEP team if osprey and bald eagle receive some benefit from the reservoir. They indicated that bald eagle and osprey currently use the reservoir but not to the same extent that they did without the project. If the Grand Coulee team had selected these raptors, the benefit would probably be equal to or less than the 7% net benefit for these species at the Dworshak project. Based on this analysis for Dworshak, species selection does not appear to be a bias for Grand Coulee.

3.1.6 Reservoir Benefits

When I first read the loss assessment, it was not clear if and how reservoir benefits were accounted. The section of the loss assessment (p. 21) that discusses this concept is confusing for it states that there are 11 indicator species, but Table 6 only shows seven species. This section of the assessment also states there have been no significant net benefits for most species. This implies that some net benefits occurred for some species. I discussed this topic with the HEP team and they indicated that the HEP study accounted for benefits for the Canada goose but that the benefits realized were less than the losses that occurred. I asked to review the data and analyses that were used to reach their conclusion. My review of these data indicates that with-project benefits (e.g., secure nest sites) are assigned to the Canada goose. As stated in the assessment, the benefits assigned to the Canada goose with the project are less than the losses, and as such there is no net benefit for the goose and no reservoir benefit for any of the other species selected. The discussion of species selection (above) indicates that other HEP teams selected the Canada goose plus other species such as osprey, bald eagle, and mallard that received from 7% (Dworshak project) to 58% of the HUs lost. The Grand Coulee HEP team indicated (during my meeting) that the mallard did not use the Grand Coulee Reservoir with its steep and sometimes exposed/eroding shoreline to the extent that the mallard used the McNary Reservoir with its more level shoreline/wetlands. To summarize, the Grand Coulee HEP team species selection process, while somewhat different from other projects, is not likely to result in a bias.

3.1.7 Existing Mitigation

Washington Department of Game (currently Washington Department of Wildlife) indicated, during our meeting to discuss the Grand Coulee HEP, that no mitigation has occurred for the Grand Coulee losses (Howerton pers. comm., 1987). However, PNUCC indicates that extensive lands have been set aside for wildlife mitigation (Wright 1991). I have reviewed the PNUCC letter in detail and conclude that a major effort (at least three times the effort of an individual loss assessment (see Recommendation Section 5.0 for more discussion) would be required to determine which of the lands listed by PNUCC actually provide benefit for wildlife (BEAK 1991b).

The lands listed by PNUCC do not appear to address the National Park Service Lands that are adjacent to the Reservoir. These lands are approximately 60 feet wide and occur between elevation 1290 and 1310 feet around the reservoir. Assuming 660 miles of shoreline minus 129 miles of shoreline with erosion, there are 531 miles of National Park Lands around the Reservoir. This constitutes approximately 3862 acres. One can assume the HEP team would assign this acreage a low HSI (see p 15 of the loss assessment, lands in the area have deteriorated). For purposes of this example, I assume the HSI would be 0.27 or 50% of the average HSI score for the seven evaluation species in the impact zone. This translates to 7299 HUs (.27 x 3826 x 7) on the Park lands adjacent to the reservoir. If the reservoir had not been built, some portion of this land may have been developed. As an extreme case, consider the scenario that all of this land might have been developed without the project and all 7299 HUs would be lost. With the project, these lands have been allowed to stay intact and one might say they have been preserved by the Park Service. This preservation, (7299 HUs), is less than one percent of the total number of HUs lost (Table 6 in the loss assessment). Thus, the failure of the Grand Coulee HEP team to consider these lands is of little consequence and is not judged to be a bias.

3.1.8 Net Loss Issues

The Wildlife Record indicates a number of issues that relate to poor definitions of net loss. Examples provided in Appendix A (Table A-2) of the audit are too numerous to discuss individually but combined, they relate to the lack of defined goals for the loss assessments. These examples illustrate the different ways the various projects define impact. As discussed previously for the Goals

issue, there is a need to provide some additional guidance for the HEP teams. This guidance will help to standardize goals, objectives and methods to meet the Council's goals and objectives.

3.1.9 Cover Types

As previously mentioned, a cover type map was not prepared for the project or adjacent lands. Subsequent analysis of impact of operations or impacts on adjacent lands will require additional cover type mapping.

3.1.10 Field Analysis

The HEP methods used by the Grand Coulee team were considerably different from the methods used by other teams. For example, the McNary HEP team collected field data on a variety of parameters (e.g., tree cover) to determine HSI values for each cover type. The Grand Coulee team did not collect field data; instead they determined the value of relatively large (multicover) areas delineated by river reach (p. 68, loss assessment). I checked their abbreviated analyses by river reach and talked to the biologists that conducted the HEP. Analyses appeared appropriate and quality assurance is dependent on the biologist's familiarity with the project area. Therefore, continuity in quality assurance from the loss assessment to mitigation planning and assessment is dependent on having at least one biologist involved with the loss assessment participate in the migration assessment so that the assumptions for the loss assessment are carried over. This type of carryover is typically provided by HSI models, field data and model validation. For example, the Dworshak team collected field data on a variety of parameters and they conducted detailed studies of some HEP evaluation species (e.g., river otter) for HSI model validation (Lawrence, pers. comm., 17 November 1992).

3.1.11 Budget

The budgets for the HEP studies presented in the BPA Wildlife Expenditures Table (BPA 1992, Appendix B-3) indicate funding was adequate for the level of work conducted, but was not adequate to conduct annualizations. Funding for Grand Coulee ($93,000), the largest project (70,000 acres), was less than funding for the other smaller projects. For example, the Dworshak

project, (17,000 acres) received $70,000 for Wildlife P.M.E. Planning, $46,000 for Wildlife Mitigation Planning, and $199,000 for Wildlife Mitigation Planning.

3.1.12 Grand Coulee Summary

The HEP team's choice of study area and their decision not to annualize resulted in the potential for bias (Table 3.1). These potential biases could be addressed in a quantitative or qualitative manner as part of the mitigation phase (see the Recommendation section). Failure to document pre-project wildlife habitat value is also a concern.

Table 3.1. Summary matrix of project biases for Grand Coulee Dam.

Overestimated Losses	Underestimated Losses	Net bias
	Study area defined only as the area of inundation (excludes lands adjacent to the reservoir).	underestimate > 25%
	Cumulative impacts not compensated for with cumulative mitigation	underestimate > 25%
	Older projects have more impact than younger projects.	underestimate
	Goals are not consistent between loss assessments.	underestimate

3.2 McNARY DAM

The McNary loss assessment (Rasmussen and Wright 1990) was directed by the U.S. Fish and Wildlife Service, (Portland Field Station).

3.2.1. Study Area

The study area for the McNary project includes the reservoir area (about 39,000 acres) and the area of the dam and support facilities but not residential/urban/industrial areas flooded by the reservoir (Rasmussen and Wright 1990). The study area was intended to focus on construction impacts rather than operation impacts of the reservoir. The accounting methods used for the adjacent lands (e.g., residential/urban/industrial cover type) was different than what was used for the Grand Coulee project (e.g., adjacent lands were not considered). These differences involved relatively few acres (e.g., 137 acres) and as such are not likely to be a bias. Other differences in determining study area, such as the Willamette HEP team considering impact on adjacent lands (e.g., ongoing operation), have the potential to result in a relative underestimate of impacts for projects such as McNary that did not consider impact on adjacent lands.

3.2.2 Team Members

The HEP team members included agency and tribal biologists. PNUCC was not represented, but the HEP team members indicated that PNUCC was invited to participate. Correspondence documenting PNUCC's participation or lack there of was not available for this project as it was for the Grand Coulee project.

3.2.3 Annualization

The McNary HEP team conducted a relatively straight forward HEP (which followed the HEP manual) with few exceptions. One exception was the choice not to annualize. As stated for Grand Coulee, the first question asked was: what time in history is impact assessed? The review of the loss assessment and meeting with the HEP team indicates that they compared without-project conditions in 1952 to with-project reservoir conditions in 1987, which occurred 35 years later. They

did not compare Year "0" (1952) to Year "1" (1953) as is usually the case for HEP analyses. By comparing pre-project conditions (Year 0, without project) to conditions 35 years later, they assumed that the cover types present in 1987 were created instantly when the project was inundated. For example, there was a net gain (as shown in a supplementary report prepared by Glad, no date) in wetlands between 1952 (598 acres pre-project) and 1987 (947 acres post project). The increase in wetland acreage probably developed gradually over many years (This assumption could be checked by following up with local biologists such as John Anear at the Umatilla Wildlife Refuge). Assessing impact by comparing 1952 to 1987, essentially gives instant credit for the 1987 wetlands. By giving instant credit for the 1987 wetlands, the HEP team underestimated the impact (Figure 3.4, curve C1 - C3) compared to an analysis that would have compared Year "0" to Year "1" (Curve C1 - C2). The amount of underestimation as a result of assigning instant credit for wetlands (i.e., not annualizing) is probably only a few percent, but wetland represents only one of many cover types that could have been effected by the way the HEP team assessed impact. Determining the potential for bias as a result of not annualizing the other cover types is beyond the scope of this audit. Assessing impact by comparing 1952 to 1987 is just one more example of a slightly different method used in this HEP analysis. This and other differences between the HEPs make it difficult to compare HU losses between projects prepared by different HEP teams.

The McNary project (Figure 3.7) is approximately 10 years younger than the Grand Coulee project (Figure 3.2). As a consequence the McNary project has resulted in 35 (1987 - 1952) years of loss while the Grand Coulee project has resulted in over 45 years of loss. At this point in time, the McNary project has resulted in approximately 20% less total loss than Grand Coulee if one considers only the time difference in the projects have been in place. As discussed for the Grand Coulee project, the lack of some type of annualization analysis to account for the difference in age between the projects should be considered a systematic bias against all projects, especially the older projects.

The amount of development that might have occurred in the study area had the project not been built would influence the accuracy of the without project portion of the loss assessment. The McNary project is in close proximity to Richland, Wallula, Pasco and Kennewick and the land in the study area might have been developed much differently, if the project had not been built. The information provided by Glad (no date) in her supplemental report indicates urban areas grew by

Figure 3.7. Older projects such as Grand Coulee and McNary have incurred more impact than more recent projects such as Dworshak. This figure assumes all the projects had similar impacts due to construction

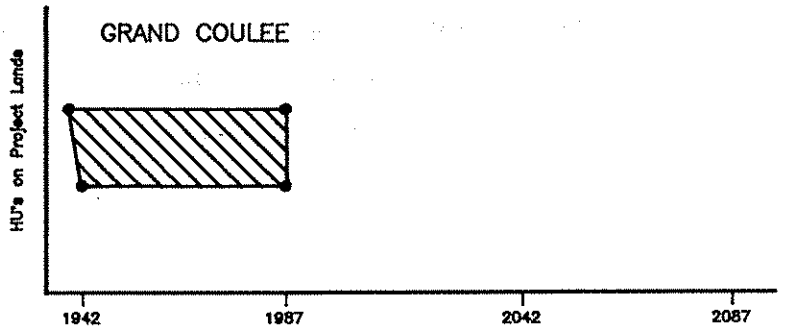


FIGURE 3.7A

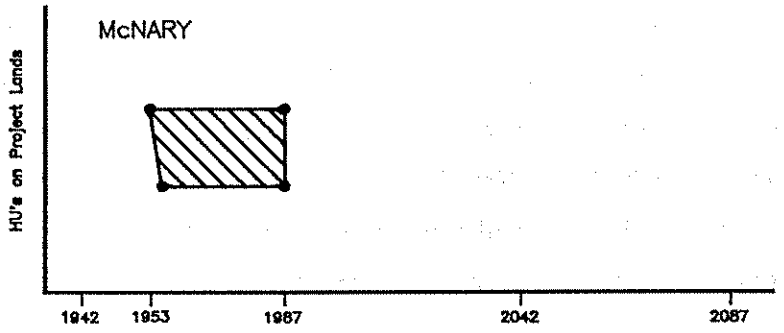


FIGURE 3.7B

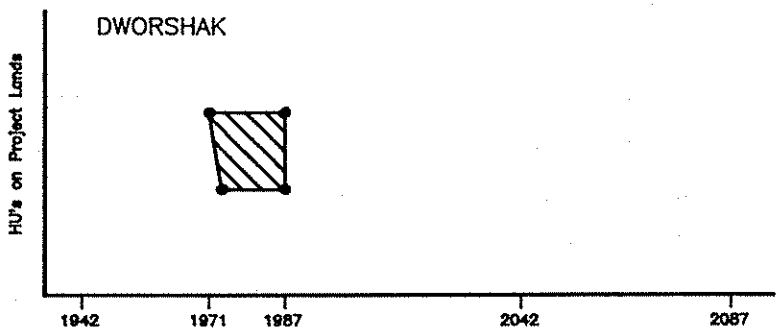


FIGURE 3.7C

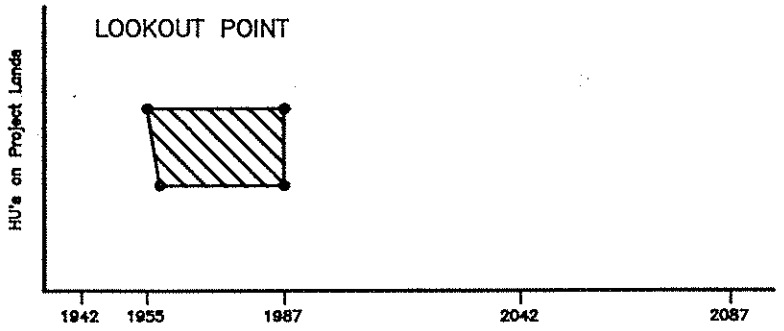


FIGURE 3.7D

four to five hundred acres between 1952 and 1987. If one assumes development would have occurred in the reservoir area, some of this habitat would have been lost even if the project was not built. The number of acres lost to development is low compared to the total area inundated, but secondary impacts associated with the development could have been more extensive. Due to the proximity to four towns and cities, additional investigation should be considered to determine if lands in the reservoir area might have been developed more extensively had the project not been built.

3.2.4 Goals

The stated objective of the McNary loss assessment (Rasmussen & Wright 1990, page 1) was to estimate the net effects to wildlife resulting from hydroelectric construction and operation. The supplemental Vegetation Analysis prepared by Glad (no date) indicates that lands below McNary dam that might have been influenced by project operation were included in the HEP. However, during my meeting with the McNary HEP team, they indicated operational impacts were not assessed. I am not entirely sure whether or not operation was considered. I provide this information to illustrate some apparent confusion about project objectives. The Council needs to clearly state the goals for the loss assessments.

3.2.5 Species Selection

The species selection process is well documented. The team selected the mallard that received considerable benefit from the reservoir and the Canada goose that received no benefit (note that the Grand Coulee team selected the Canada goose which received some credit and did not select any other species that might have received benefit from the reservoir). The mallard accounted for +13,744 HUs or about 58% of the HUs lost. This is a large percentage and the decision to include a species that would receive so much benefit is significant. If the HEP team had not chosen the mallard, as was the case for the Grand Coulee team, the results would have been considerably different. While selecting the mallard might be considered a bias, the HEP team agreed to this species and its influence on the HEP results. Given the gentle topography and the amount of shoreline wetlands (i.e., mallard nesting habitat) associated with the project, I believe the mallard was a good choice as an evaluation species and that the choice should not be considered a bias.

3.2.6 Reservoir Benefits

Relatively more reservoir benefit was given to McNary than for Grand Coulee and the other loss assessments I reviewed. As discussed above, this benefit was entirely due to one species, the mallard. The relatively large benefit for the mallard appears related to the fact that the physiography of the McNary area is good for waterfowl production. Consequently I do not consider the large reservoir benefit for mallard to be a bias.

Wetlands associated with the project (possibly within the reservoir boundary) are an issue for the McNary project, because of the gentle topography adjacent to the reservoir. Possible benefits for species (e.g., mink) that likely utilize the increase in wetlands acres (Glad, no date, Table 1) are not accounted for in Table 3 of the loss assessment. Accounting for species that might utilize with-project wetlands was discussed during a meeting with the McNary HEP team as the audit was being prepared. The HEP team provided me with the Glad (no date) Supplemental Report so I could better understand accounting for the wetlands. I reviewed this document and still have questions regarding wetland accounting. Rather than schedule a second meeting with the McNary HEP team, that would result in further delays with the audit, the wetland accounting issue is not resolved. It appears that wetland acres increased as a result of the reservoir. Wildlife benefits related to this increase in wetland acreage are apparently not accounted for. It is hoped that wetland related benefits will be accounted for during subsequent assessments of operation and mitigation. The increase in wetland acres (+349 acres) is not large compared to the loss of vegetated acres (-15,639 acres) and should not be considered a bias, as defined for this audit.

This wetland example also illustrates the importance of having clearly stated goals, objectives, assumptions and methods. As discussed above, the McNary goals state that operation was considered (page 1 of the loss assessment) but operational benefits for wetlands were apparently not addressed. If this and other similar types of inconsistencies both within and between loss assessments will ultimately be dealt with as the HEP proceeds, there is little cause for concern. However, if the HEP is not completed, the potential for bias is high.

3.2.7 Existing Mitigation

PNUCC raised the issue of accounting for mitigation that has accrued on Federal lands associated with the lower four Columbia River projects (PNUCC 1992). Approximately 89,000 acres of Federal lands were identified in this letter. This is approximately three times the amount of terrestrial and river acres that were inundated by the McNary project. One can imagine that some of the 89,000 acres, that include wildlife refuges, are providing benefit for wildlife. Council staff asked BEAK to spend a few days assessing the likelihood that 89,000 acres are providing benefit for wildlife. At the staff's request, we called several agencies including the U. S. Corps of Engineers (Corps) and a tribal biologist. Results are summarized in a note to the project file (Whitney and Curry 1992, see Appendix B-4). We found several Corps documents that outlined a large number of acres associated with the lower four projects, but were unable to correlate the acres referred to by PNUCC with the acres and locations of lands that were mapped in the Corps documents. Project lands in the Corps documents appeared to consist of a few large wildlife refuges and a string of lands along the lower four reservoirs. BEAK felt it would be sizeable job to simply find, catalogue, and map these lands. It would also take considerable time to assign these lands to the various projects and determine when the lands were purchased. Knowing the time of purchase would help to document if land use changed after the projects were constructed.

Assessing possible mitigation credit for these 89,000 acres would require both a hindcasting (historical) and a forecasting (futures) analysis of with and with-out mitigation. The hindcasting would include old (e.g., pre-1952) cover type maps, an assessment of gains or loss in wildlife value between 1952 and present, and an assessment of what might have happened to these lands if the projects had not been built. The forecasting would require similar types of HEP analyses between the present and 2052. Forecasting would be based on mitigation plans for all appropriate lands. These plans would forecast cover types and future HSI values for the evaluation species.

Preparing two HEP analyses (hindcasting and forecasting) and mitigation plans for project land between the McNary project and Bonneville Dam is well beyond the scope of this audit. None the less, PNUCC is confident that benefits have accrued while agency staff indicate that no benefit has accrued due to lack of clear ownership (fee title issues) and inadequate operation and maintenance funds to manage the lands. A HEP analysis of the mitigation crediting issue would

take a major effort. A proposal to conduct this analysis using a GIS based HEP procedure was prepared by BEAK. Any analysis of this issue may require some legal investigation into the Fish and Wildlife Coordination Act and the different designations for refuge lands.

While there are ways to conduct a less extensive HEP analysis of the existing mitigation issue (e.g., delete GIS), clear goals and objectives of the analysis should be outlined before a scope of work is prepared. Discussion and agreement on the scope of work should be completed before the analyses are conducted to increase the likelihood that consensus will be reached following the analyses.

3.2.8 Field Analysis

The nature of the audit is to look for problems, a process that can result in a negative tone. I want to give credit where credit is due and compliment the McNary team on a quality HEP analysis. The results are for the most part clear and easy to understand. This is not surprising given that HEP is a product of the Fish and Wildlife Service and that the McNary team was mainly comprised of biologists from this agency. None the less, there are things which could be improved for this and the other loss assessments. For example, more with and with-out data (as outlined by Form D and Form H in the HEP Manual (USFWS 1980)) in the reports would enhance the analysis. I feel it would be appropriate to provide the field data, cover type map(s) and more detail about assumptions made during the HEP process. Without these types of information, it is difficult for a reviewer to assess whether or not the HEP was appropriately conducted. Since the Council is not interested in an in-depth analysis, the audit stops short of a complete review of the with and without data.

3.2.9 Summary McNary

The audit process revealed no systematic bias in the way this HEP was conducted. As discussed for the Grand Coulee project, there are a variety of inter-project issues that could lead to bias in the mitigation process (Table 3.2). If these issues (e.g., how to deal with project age and species selection) are acknowledged and addressed, the HEP teams collectively should be able to complete their HEPs without systematic bias.

Table 3.2. Summary matrix of project biases for McNary Dam.

Overestimated Losses	Underestimated Losses	Net Bias
	Focus on construction impacts: Study area includes the reservoir area, area of the dam and support facilities, but not adjacent lands.	underestimate > 25%
	Age of the project was not considered in the loss assessment.	underestimate > 25%
Crediting for existing mitigation is not addressed.		unknown

3.3 DWORSHAK DAM

The Dworshak loss assessment (Meuleman et al. 1989) is the only project that considered downstream impacts and ongoing mitigation.

3.3.1 Study Area

The Dworshak project study area includes: the reservoir area (16,970 acres), a mitigation "hard core" area on Corps project lands adjacent to the reservoir, and downstream lands along the Clearwater River. This study area is conceptually different from the Grand Coulee study area that only included the inundation area, and from the McNary study area that did not address losses and gains on adjacent lands. The Lookout Point project addressed adjacent lands (no mitigation lands) but did not address downstream lands. In short, the study areas for each project were conceptually different.

This type of variability between projects essentially precludes meaningful comparisons of HUs between projects. These differences between projects will presumably be resolved as the HEP analyses are completed (i.e., the mitigation HEP is conducted). If the differences are not resolved and different projects address conceptually different impacts (inundation vs. inundation plus secondary adjacent impacts), the projects such as Dworshak that considered the inundation and downstream impacts are likely to overestimate impact compared to projects that only considered inundation impacts.

The study area for the downstream impacts was not mapped. This area was defined by individual species needs and was determined to be 50 meters on each side of the river for the length of the river, plus the width of the river. While this method makes sense, it is different from the McNary team that provide a map for the downstream area. If all the HEP teams used the same method for assessing downstream impacts, it would be easier to compare the results from each of the projects.

3.3.2 Team Members

The Dworshak team supplied me with a complete set of meeting minute notes (Kronemann pers. comm., 16 September 1987). Meeting participants were listed as were the people invited. The usual list of participants included a variety of agencies such as the Corps, BPA, the Nez Perce tribe, and Potlach Corp. PNUCC was invited to each meeting but didn't attend.

3.3.3 Annualization

The Dworshak team, as the other teams, discuss the consequences of using simplified (non-annualization) methods for accounting (e.g., page 29 of the loss assessment, Meuleman et al. 1989). This team discusses assumptions that relate to annualization, however these assumptions are not the same as assumptions made or implied by the other HEP teams. For example, project impacts were calculated as the difference between present-day HUs (Year 16, 1987) and pre-construction HUs (Year 0, 1970) in the study area (page 11 of the loss assessment, Figure 3.7B of the audit). The HEP team also assumed that field data collected in post-construction cover types represented pre-construction conditions in the same cover types (page 16 of the loss assessment). These two assumptions are similar to the McNary team but different from the Grand Coulee team that assumed that habitat quality decreased in value since the project was built. These two assumptions imply that habitat value observed in 1987 was instantaneous after inundation and that there were no changes in the habitat quality with or without the project. While the HEP team acknowledges that successional changes have occurred on project lands (page 34 of the loss assessment), the HEP team does not account for such changes in their analyses.

The consequences of not accounting for successional changes that have occurred can only be estimated by conducting an annualization analysis. Such an analysis is beyond the scope of the audit, but would probably indicate that impact was overestimated for species that benefit from mature cover types (e.g., pileated woodpecker). The overestimate is due to counting all the benefits of the mature forest from the day the project was built rather than gradually as the forest matured. Line D7 - D4 (Figure 3.8) shows an increase in slope from the past (1970) to the present (1987). The increase in slope is due to a gradual increase in HUs as the forest matures. The assumption of instantaneous maturation (see above) made by the Dworshak team, (i.e., present conditions have

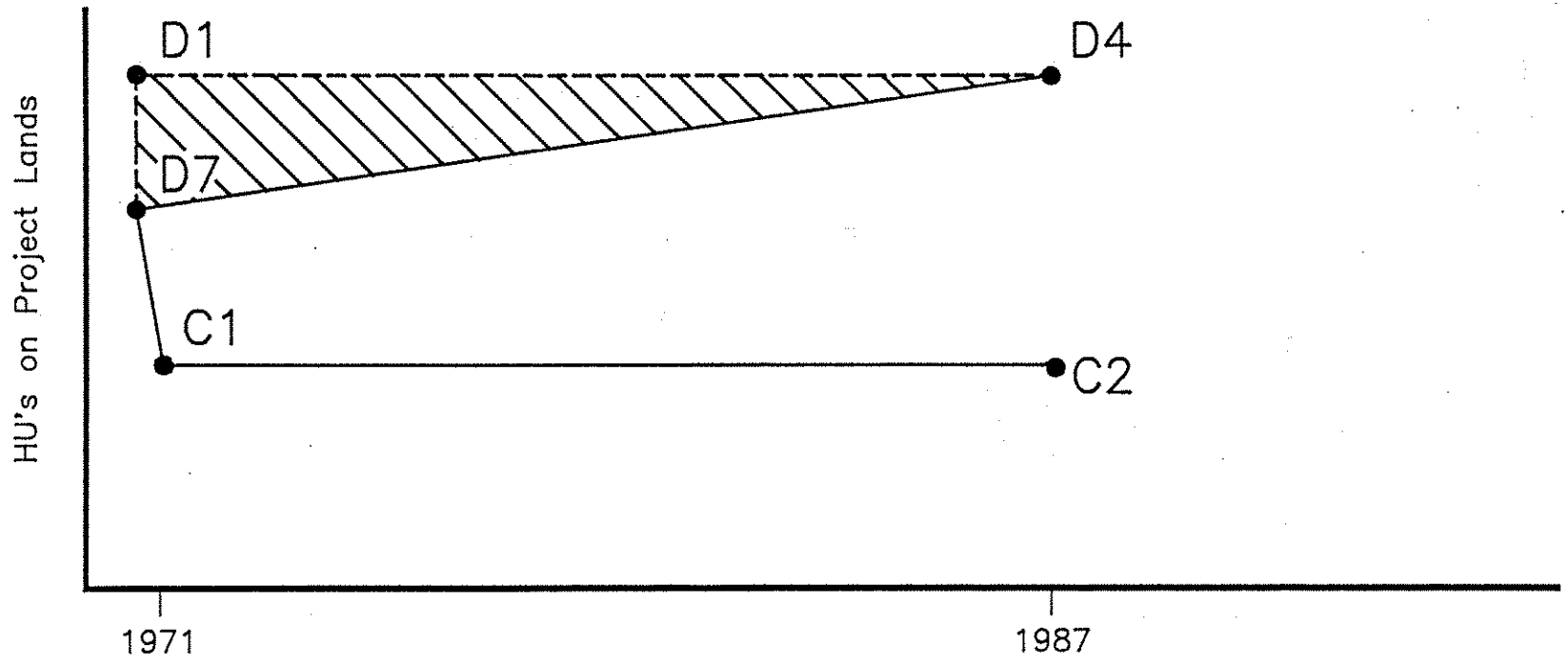


Figure 3.8. Benefits related to forest succession have been accounted for in the impact (C2–D4). The shaded area shows benefits that should not have been counted

occurred from the start of the project to the present) will result in an overestimate of loss. The amount of overestimate is depicted by the shaded area in Figure 3.8. This shaded area represents the difference between instant maturation (a Dworshak project assumption) and gradual maturation. The shaded area would be accounted for in the Dworshak loss assessment as it was conducted (i.e., the difference between D4 and C2 in Figure 3.8). However, the shaded area would not be accounted for in an annualization analysis because the forest wasn't mature when the project was built. It is beyond the scope of the audit to determine if the overestimate is a bias.

Discussions of annualization with the HEP team indicate that the forest on the project area would not have been harvested (note past tense) if the project had not been built. However, there is reference in the Dworshak Withdrawal Environmental Assessment (Document provided by Jerome Hansen, Idaho Fish and Wildlife) to a proposed (future) state road and new all weather logging roads planned for the area south of the reservoir. This potential road construction and secondary development (without the project) could be included in an annualization analysis of impact in the future. Reduced habitat value, as a consequence of road construction, increased access, and increased future harvest, without the project would likely result in lower impact. There is the possibility that the harvest (per se) would be a positive impact for some of the species such as deer that would benefit from new openings and browse fields. Whether benefits of the increased access would offset the negative impact of development can best be accounted for with annualization. Without such an analysis, it is possible that errors could be made. The consequence of not considering forest practices that would likely have occurred without the project is discussed in more detail for the Lookout Point project conducted by the Oregon HEP team. Not annualizing for likely forest practices in the area of Lookout Point was judged to result in an overestimate of impact and could also be a bias for the Dworshak project.

The Dworshak project is the most recent of all the projects I examined (Figure 3.7). The project, constructed in 1971, is partially mitigated by improvements on the "hard core" mitigation lands. These improvements were implemented when the project was constructed and have been compensating for some of the impacts since the project was built. The mitigation on the "hard core" lands is only partial and falls short of compensating for all of the impact that occurred. Additional mitigation is needed to compensate for the remaining (the portion not compensated by the "hard core" mitigation) impacts that have incurred since the project was constructed. Since this project

is one of the youngest being considered by the loss assessments, the remaining impact since construction is not as great as the older projects (Figure 3.7).

The lack of mitigation for some of the impact since construction should be addressed. If the non-mitigated impact that occurred since construction is not compensated for, the consequence is essentially an underestimate of impact. The extent of underestimate is not nearly as great as for the Grand Coulee project, but could be accounted for with annualization.

3.3.4 Goals

The goals of the Dworshak loss assessment include this specific objective: To quantify net impacts of development and operation, and to evaluate the benefits of a 5,120 acre "hard core" mitigation parcel. This objective is considerably different from the McNary project where potential mitigation on adjacent Federal lands was not accounted for. If this differing objective is not taken into account, it may appear that the project with the mitigation included (i.e., Dworshak) has less impact than projects that have not implemented mitigation. The way impact and mitigation information are combined (Table 28 in the Dworshak loss assessment) does not allow me to separate out the loss of HUs due only to the reservoir. One could calculate the loss due to the reservoir separately from the mitigation benefit realized on the "hard core" mitigation area, however this would require a reanalysis of the raw data for acreage and HSI modeling for both with- and without-mitigation scenarios. Such an analysis is beyond the scope of this audit.

Part of the problem with the differing goals between projects is that each HEP team completed different portions of the total HEP analysis as part of the loss assessment. I have indicated, in the discussions for the other projects, that completeness issues can be adequately addressed during the mitigation phase of the HEP analyses. Ongoing discussion about goals and objectives among all the HEP teams will assure that potential for bias will be reduced in the mitigation phase.

3.3.5 Species Selection

The loss assessment does not present a justification for the species selection process. Compared to other projects, the Dworshak team selected more species that receive benefit from the project (e.g., Canada goose, bald eagle, osprey, and yellow warbler). Selecting this many species that could benefit from the project has a tendency to underestimate impact compared to other projects that only selected one species that would benefit. For example the reservoir impact analysis indicates that the eagle contributed a net 1627 HUs, and the osprey contributed a net 1674 HUs (3224 - 1550, Table 28 of the loss assessment). The sum of these benefits 3301 HUs (1627 + 1674), is effectively subtracted from the sum of negative impact. The resulting impact (with positive impact subtracted) is less than impact for a project that accounted for little or no with-project benefits. The contribution of HUs from the osprey and the bald eagle is about 13% of the impact and results in an underestimate compared to other projects such as the Grand Coulee that credited very little benefit from the reservoir. The question is, do the underestimates of impact made by the Dworshak team compensate for the overestimates? As discussed for other projects the best way to find out is to start over with a more standardized set of objectives, methods, and assumptions.

The Dworshak HEP team seemed to realize that their selection of species provided more project benefit than they anticipated (my speculation). For example, the team proposed not to count reservoir benefits for the osprey (see page 68, para 3 of the loss assessment) and not to include the osprey as a mitigation evaluation species. I agree, and have suggested above, that the mitigation portion of the HEP is the time to address these types of concerns, but there is once again a concern that each HEP team will choose a different method for adjusting their loss assessments. While each one of the proposed adjustments might make biological sense, there is definitely a potential for inconsistency between projects and the appearance that the adjustments are arbitrary. Discussion among the HEP teams prior to the mitigation phase of the HEP should encourage the teams to standardize the way they deal with adjustments for the loss assessments.

Species selection for the mitigation phase of the HEP is a key issue that is closely aligned with the Goals issue. To illustrate this point, I refer to the mitigation HEP work for the "hard core" area adjacent to the reservoir. Species selected for this analysis were only those that received benefit from the mitigation. For example, the HEP team did not quantify negative impacts to one target

species (pileated woodpecker) that resulted from mitigation intended for another species (elk). This decision (Hansen pers. comm., 3 September 1992, Appendix B-5), if implemented for all projects, would likely result in a systematic bias that overestimates mitigation benefits, which would leave some impacts not compensated for. The HEP teams can set their goals, objectives, and methods as they see fit, but the more common HEP method outlined in the HEP manual is to use the same species for mitigation as were used for impact. If the HEP teams want to conduct trade-off analyses, I suggest that trade-offs be initiated following the mitigation analysis. Conducting trade-offs after mitigation will allow readers and reviewers to understand the mitigation package before adjustments.

The decision to only count benefits on the "hard core" mitigation area results in an underestimation of impacts. Calculating the extent of the underestimate is beyond the scope of the audit. I cannot determine whether or not this issue is a bias. My greatest concern with this issue is the potential for one team to only count benefits for a few species while another team may balance the benefits as well as losses related to mitigation. The issue of how to account for mitigation should be addressed in a Written Plan.

3.3.6 Reservoir Benefits

The Dworshak HEP team selected four species that receive benefit from the project. Issues related to reservoir benefits are discussed under 3.4.5 Species Selection. I conclude that choosing four species that receive benefit from the reservoir results in an underestimate of impact relative to other projects. This underestimate, by itself, is not likely to be a bias.

3.3.7 Existing Mitigation

Information on the "hard core" mitigation lands presented in the loss assessment was difficult to understand. The HEP team provided additional information on the "hard core" lands to give me a better idea of how and why these lands were proposed and implemented. One interesting Memorandum from the Bureau of Land Management (Jan. 16, 1978, Appendix B-6) reviews the struggle and compromise (my words) related to the mitigation land set aside for the Dworshak project. This information provides insight into struggles that the Council is dealing with today as they review the wildlife loss assessments. For example, the author of the BLM Memorandum refers

to the political sensitivity of the mitigation issue and the problems and compromises associated with crediting for the mitigation as it relates to the impact incurred. I believe the HEP loss assessment is the first attempt to assess the crediting issue for the "hard core" mitigation and it indicates the mitigation in place does not fully compensate for the impact (Table 28 in the loss assessment, which includes mitigation, shows outstanding impact).

The credit that has accrued by implementing the "hard core" mitigation at the start of the project operation is real and has, according to the HEP, provided benefit to wildlife for 16 years (1987 minus 1971). In short, there is no real need to go back and make up for a total lack of mitigation. However, if one wants to go back and give credit for the accumulated mitigation, one must also go back and account for the past impact. It would be inconsistent to count past mitigation but not past impact. Consistency is important. If one wants to count the benefit of the "hard core" lands, then there is an obligation for Dworshak and other projects to identify compensation for past losses that have not been mitigated. If the Council decides not to require compensation for past losses, the Dworshak team should not subtract the benefit of the "hard core" mitigation from the impact. The consequence of not subtracting the mitigation is an underestimation of impact by the amount of the mitigation provided on the "hard core" area. The HEP team does not split out the mitigation benefit in Table 28 in the loss assessment so the underestimation cannot readily be assessed. I assess the extent of this underestimate by comparing the size of the "hard core" parcel to the impact area. The "hard core" area is about 23% of the total area inundated (4,028/16,970 acres). If one assumes the "hard core" mitigation compensates for 23% of the impact in Table 28 of the loss assessment, the level of impact is underestimated by 23% and, thus, has the potential to be a bias (if the Council decides not to account for past impact and mitigation).

I was concerned (Whitney, pers. comm. 12 June 1992) that the mitigation proposed for the "hard core" lands may not be different from conventional forest practices. The HEP team sent a copy of the mitigation plan (no date) for the "hard core" lands so I could assess this issue. The plan outlines a variety of goals that are apparently in addition to standard forest practices for the area. These goals focus on elk needs for cover (thermal and hiding), travel, water, and interspersion. Specific actions to achieve these goals are outlined in the plan and are summarized in the Environmental Assessment for the Dworshak Withdrawal prepared by the BLM (no date). Actions include: plowing, drilling, crushing, broadcast burning, and hand planting desirable browse species.

The plan appeared to be well thought out and is likely to benefit elk. Benefits for other species are likely and I understand that such benefit was included in the HEP. However as mentioned above, negative aspects of the mitigation were not included in the mitigation assessment. The decision to only account for benefits of the mitigation while ignoring negative aspects may overestimate mitigation credit or underestimate impact.

The likelihood of forest harvest in the project area in the future is addressed above in the discussion of annualization and in the letter from Hansen (pers. comm, 3 September 1992). Both discussions indicate that forest harvest would have been likely in the future (I concluded that the lack of access in the past precluded timber harvest), without the project. I agree with Jerome Hansen when he speculates "I believe it is possible that we have over-credited the Corps elk mitigation efforts by assuming that without mitigation conditions did not include the creation of additional openings and browse fields by regular timber harvest." The over-crediting for elk in Table 28 of the loss assessment is the same as an underestimation of impact. The extent of underestimation of impact for elk, one of nine evaluation species, is not likely to be greater than 25% for the whole loss assessment. If this issue is to be resolved, it is important to confirm which species were considered for evaluation on the mitigation lands and if both gains and losses were counted.

3.3.8 HEP Process

HEP models used for the Dworshak project are presented in the loss assessment. The HEP team provided me with information that shows how the model calculations were conducted for the white-tailed deer. A brief review of the calculations for this evaluation species suggests they are appropriate. The calculations were similar to the Grand Coulee and Lookout Point methods that estimated HSIs for aggregated cover types over large portions of the project area (e.g., by river reach or above and below Evans Creek). The McNary HEP team estimated HSIs for each cover type.

3.3.9 Other HEP Issues

The Dworshak project, with partial mitigation, brings the annualization issue to a head. It is possible that accountability for past impacts, according to annualization methods, will not be

implemented and the decision of whether or not to count past mitigation will be moot. If this is the case, future compensation should be based on the full impact of the Dworshak Project (as it will be for the other projects that have not mitigated or counted for existing mitigation), not impact minus the past mitigation. When planning for the future, the HEP teams and the Council should all start from the same point, i.e., full impact (without mitigation subtracted). It would not be appropriate to assume that existing mitigation for the Dworshak will continue as implemented into the future (an implied assumption made by the impact numbers in Table 28 of the Dworshak loss assessment). Reasons for not counting existing mitigation into the future are discussed above and in the Dworshak loss assessment and include: increased future access and changing land uses, only counting mitigation benefits, and the need to maintain (i.e. thinning or new harvest) mitigation operations on the "hard core" lands.

A variety of HEP-related issues are discussed for the Dworshak project and the likelihood of bias is discussed. Both under and overestimations are mentioned. It is not the intent of the audit to consolidate all of these issues and conclude with a net over or under ~~conclusion~~ estimate for Dworshak (or any of the other projects). The Summary matrix (Table 3.3) lists the major conclusions for the project. While it will be tempting to somehow add and subtract the various biases and reach overall conclusions, this would not be technically correct because the various estimates of bias are not independent. The information in the Summary and Recommendation sections of the audit is intended to identify possible biases and to help the Council decide the appropriate action.

3.3.10 Budget

A spread sheet of budgets for the various wildlife projects (Appendix B-3) indicates a variety of support projects (e.g. model validation) have been funded. For example, a river otter study was conducted to help validate the HEP model used for this species. The Nez Pierce tribe discussed the river otter study with me and showed me slides of the otter study area. It appeared that the otter study increased the information base for the local otter population and this type of on-site data will undoubtedly increase the accuracy of future HEP analyses in this area.

Table 3.3. Summary matrix of project biases for Dworshak Dam.

Overestimated Losses	Underestimated Losses	Net Bias
HEP team acknowledges that successional changes have occurred but does not account for those changes (e.g., mature cover types - pileated woodpecker).		not estimated
Without the project, likely road and other developments in area adjacent to reservoir.		not estimated, bias likely
	Without the project, forested area would not have been harvested.	not estimated
	Reservoir benefits	not estimated
	Mitigation only counts benefits	potential bias
	Cumulative impacts not compensated for with cumulative mitigation.	not estimated

3.4 LOOKOUT POINT DAM

3.4.1 Study Area

The study area for the Lookout Point project is presented in the loss assessment as the "project area" (8,543 acres). The project area includes the "affected area" (6,790 acres) which is made up of the reservoir (4,255 acres) and land adjacent to the reservoir (2,535 acres) that was directly affected by project construction and operation. The adjacent lands include support facilities such as relocated roads and staging areas. A transmission line to the power grid was not included in the loss assessment. Most of the 2,535 acres of adjacent land is wildlife habitat that has been influenced by the project. For example, habitat quality adjacent to relocated roads is judged to be lower than pre-project conditions (loss assessment, Bedrossian et al. 1989, p. 19, 2.d.).

The adjacent lands comprise approximately 37% of the affected area/study area. This is a large percentage compared to the other projects examined. For example the Grand Coulee project did not consider project facilities or adjacent wildlife habitat. Compared to the other loss assessments that did not consider the impact of construction and operation on adjacent land, the Lookout Point project overestimates impact. The amount of impact overestimate will depend on the projects being considered and amount of impact on adjacent lands, but will be some portion of the 37%. This portion cannot be derived from the data presented in the loss assessment but could be calculated from the raw data in the Lookout Point files. Such an analysis is beyond the scope of the audit. Until such an analysis is conducted, I can only conclude that the Lookout Point project overestimated impact, relative to other projects in the audit.

3.4.2 Team Members

The Lookout Point loss assessment does not appear to include input by PNUCC or a tribe (page 71 of the loss assessment). I reviewed the HEP files for this project and did not see any evidence that PNUCC or a tribe was invited to participate. The agencies that one would expect to participate in the HEP were present, as was the developer (USACE).

3.4.3 Annualization

The concept of annualization was referred to several times in the loss assessment (e.g., p. 55, and p. 58). The Lookout Point HEP team assessed impact at two times: 1. post-construction and 2. recent (e.g., loss assessment Table 3). The Corps also referred to the annualization concept in a letter to ODF&W (Keough pers. comm. 7 June 1984, Appendix B-7). The Corps asked that the HEP team clarify the specific time for which loss assessments will be derived and to set clear guidelines for dealing with duration/time of loss prior to conducting the loss assessment. At some point in the process a decision was made not to annualize and the Corps advice to set clear guidelines was not followed. During a meeting with ODF&W to discuss the audit, representatives of the HEP team indicated the choice not to annualize was based on the limited budget.

The Lookout Point HEP team assessed impact by comparing pre-project conditions to with-project (1987) conditions. As other HEP analyses considered in the audit, the Lookout Point HEP impact calculation(s) did not consider how habitat quality might have changed if the project had not been built. The extent that habitat quality of the project lands would have deceased, had the project not been built, should not be considered as impact of the project. This concept, as illustrated in Figure 3.3, is particularly relevant to the Lookout Point inundation area because much of the mature and old growth forest in the Willamette Valley has been harvested since the project was constructed (p. 58, para. 2, loss assessment, " ... considerable change in conditions for wildlife in the Willamette Basin caused by timber harvesting and increased human use". The Mitigation Report (Preston et al. 1987, p. 4) prepared by the HEP team indicates that "the quality of habitat that was lost no longer exists in proximity to the project area". The information presented by the HEP team indicates that had the project not been built, the habitat quality would have declined or been lost anyway.

The extent that the value of wildlife habitat in the project area has been reduced by timber harvest, recreation, and other human use cannot be directly assessed by the data in the loss assessment. I estimate the extent of reduction in habitat value in the general area of the project by reviewing the data in the Mitigation Report (Preston et al. 1987) prepared by the HEP team. I used the habitat value (HSI) for elk on an assortment of potential mitigation parcels (Table 2: Summary of Mitigation Opportunities and Habitat Goals, Preston et al. 1987) as a rough index of how habitat value has declined due to changes in land use. HSI values calculated from the data in this table

indicate an average HSI of 0.4 for elk on the potential mitigation parcels. This is twice as high as the elk HSI calculated by the HEP team for post-project adjacent lands (HSI 0.2) and lower than the pre-project lands (HSI 0.7). This assessment for one of the evaluation species indicates that habitat quality of non-project lands may be higher than the current lands adjacent to the project but not as high as pre-project lands. For purposes of the audit and to illustrate how annualization might influence the results of the Lookout Point project, I assume the habitat value for all evaluation species in the project area would have been reduced by an average of 50% since project construction. The Mitigation Report (Preston et al. 1987, p. 35 and p. 22) indicates this is a reasonable assumption.

A 50% reduction in habitat value of the affected area, as illustrated in Figure 3.9, relates (approximately) to a 25% loss over time (e.g., the shaded area above the with-out project curve, D1 to D3). The accuracy of this prediction is based on knowing the extent that habitat value in the area of the project has been reduced since the project was constructed.

Annualization as it relates to duration of impact is also important to discuss because the Lookout Point project (finished in 1955) has been in place longer than the Dworshak (finished in 1971), shorter than the Grand Coulee (finished in 1942) and about the same time as the McNary project (finished in 1953). As such, the Lookout Point project has accrued more impact than some projects and less than others (Figure 3.7). The Lookout Point project, compared to Dworshak, has accumulated impact for twice the time (33 vs. 16 years). As a consequence, the Lookout Point project (as all projects) has underestimated impact, which could be considered a bias.

3.4.4 Goals

The Lookout Point HEP team developed a six page Work Statement that outlined five major objectives, each with 2 to 8 tasks. The tasks addressed general procedures but didn't go into the details of how the HEP values (e.g., HSI or target years) would be calculated. The details were decided during the actual HEP meetings once the loss assessment had commenced. The Work Statement was circulated to the Corps, BPA and a variety of comments were received. ODF&W indicated, during a meeting to discuss the loss assessment, that there was no coordination with other

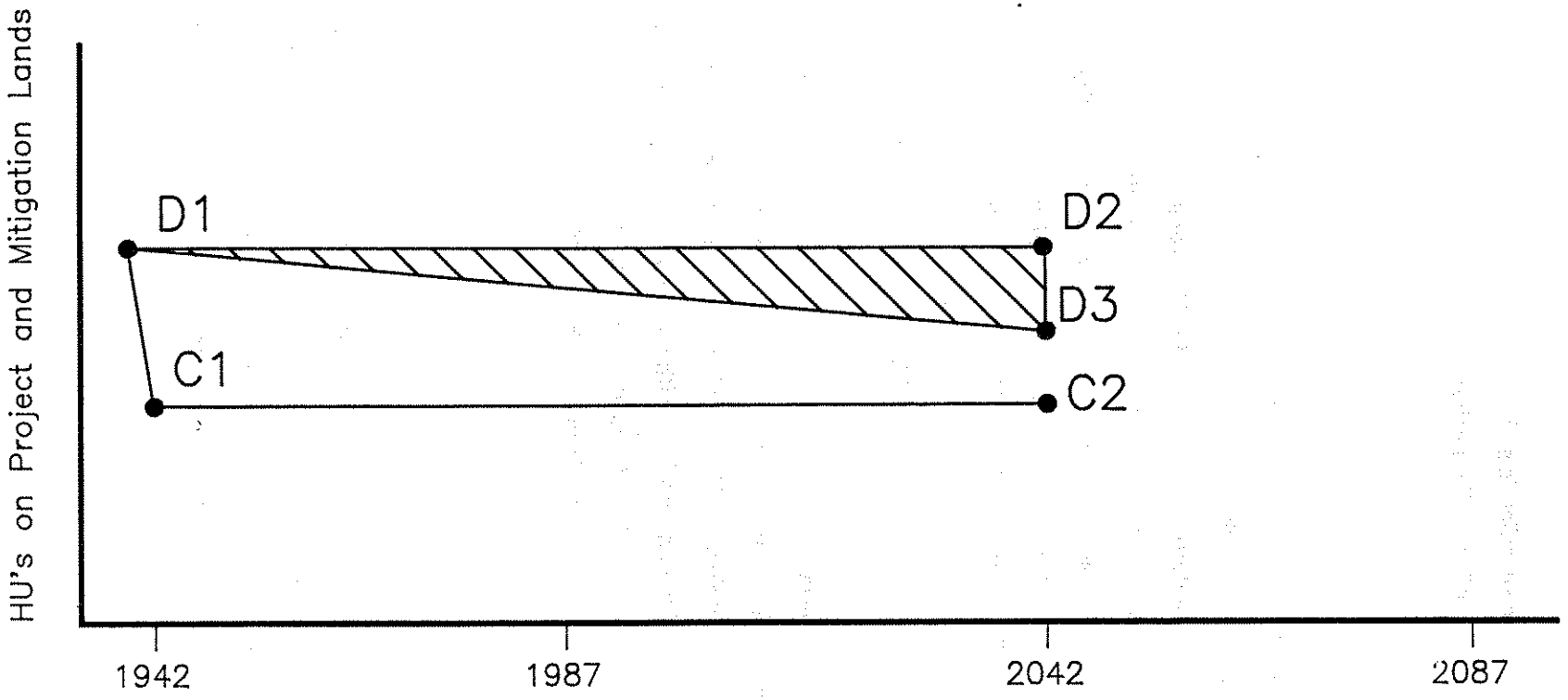


Figure 3.9. The Willamette team did not account for forest management that would likely have occurred on project lands. The shaded area illustrates a loss in habitat value (without project) that should not have been accounted for in the impact assessment.

HEP teams to standardize the specifics (e.g., HSI model detail, impact of operation, target years, field data collection methods) of the HEP analyses.

3.4.5 Species Selection

The Lookout Point HEP team choose considerably more evaluation species than the other HEP teams. Seventeen species were chosen for the Lookout Point project compared to 7 species for Grand Coulee, 8 species for McNary, and 9 species for Dworshak. When I asked the Willamette HEP team why so many species had been selected, they indicated they tried to reduce the number but they couldn't agree on which species to eliminate. The result of selecting so many species for the Lookout Point project as well as the other Willamette projects is of little consequence to the individual Willamette HEPs. The additional HUs generated by the additional species will be compensated for by the same species during the mitigation process. In short, more species does not necessarily equate to more impact, if the HEP mitigation studies are completed.

The potential for misusing the additional HUs generated by selecting 17 species is most noticeable when comparing the Lookout Point project to other projects. If one were to compare the HUs lost for the various projects in Table 5 of the "Rule" (Northwest Power Planning Council 1989a), it appears that the Willamette projects with more species incurred greater losses than the other projects with fewer species. If the HEP analyses were to stop at this phase of the process, the Lookout Point project would overestimate impact by about 142% (e.g., 17-7/7 = 1.42) compared to the Grand Coulee project.

3.4.6 Reservoir Benefits

The Lookout Point HEP team assigned reservoir benefits for several species. For example, the bald eagle and the osprey received net benefit as a result of the project. The net benefit resulting from the project was approximately 10% of the loss from the project. To this extent, the Lookout Point project underestimated impact compared to the Grand Coulee project.

3.4.7 Existing Mitigation

The loss assessment for the Lookout Point project (p. 2 of the loss assessment) indicates that 2,083 acres of project lands occur outside of the Willamette National Forest boundary and 2,250 acres of project lands occur within National Forest boundaries. I called Ron Mecklenburg (pers. comm. 11 December 1992), wildlife biologist for the Lowell Ranger District, and inquired about mitigation on Forest Service land. He indicated a management plan has not been prepared for these lands, but a Reservoir Management Plan has been prepared for the Lookout Point project, and that approximately 10 to 20 acres in the draw-down zone and along tributary streams were being managed for fish and wildlife. Management activities are being maintained sporadically by groups such as the Isaac Walton League and the 5th Graders from the Thurston School. Management activities include riparian and emergent plantings in the draw down zone of the reservoir. Mitigation analyses for the Lookout Point project should investigate the Reservoir Management Plans and the status of project lands both in and adjacent to the National Forest.

3.4.8 HEP Models

The HEP models for the Lookout Point project were word type models referred to as work sheets. The work sheets were designed to provide a standard for rating habitat suitability (loss assessment p. 7). The work sheet for bald eagle is typical of the work sheets that I reviewed in the ODF&W HEP files. The natural history notes are useful for describing bald eagle habitat, but there is no mention of HSI scores and no attempt to correlate the eagle natural history notes with habitat value. These work sheets were probably helpful for the HEP team that conducted the loss assessment but would be of less value to a new HEP team assembled for mitigation analyses. Compared to the more conventional HEP models used for the McNary and Dworshak projects, the Willamette work sheets are less likely to provide continuity between the impact and mitigation HEP analyses. ~~Every effort should be made to provide continuity between the impact and mitigation HEP analyses~~. Every effort should be made to provide continuity between the impact and mitigation portions of the HEP by using the same loss assessment HEP team members for the mitigation analysis.

3.4.9 Cover Types

A cover type map was included with the Lookout Point project. Other projects such as McNary and Grand Coulee did not have cover type maps in the loss assessment text which made it difficult to tell how the HEP was conducted. Cover types were determined from aerial maps and ground truthed by the HEP team as one would expect.

3.4.10 Field Analysis

The field portion of the Lookout Point HEP was considerably different from the McNary and Dworshak HEPs. Field data for the Lookout Point project was recorded for large, multicover, areas. The short cut of considering large areas with several cover types is acceptable. There is no way to assess whether or not the method used would likely result in a higher or lower estimate of loss than a method that collected data by cover types.

3.4.11 Summary

The summary matrix (Table 3.4) indicates the Lookout Point project may have more overestimates than underestimates. Recommendations for dealing with these potential biases are presented in Section 5.0.

Table 3.4. Summary matrix of project biases for Lookout Point Dam and Reservoir.

Overestimated Losses	Underestimated Losses	Net Bias
Impact includes adjacent lands.		not calculated
	Older projects have more impact.	>25%
Without project land use would likely have reduced habitat value.		~25%
Many evaluation species.		>25%

4.0 SUMMARY

The goal of this audit is to determine if there is any systematic bias(es) in the way the loss assessments are conducted. For purposes of the audit, I define bias as any action that might result in an over or under estimate of 25% or more. The audit procedure for determining bias follows a sequence of steps to address key issues from the Wildlife Record. The review of key issues resulted in a list of errors, omissions, or inconsistencies associated with four representative loss assessments (Grand Coulee, McNary, Dworshak, and Lookout Point). I found very few errors in the loss assessments and those identified were of little consequence. The major concerns with the loss assessments are related to omissions and inconsistencies between projects. The summary matrices presented with each project discussion outline the major concerns and identify potential biases. The reason for saying "potential bias" is that the HEP analyses conducted to date are not complete and it is possible that all of the biases that are identified will be addressed when the HEP analyses are completed. For example if many evaluation species result in many HUs lost in the impact portion of the HEP, then the same number of species will result in more HUs gained from the mitigation. If a decision is made not to complete the HEPs, the biases that I identify will remain. A summary discussion is presented for each of the key issues.

4.1 GOALS

The Council outlines general goals for the loss assessments in the "Rule." To some degree, the various HEP teams outlined general goals in each of the loss assessments but there is little consistency between the projects audited. When I talked to the HEP teams representatives, they indicated that little guidance was given as to specific objectives, questions, or methods. I also understand that there were no workshops to review goals and objectives, etc. The lack of specific goals and objectives is likely the reason that every project was conducted in a fundamentally different way. The lack of consistency between the loss assessments is at the root of most of the potential bias identified in the audit.

4.2 STUDY AREA

There is no consistency in the selection of the study area. For example the Grand Coulee project only looked at the area of inundation (not even the area of the project facilities) while the Dworshak project included the area of inundation, project facilities, adjacent lands, and downstream impacts. The projects that addressed impacts in addition to inundation will have proportionately more impact than the projects that did not.

4.3 TEAM MEMBERS

The HEP teams were made up of all the representatives that one would expect. The only exception is PNUCC. The review of the Grand Coulee HEP meeting notes indicates that PNUCC started off as an active participant in the loss assessment process. Toward the end of the study, PNUCC representatives expressed dissatisfaction and stopped attending meetings. It appears that PNUCC chose not to participate in subsequent HEPs. PNUCC's role in the loss assessments can be viewed as an inconsistency between projects and possibly an omission. Whether or not their lack of participation resulted in a bias cannot be determined from the information in the loss assessments or the audit.

Many of the team members that worked on the loss assessments are no longer with the various agencies that conducted the loss assessments. This is a concern because some of the HEP studies were qualitative in the sense that there were no models and assumptions stated in the loss assessments. Much of the information needed to complete the HEPs is in the heads of the team members that are no longer employed by the agency that conducted the HEP. If the HEP process is completed, the information that will lead to consistency between the impact and the mitigation portions of the HEP (e.g., assumptions and models) may be unavailable or incomplete and could lead to a significant bias.

4.4 APPROPRIATE BUDGET

Budgets for the loss assessments varied widely. Grand Coulee, the largest project reviewed, had a relatively small budget. All of the HEP teams felt their budgets precluded annualization.

4.5 SPECIES SELECTION

The number of species selected for the loss assessments varied between 7 and 17. If the HEP processes are completed, and if the same species are used for mitigation, this variation will not likely be a problem, for the HEPs will be internally consistent. If the HEPs are not completed, there is a large potential for bias. The potential for bias relates to overestimation of loss for projects such as Lookout Point that choose many species.

4.6 COVER TYPE

A variety of methods were used to assess cover types. Some degree of cover type map was produced for each project, but this is all the various cover type maps had in common. The Grand Coulee map is a series of aerial photos with tracing paper overlays, the Dworshak project did not produce a cover map for down stream loss assessments and the Lookout Point project was the only one to include a cover type map in the loss assessment document. These inconsistencies and omissions made the audit more difficult but are not likely to produce a bias.

4.7 FIELD ANALYSIS

A wide variety of field procedures were used to assess wildlife habitat quality. There was little or no attempt to coordinate field procedures between projects. As a result, some of the loss assessments are based on measurements of parameters in the field, while others are based on reconnaissance level site reviews. There is some potential for bias related to those projects with no defined field methods, little or no quantitative field data, and few of the original team members available to participate in the mitigation process.

4.8 HEP MODELS

The HEP models and assumptions are important items for maintaining consistency between the impact and mitigation parts of the HEP process. Some projects (e.g., Lookout Point and Grand Coulee) did not use conventional HEP models while the other two projects did. The lack of HEP

models is a concern and could result in bias if not addressed in the next phase of the loss assessment process.

4.9 ANNUALIZATION

The lack of annualization represents the greatest potential for bias. The older projects have accumulated more impact than the younger projects and there is no current mechanism in the loss assessment process to account for age of the project. None of the HEP studies assessed the value of habitat before the projects were built. The Grand Coulee loss assessment assumed pre-project (1941) conditions were better than current (post-project, 1987) conditions but there was no attempt to assess how much better the pre-project conditions were. Information is available for pre-project conditions but is not incorporated into any of the HEP analyses. Failure to assess this fundamental issue is a potential source of bias. Common sense suggests that large changes have occurred in the availability and quality of wildlife habitat since the first projects were built. HEP studies can account for these types of changes by assessing the likely fate of the project lands, had the projects not been built. While it is impossible to predict exactly what might have happened had the projects not been built, it is also impossible to predict the future. The inability to predict the future has not prevented scientists and hydropower planners from projecting into the future with models based on probabilities. In a similar manner there is no reason that hindcasting, based on probabilities, cannot be conducted for past scenarios.

4.10 RESERVOIR BENEFITS

Some of the loss assessments (e.g., McNary) indicated significant benefits from the reservoirs while others (e.g., Grand Coulee) indicated little benefit. These differences are related in part to regional physiography and to some extent species selection. For example, the physiography of the land around the McNary project is more conducive to waterfowl production than the area around the Grand Coulee project (note comments, in the Grand Coulee section, about the large draw-down and shoreline-slumping).

4.11 EXISTING MITIGATION

Some type of mitigation exists for each of the projects reviewed. The Dworshak project is the only one that includes an analysis of past mitigation. From an annualization point of view, I ask whether it is consistent to consider past mitigation but not past impact. The Council should address this issue in a consistent manner. Possible mitigation for the other projects include: the Grand Coulee project has some mitigation on adjacent lands that have been preserved by the Park Service, the McNary project has a yet to be determined amount of mitigation that could be significant (many thousand acres), and the Lookout Point project has some (probably less than 50 acres) identified mitigation and possibly many more acres. We attempted to figure out how much potential mitigation land is associated with the projects but had little success locating the sources of information that outline where these lands are and how they have been managed. Based on our initial investigation, we determined that the analysis (i.e., finding and mapping the lands and conducting a HEP) of existing mitigation could be as large an effort as the original loss assessments. The potential for bias is high.

5.0 RECOMMENDATIONS

The goal of the audit is to identify potential bias(es) and to make recommendations to the Council on how to proceed. The audit focuses on technical issues and avoids the many political issues that are associated with the loss assessment process. From a technical point of view, the Council should review the potential for biases outlined in the audit with the various HEP teams, and then determine how each bias should be addressed, if at all. I suggest that the Council present three generic approaches as a focus for discussion with the HEP teams: 1. Reassess. All of the existing raw data would be reprocessed following similar methods to address similar goals, questions, and objectives. Analytical methods and assumptions would be outlined in a Written Plan. HEP analyses conducted for mitigation would follow methods as defined in the Written Plan. The various projects should be annualized and losses should be calculated for construction. Impacts of operation on adjacent lands would be listed separately from the impact of construction. Mitigation HEPs would follow the methods outlined in the Written Plan; 2. Qualitative Adjustments. Qualitative corrections would be made for issues that might result in bias (e.g., the lack of annualization and inconsistent study area size). Future mitigation HEPs would be internally consistent with the impact assessment methods as outlined in a Written Plan; or 3. Proceed Without HEP. No additional HEP work would be conducted. Mitigation would be directed by a set of goals and objectives developed for each project. Each HEP team would justify, on an intuitive basis, how mitigation would address the losses identified in the loss assessments. There would be no requirement to use HEP methods in the mitigation process. The pros and cons for these three approaches are discussed below.

5.1 REASSESS

The best technical solution to the bias identified in the loss assessment audit is to start the HEP process over with agreed to goals, objectives, questions, and methods. Short of starting over, the best alternative is to gather the raw data from the various HEP teams and process the data following similar assumptions and analytical methods. The assumptions and methods would be outlined in a Written Plan. This alternative has the greatest likelihood of reducing the potential for bias in the loss assessments and for conducting the mitigation HEPs with as little bias as possible. This would be the best way to assure that all mitigation required to off set impacts is identified as

accurately as possible. The disadvantage to this alternative is the amount of resources that would be required to conduct the reassessment, and there would still be some inconsistencies between the various loss assessments.

I estimate such a reanalysis would require $100,000 to develop a Written Plan that all the HEP teams could agree to, and $30,000 per project to implement. These costs assume that an Executive Committee of five or fewer consenting representatives would be directed by the Council or a representative such as the U.S. Fish and Wildlife Service. Other disadvantages include the difficulty many people have understanding the HEP process, devoting dollars to analyses instead of mitigation, and the risk that the reanalyses would not make controversy go away.

I recommend this alternative because it is based on data and information collected by biologists familiar with the resource. While HEP has its problems, the principles are simple and intuitive, and have been endorsed by the US Fish and Wildlife Service. Using HEP to proceed need not preclude implementing interim mitigation, flexibility in mitigation planning or monitoring.

5.2 QUALITATIVE ADJUSTMENTS

If the first alternative is unacceptable to the Council, the HEP teams, or other interested parties, a second alternative is offered. The audit identifies potential biases, which should be addressed before proceeding with mitigation accounting. For example, the Council needs to decide if mitigation is intended to compensate for construction, operation, and secondary impacts on adjacent lands. The answer to this question is not clear, as indicated by the various study area sizes chosen by the various HEP teams. The Council needs to outline the answers to this and other fundamental questions in a Written Plan. Once a Plan is in place, the Council could meet with the various HEP teams and reach agreement as to how the existing data could be used to qualitatively address the various potentials for bias. For example, if the Council decides the loss assessments are intended to address only construction impact, the Grand Coulee losses would not have to be adjusted for this issue, but the Dworshak project would have to reduce the size of the study area to the reservoir and discount the existing mitigation to arrive at an estimate of loss due to construction. The data available in the loss assessments, local knowledge of the study area provided by HEP team members, and a complete understanding of the HEP process could be sufficient to negotiate an

on data, and keeping track of twenty different projects that might choose very different approaches for proceeding.

5.4 OTHER RECOMMENDATIONS

I offer several additional recommendations that address key issues identified in the audit. My recommendations assume that the Reassess alternative will be selected by the Council. If some other alternative is selected, recommendations offered may not be applicable.

5.5 STUDY AREA

The Council must decide which impacts are to be addressed: construction, and/or operation (including Columbia Basin Project), and/or secondary on adjacent lands. The study areas and HEPs should reflect this decision.

5.6 TEAM MEMBERS

PNUCC should be encouraged to play a role in the ongoing loss assessment and mitigation processes.

5.7 BUDGET

The Council should provide guidance about budgets. Will budgets based on non-technical issues determine the amount of mitigation, or will accountable estimates of net loss drive the mitigation process? The Council should directly address the question: will the funds devoted to completing the HEP process be wholly or partially subtracted from the funds for on the ground wildlife mitigation?

agreement which meets the Council's goals and objectives. The cost for such negotiation is likely to be less than the reassessment alternative. Negotiations could require approximately $15,000 per project and $50,000 for a Written Plan that outlines objectives and methods for proceeding with mitigation. The advantage of this alternative is that the biases identified in the audit would be addressed and to some degree rectified. Addressing these biases could reduce the likelihood that the biases would resurface if and when the mitigation plans are implemented. The disadvantages relate to the qualitative nature of the negotiation and the inability to assess interaction between the various issues. For example, if bias is identified for four issues (three overestimates and one underestimate) how much of each bias overlaps with each of the other biases? The biases are not independent and should not be added or subtracted. Assessing the amount of interaction between biases could introduce yet another source of bias. Other disadvantages associated with the first alternative also apply to this alternative

5.3 PROCEED WITHOUT HEP

I cannot ignore the fact that the Montana and the Dworshak teams have negotiated agreements that are not bound to HEP. Such an alternative could be developed for the remaining projects and would allow the mitigation programs to proceed as soon as possible. I am not familiar with the details of these agreements and cannot comment on whether or not technical issues listed in the Wildlife Record are addressed. Presumably these agreements are based on some type of mitigation ratio of loss to gain. If they are not, it might be difficult to demonstrate how the general Council goals or the Northwest Power Act is being addressed. If this alternative is selected, I still believe a Written Plan should be developed that provides some technical/intuitive guidelines for using the loss assessment data and for proceeding with mitigation. The Written Plan would provide some continuity between projects and would increase the likelihood that the teams could justify that mitigation was implemented and successful. A Written Plan could be developed for $30,000. Once a Written Plan was agreed to by the various HEP teams, mitigation goals could be set and the teams could proceed with mitigation planning. The advantages of this alternative relate to its simplicity, not spending time to deal with and argue about possible biases, proceeding with mitigation, and having a system that could be immediately understood by most people. The disadvantages of this alternative relate to poor accountability for the Council, using conversion ratios that are not based

5.14 RESERVOIR BENEFITS

No Recommendation.

5.15 EXISTING MITIGATION

Increased effort is needed to find and evaluate existing mitigation lands. Second to annualization, this a very important issue that should be resolved during the mitigation effort. If PNUCC is correct and 89,000 acres of project lands are potentially providing mitigation credit, the remaining mitigation required might be substantially reduced. The Written Plan should be developed before additional HEP work is conducted on the project lands (i.e., potential existing mitigation) for any project. The Council should also determine whether or not it is appropriate to account for past mitigation but not past impact.

5.16 NET LOSS ISSUES

No Recommendations.

5.17 HEP PROCESS

The HEPs are not complete and each loss assessment is conducted differently. As a result the HU values in Table 5 of the Rule should not be used as a basis for allocating mitigation funding. The Written Plan should outline some specific guidelines for completing the HEPs and for proceeding with the mitigation HEPs. The Written Plan should consider the suggestions provided in the text of the audit. For example, Summary Forms such as D and H in the HEP Manual should be provided in the final reports for mitigation.

I can think of many more recommendations that would enhance the quality of the HEP studies. For example Geographic Information Systems (GIS) technology could be implemented to organize, account, and report mitigation success. Data management for the mitigation programs will likely be an issue that the Council has to deal with as the Wildlife Program proceeds.

5.8 GOALS

A Written Plan should be developed to provide guidance for proceeding. The Written Plan should link the goals of the Northwest Power Act to the goals, objectives and methods for proceeding with the loss assessments, mitigation, and monitoring.

5.9 SPECIES SELECTION

Use same species for mitigation HEPs that were used for impact HEPs.

5.10 COVER TYPES

Cover type maps of operation, adjacent, and mitigation lands should be provided in future reports.

5.11 FIELD ANALYSIS

The Written Plan should address the level of field analysis that is desirable for each mitigation area.

5.12 HEP MODELS

These models should be the basis for linking impact losses to mitigation gains. The models should also be the basis for setting success criteria for mitigation. Some work will be required to use existing models as the basis for mitigation goals.

5.13 ANNUALIZATION

Annualization is essential and is potentially the greatest source of bias associated with the loss assessments. Annualization should be conducted for all projects.

The Council might also consider GIS and earth-satellite technology as a means for: 1) addressing the impact of operation (e.g., Columbia Basin Project) on adjacent lands, 2) coordinate Council approved mitigation efforts with other state and Federal mitigation efforts and land acquisition, and 3) identify areas where additional mitigation might enhance existing and proposed mitigation (e.g., GAP Analysis). BEAK (1991b) proposed a large scale HEP/GIS analysis to assess existing mitigation along the mainstem Columbia River. Such an analysis is expensive but when one considers the large number of acres that could be involved, the cost of a HEP/GIS system that could be used to standardize and coordinate the mitigation effort is inexpensive on a per acre basis. Such a system, if used for all projects would greatly increase the likelihood that the results from one mitigation effort could be compared to another Council, state or federal mitigation effort.

The cost estimates for the above alternatives are not based on detailed budgeting procedures. They are offered to give the Council an idea of the costs for proceeding. I consider these estimates to be minimal. Additional funding will be required for addressing operational impact, existing mitigation and new mitigation.

6.0 REFERENCES CITED

Beak Consultants, Incorporated. 1991a. A Proposal to Audit Wildlife Loss Assessments Prepared for Northwest Power Planning Council, Portland, Oregon. August 1991.

Beak Consultants Incorporated. 1991b. A Proposal to Prepare a Habitat Evaluation Procedure for Mitigation of Lands Associated With the Four Lower Columbia River Projects: Bonneville, The Dalles, John Day, and McNary. Prepared for Bonneville Power Administration, Portland, Oregon. December 1991.

Bedrossian, K. L., J. H. Noyes, and M.S. Potter. 1985. Wildlife and Wildlife Habitat Loss Assessment at Lookout Point Dam and Reservoir, Middle Fork Willamette River, Oregon. Oregon Department of Fish and Wildlife, Environmental Management Section. Prepared for U.S. Department of Energy, Bonneville Power Administration, Division of Fish and Wildlife, Portland, Oregon. September 1985. Project No. 84-36. 66pp. + appendices.

Bureau of Land Management. 1978. Memorandum to Director (322). 16 January 1978. Copy supplied by Jerome Hansen, Wildlife Mitigation Specialist, Idaho Department of Fish and Game, Boise, Idaho.

Bureau of Land Management. No date. Environmental Assessment Record for the Dworshak Withdrawal. Copy supplied by Jerome Hansen, Wildlife Mitigation Specialist, Idaho Department of Fish and Game, Boise, Idaho.

Cowling, E. B. 1992. The Performance and Legacy of NAPAP. Ecological Applications 2(2):111-116.

Glad, J. No date. Vegetation Analysis: McNary Dam and Reservoir. Prepared for the U. S. Fish and Wildlife Service Field Office, Portland, Oregon.

Hanson, H. J. 1992. Wildlife Mitigation Specialist, Idaho Fish and Game, Boise, Idaho. Personal Communication Letter to P. H. Whitney, Beak Consultants Inc. 3 September 1992.

Howerton, J. 1986. Meeting Minute Notes from the Grand Coulee Study Oversight Committee, August 13, 1986. Copy supplied by Brent Renfrow, Washington Department of Wildlife.

Howerton, J., J. Creveling, and B. Renfrow. 1986. Wildlife Protection, Mitigation, and Enhancement Planning for Grand Coulee Dam. Washington Department of Game, Habitat Management Division, Olympia, Washington. Prepared for U. S. Department of Energy, Bonneville Power Administration, Division of Fish and Wildlife, Portland, Oregon. August 1986. Project No. 86-74. 120pp.

Keough, P. J. 1984. Chief, Planning Division, U.S. Army Corps of Engineers, Portland, Oregon. Personal Communication. Letter to K. Bedrossian, Wildlife Biologist, Environmental Management Section, Oregon Department of Fish and Wildlife, Portland, Oregon. 7 June 1984.

Kronemann, L. 1987. Wildlife Biologist, Resource and Forestry, Nez Perce Indian Tribe, Lapwai, Idaho. Personal Communication. Letter to J. Hansen, Wildlife Biologist, Idaho Fish and Game, Boise, Idaho. 16 September 1987.

Lawrence, K. 1992. Nez Perce Tribe, Lapwai, Idaho. Meeting with P. Whitney and P. Paquet in Portland, Oregon. 17 November 1992.

Mecklenburg, R. 1992. Wildlife Biologist, Lowell Ranger District, Willamette National Forest. Personal communication. Telephone conversation with P. Whitney, Beak Consultants Incorporated. 11 December 1992.

Meuleman, G. A., H. J. Hansen, and R. C. Martin. 1989. Phase II: Wildlife Protection, Mitigation, and Enhancement Planning, Dworshak Reservoir. Idaho Department of Fish and Game. Prepared for U. S. Department of Energy. Bonneville Power Administration, Division of Fish and Wildlife, Portland, Oregon. November 1989. Project No. 88-154. 137pp.

Northwest Power Planning Council. 1989. Wildlife Mitigation Proposals Public Hearing, Sea-Tac Airport. 20 September.

Northwest Power Planning Council. 1989a. Wildlife Mitigation Rule and Response to Comments: 89-35. Northwest Power Planning Council, Portland, Oregon. 21 November.

Preston, S. K., J. H. Noyes and M. S. Potter. 1987. A Wildlife Habitat Protection, Mitigation and Enhancement Plan For Eight Federal Hydroelectric Facilities in the Willamette River Basin. Prepared for U. S. Department of Energy, Bonneville Power Administration Division of Fish and Wildlife. Project No. 86-64. 85pp.

Rasmussen, L. and P. Wright. 1990. Wildlife Impact Assessment, McNary Project, Oregon and Washington. In Wildlife Impact Assessment, Four Reports: Bonneville, McNary, The Dalles, and John Day Projects. U.S. Fish and Wildlife Service, Portland Field Station, Portland, Oregon. Prepared for U. S. Department of Energy, Bonneville Power Administration, Division of Fish and Wildlife, Portland, Oregon. October 1990. Project No. 88-12. 46pp.

Rogers, T. 1941. A plant survey of the Upper Columbia River in Washington. Unpbl. M.S. Thesis. Washington State University. 59pp.

Snowden, D. 1985. Executive Director, Pacific Northwest Utilities Conference Committee, Portland, Oregon. Personal Communication. Letter to J. Palensky, director, Division of Fish and Wildlife, Bonneville Power Administration, Portland, Oregon. 29 July 1985.

U.S. Fish and Wildlife Service. 1980. Ecological Services Manual, Habitat Evaluation Procedures, U.S. Fish and Wildlife Service, Department of the Interior, Washington, D.C. Pages variable.

Whitney, P. H. 1992. Beak Consultants Incorporated, Portland, Oregon. Personal Communications. Letter to J. Hansen, Wildlife Mitigation Specialist, Idaho Fish and Game, Boise, Idaho. 12 June 1992.

Whitney, P. and C. Curry. 1992. Memo: Search for information on project lands adjacent to the Lower Columbia River projects. Beak Consultants Incorporated, Portland, Oregon. Project No. 73485. 8 June 1992.

Wright, R. 1991. Executive Director, Pacific Northwest Utilities Conference Committee, Portland, Oregon. Personal communication letter to S. Crow, Director of Governmental Affairs, Northwest Power Planning Council, Portland, Oregon. 10 September 1991.

APPENDIX A

Table A-1. Issues identified in response to the Northwest Power Planning Council regarding the application of HEP to Wildlife Loss Assessments.

Letter No.	Organization	Issue(s)
WMR 003	NWPPC	o Annualization, not all mitigation parcels have been in place the same amount of time.
WMR 015	Richland Rod and Gun Club	o Species selection, wanted more game species. o Study area, Columbia Basin Project should be addressed.
WMR 016	Nespelem Valley Electric	o Annualization, with out project scenario flawed: ° populations have decreased due to non-dam related activity. ° effective (net) loss should be lower.
WMR 031	Gary Fenton	o Funding should be provided to increase the carrying capacity on the mitigation lands. o Annualization needed.
WMR 037	Donna McMurray	o Study Area, other project facilities not addressed.
WMR 045	Don Fager	o Species selection, want all wildlife addressed.
WMR 072	Inland NW Wildlife Council	o Annualization, each project has a different age. Age should be related to loss.
WMR 073	Irwin Graedel	o Study Area: ° Columbia Basin Project benefits (wetlands) not assessed. ° 7 million acres in BPA service area not addressed. o Mitigation Lands, not all areas accounted for: ° 112,423 acres dedicated to recreational wildlife. ° 23,255 acres used as wildlife preserves.
WMR 074	Brian Worden	o Historic quality of habitat: ° Range was overgrazed before irrigation. ° Now habitat produces a lot of wildlife.
WMR 075	Lester Lyle	o Irrigation benefits deserve credit. o Loss by dams has been offset by lakes and marshes.
WMR 076	Forest Service	o Operation impact not assessed (e.g., draw down)
WMR 190	Okanogan County Electric Coop	o HSI of reservoir not accounted for accurately.
WMR 198	Allen Martinell	o Irrigation benefit wildlife: °depredation on crops.
WMR 199	Bernice Cummings	o Historic quality of riparian vegetation was low.
WMR 230	Shoshone-Bannock Tribe	o Historic habitat quality: ° Historic area teeming with wildlife.

Table A-1. Continued.

Letter No.	Organization	Issue(s)
WMR 232	Forest Dobson	o Annualization, historic habitat would not stay the same if projects were not constructed. Golf courses would have been built and these were not accounted for.
WMR 233	Lincoln Electric Corp.	o Grand Coulee HUs overstated (Table 5). o HEP inconsistency project to project and state to state. o HSI higher now than historically: ° Old timer's testimony not taken into account, old appraiser's notes not considered. o Mitigation programs are not species specific. o Habitat enhancements not accurately accounted for. o Mitigation study areas, CRP should be counted. o Annualization without project not done accurately. o Evaluation species not represented, too many game species. o Columbia Basin Project land not considered. o Alternatives Analysis, what would impacts of other energy sources have been? o Cumbersome process, how can HUs be converted to dollars.
WMR 234	Lincoln Electric Coop	o Fish not considered as an evaluation species. o Trade-off dry land species lost for waterfowl gains.
WMR 255	Mt. Electric Generating & Transmission Corp.	o Mitigation, all lands not accounted for. o HEP should be replaced by a population-based accounting system. o Mitigation lands locations are too close to crop lands.
WMR 261	IDFG	o Annualization not appropriate because no data was available. o Irrigation benefits become lost on small farms with less effective land use (e.g., hedgerows, runoff). o An acre for acre approach would not account for habitat quality.
WMR 263	Chukar Foundation	o Winter range not accounted for, impact on larger summer range not accounted for, HEP doesn't account for this.
WMR 264	Idaho Water Users Association	o Historical HSI, doubts if this can be done. o Reservoir shoreline not accounted for.
WMR 269	Prairie Power Coop	o Recreation not used in trade-off.

Table A-1. Continued.

Letter No.	Organization	Issue(s)
WMR 278	Idaho Coop Utilities Assoc.	o Mitigation credit: ° Not all accounted for e.g., reservoir fish as a prey base. ° Credit not given for canceled grazing permits. o Study area, downstream impacts as well as benefits not accounted for.
WMR 279	IDFG	o Unique habitat not accounted for - wetland, low elevation upland, and free flowing river cannot be replaced by mitigation upland. o Mitigation, some lands implemented; some not, but are on line.
WMR 289	Puget Power	o Annualization not done hence not accurate. o Mitigation, thousands of set-aside acres not accounted for. o Team approach lacking. o HSI Models not documented. o Objectives of mitigation not clearly stated, monitoring will be difficult.
WMR 318	USFWS	o Impacts on wetlands around Lake Pend Oreille not accounted for.
WMR 320	Washington Department of Wildlife	o Facilities not accounted for, nor was cumulative impact. o HEP assumptions, details not clearly stated: ° no credit for existing HUs on public land. ° no credit given for anadromous fish. o HU errors in Table 5.
WMR 321	Washington State Bass Clubs	o Species selection, no mitigation given for fish.
WMR 329	Yakima Nation	o Annualization - losses not amortized.
WMR 332	The Nature Conservancy	o Critical habitat not addressed - bottom land and aquatic communities, how were these areas cover typed?
WMR 340	UCUT	o Historic populations greater but were dispersed: o Current populations confined to narrow strips and are concentrated in these areas, that's why people think they see more today.
WMR 341	UCUT	o Soils not taken into account.

Table A-1. Continued.

Letter No.	Organization	Issue(s)
WMR 342	UCUT	o Species selection biased. o Field sampling not conducted - model verification not done. o HSI values per cover type, some appropriate cover types not rated: ° 29,190 acres ignored. ° Flood plain agricultural lands and rock cliffs along a free flowing river ignored. o Field data not collected for pre-impact. o Annualization without project. o Standardization of data lacking. o Mitigation not fully accounted e.g., Minidoka Project.
WMR 418	PNUCC	o Modified HEP's inconsistent. o No team approach. o Models based on professional judgement. o Annualization without project should include timber harvest, agriculture, and urbanization. Perhaps alternatives could be considered. o Mitigation does not consider benefits to wildlife from fish in the reservoirs.
WMR 426	BPA	o Net losses poorly outlined and explained. o Goals for mitigation/compensation not set.
WMR 438	Salish and Kootenai Tribes of the Flathead Reservation.	o Impact of operation erosion not accounted for and loss of production over the years not accounted for.
WMR 476	City of Seattle	o Double counting concerns.
WMR 485	Department of the Army	o Time not adequate. o Funding not adequate for habitat mapping, species model testing, field sample design, sample size determination. o Ball park numbers not sufficient to set priorities.
WMR 546	Port Neuf Valley Audubon	o Impact of downstream transmission lines on birds not accounted for.
WMR 594	SeaTac Hearings Glen Lawyer	o Species selection - too few species, no plants selected.
WMR 594	Baliff	o Mitigation not long term. o Annualization: ° Succession not addressed. ° Time to mitigation effectiveness not assessed.
WMR 594	Best	o Negotiation plays a major role in all large projects.

Table A-1. Continued.

Letter No.	Organization	Issue(s)
WMR 616	Steve Gigliotti	o Species selection: ° Species selected will not be subject to proposed mitigation. o Impact on winter range not accounted for, had to guess where it occurred: ° Project resulted in no net benefit. ° Losses were based on population densities reported from the literature.
WM 617	Hearing 9/27/89 Lovlin	o Mitigation: ° Impossible to obtain 50% mitigation during a 10-year period.
WM 585	Ephrata Sportsmen's Association	o Species selection: ° No exotic species chosen. ° Species that would benefit were excluded (e.g., pheasant).
WM 593	Nature Conservancy	o Endangered species, a full range was not considered.
WM 616	PNUCC	o Population trends - population data should not be used to assess success. o Trade-off process, not clear how this is working.

Table A-2. Summary of key issues by topic identified in response to the Northwest Power Planning Council regarding the application of HEP to Wildlife Loss Assessments.

ISSUE SUMMARY		
Topic	Comments	Source WMR #
Goals	o Objectives of mitigation not clearly stated, monitoring will be difficult.	289
	o Standardization of data lacking.	342
	o Goals for mitigation/compensation not set.	426
	o Ball park numbers not sufficient to set priorities.	485
Budget/Economics	o Funding should be provided to increase the carrying capacity on the mitigation lands.	031
	o Cumbersome process, how can Hus be converted to dollars.	233
	o Funding not adequate for habitat mapping, species model testing, field sample design, sample size determination.	485
HEP Team Members	o Team approach lacking.	289
	o No team approach.	418
	o Negotiation plays a major role in all large projects.	594
	o Trade-off process, not clear how this is working.	616
Time	o Time not adequate.	485
Study Area	o Columbia Basin Project should be addressed.	015
	o Other project facilities not addressed.	037
	o 7 million acres in BPA service area not addressed.	073
	o Downstream impacts as well as benefits not accounted for.	233
	o Facilities not accounted for, nor was cumulative impact.	278
	o Impact of downstream transmission lines on birds not accounted for.	320
		546

Table A-2. Continued.

ISSUE SUMMARY		
Topic	Comments	Source WMR #
Species Selection	o Wanted more game species. o Want all wildlife addressed. o Evaluation species not represented, too many game species. o Fish not considered as an evaluation species. o No mitigation given for fish. o Species selection biased. o Too few species. o No plants selected. o Species selection: ° Species selected will not be subject to proposed mitigation. o No exotic species chosen. o Species that would benefit were excluded (e.g., pheasant). o Endangered species, a full range was not considered.	015 045 233 234 321 342 594 594 616 585 585 593
Seasonal Wildlife Use	o Winter range not accounted for, impact on larger summer range not accounted for, HEP doesn't account for this. o Impact on winter range not accounted for, had to guess where it occurred: ° Project resulted in no net benefit. ° Losses were based on population densities reported from the literature.	263 616
Cover Type	o Historic quality of habitat: ° Range was overgrazed before irrigation. ° Now habitat produces a lot of wildlife. o Historic quality of riparian vegetation was low. o Historic habitat quality: ° Historic area teeming with wildlife. o Critical habitat not addressed - bottom land and aquatic communities, how were these areas cover typed? o HSI values per cover type, some appropriate cover types not rated: ° 29,190 acres ignored. ° Flood plain agricultural lands and rock cliffs along a free flowing river ignored. o Funding not adequate for habitat mapping, species model testing, field sample design, sample size determination.	074 199 230 332 342 485

Table A-2. Continued.

ISSUE SUMMARY		
Topic	Comments	Source WMR #
Field Analysis	o Field sampling not conducted - model verification not done. o Field data not collected for pre-impact. o Funding not adequate for habitat mapping, species model testing, field sample design, sample size determination.	342 342 485
HSI/HEP Models	o HSI of reservoir not accounted for accurately. o Field sampling not conducted - model verification not done. o HSI values per cover type, some appropriate cover types not rated: ° 29,190 acres ignored. ° Flood plain agricultural lands and rock cliffs along a free flowing river ignored. o Modified HEP's inconsistent. o Models based on professional judgement. o Funding not adequate for habitat mapping, species model testing, field sample design, sample size determination.	190 342 342 418 418 485
HEP Assumptions	o HEP should be replaced by a population-based accounting system. o An acre for acre approach would not account for habitat quality. o HSI Models not documented. o HEP assumptions, details not clearly stated: ° no credit for existing HUs on public land. ° no credit given for anadromous fish.	255 261 289 320
HEP Results	o Grand Coulee HUs overstated (Table 5). o HU errors in Table 5. o Double counting concerns.	233 320 476
Alternatives Analysis	o What would impacts of other energy sources have been?	233

Table A-2. Continued.

ISSUE SUMMARY		
Topic	Comments	Source WMR #
Annualization	o Not all mitigation parcels have been in place the same amount of time.	003
	o Without project scenario flawed: ° populations have decreased due to non-dam related activity. ° effective (net) loss should be lower.	016
	o Annualization needed.	031
	o Each project has a different age. Age should be related to loss.	072
	o Historic quality of habitat: ° Range was overgrazed before irrigation. ° Now habitat produces a lot of wildlife.	074
	o Historic quality of riparian vegetation was low.	199
	o Historic habitat quality: ° Historic area teeming with wildlife.	230
	o Historic habitat would not stay the same if projects were not constructed. Golf courses would have been built and these were not accounted for.	232
	o HSI higher now than historically: ° Old timer's testimony not taken into account, old appraiser's notes not considered.	233
	o Annualization without project not done accurately.	
	o Annualization not appropriate because no data was available.	233
	o Historical HSI, doubts if this can be done.	261
	o Annualization not done hence not accurate.	
	o Facilities not accounted for, nor was cumulative impact.	264 289
	o Annualization - losses not amortized.	320
	o Historic populations greater but were dispersed; Current populations confined to narrow strips and are concentrated in these areas, that's why people think they see more today.	329 340
	o Annualization without project needed.	
	o Annualization without project should include timber harvest, agriculture, and urbanization. Perhaps alternatives could be considered.	342 418
	o Annualization: ° Succession not addressed. ° Time to mitigation effectiveness not assessed.	594

Table A-2. Continued.

ISSUE SUMMARY		
Topic	Comments	Source WMR #
Potential Gains	o Columbia Basin Project benefits (wetlands) not assessed.	073
	o Not all areas accounted for: ° 112,423 acres dedicated to recreational wildlife. ° 23,255 acres used as wildlife preserves.	073
	o Loss by dams has been offset by lakes and marshes.	075
	o Trade-off dry land species lost for waterfowl gains.	
	o Reservoir shoreline not accounted for.	234
	o Recreation not used in trade-off.	264 269
Mitigation	o Funding should be provided to increase the carrying capacity on the mitigation lands.	031
	o Mitigation programs are not species specific.	233
	o Habitat enhancements not accurately accounted for.	233
	o Mitigation study areas, CRP should be counted.	
	o Mitigation, all lands not accounted for.	233
	o Mitigation lands locations are too close to crop lands.	255 255
	o Mitigation credit: ° Not all accounted for e.g., reservoir fish as a prey base. ° Credit not given for canceled grazing permits.	278
	o Unique habitat not accounted for - wetland, low elevation upland, and free flowing river cannot be replaced by mitigation upland.	279
	o Mitigation, some lands implemented; some not, but are on line.	279
	o Mitigation, thousands of set-aside acres not accounted for.	289
	o Objectives of mitigation not clearly stated, monitoring will be difficult.	289
	o No mitigation given for fish.	
	o Soils not taken into account.	321
	o Mitigation not fully accounted e.g., Minidoka Project.	341
	o Mitigation does not consider benefits to wildlife from fish in the reservoirs.	342
	o Mitigation not long term.	418
	o Mitigation: ° Impossible to obtain 50% mitigation during a 10-year period.	594 617

Table A-2. Continued.

ISSUE SUMMARY		
Topic	Comments	Source WMR #
Net Loss	o Operation impact not assessed (e.g., draw down). o Downstream impacts as well as benefits not accounted for. o Impacts on wetlands around Lake Pend Oreille not accounted for. o Facilities not accounted for, nor was cumulative impact. o Critical habitat not addressed - bottom land and aquatic communities, how were these areas cover typed? o HSI values per cover type, some appropriate cover types not rated: ° 29,190 acres ignored. ° Flood plain agricultural lands and rock cliffs along a free flowing river ignored. o Net losses poorly outlined and explained. o Impact of operation erosion not accounted for and loss of production over the years not accounted for. o Impact of downstream transmission lines on birds not accounted for. o Impact on winter range not accounted for, had to guess where it occurred: ° Project resulted in no net benefit. ° Losses were based on population densities reported from the literature.	076 278 318 320 332 342 426 438 546 616
Irrigation	o Historic quality of habitat: ° Range was overgrazed before irrigation. ° Now habitat produces a lot of wildlife. o Irrigation benefits deserve credit. o Irrigation benefit wildlife: ° Depredation on crops. o Irrigation benefits become lost on small farms with less efficient land use (e.g., hedgerows, runoff).	074 075 198 261

Table A-3. Continued.

Key Issues	Appropriate	Different	Unacceptable	Missing
Field analysis	Marginal, no field data was collected. Analyses were based on experience gained while working on other projects.	Yes	No	Yes, field data was not collected. Ground truthing for the cover type map was not conducted.
HEP Models	Marginal, HEP models used apply to a HEP with cover type maps and cover type specific HSI scores. Models were used to evaluate multiple cover types in extended river reaches.	Yes, each HEP team used a different method.	Marginal, models will provide little continuity between impact and mitigation aspects of the HEP. Continuity will largely depend on keeping the same biologists on the HEP team.	Not verified, models used were not entirely compatible with the modified HEP used by the team.
Annualization	No, was discussed and figures were presented but annualization was not conducted.	Yes, other studies discussed annualization concepts but didn't present figures.	Possibly, figures presented were not adequately explained. It is possible to misinterpret study results and goals for mitigation.	Mostly
Reservoir benefits	Yes	Yes, other HEP teams selected several species that might benefit from the reservoir. Goose losses were not expressed as HUs.	No	No

Table A-3. Continued.

Key Issues	Appropriate	Different	Unacceptable	Missing
Existing mitigation	No, This is a major outstanding issue . Lands listed in the PNUCC letter have not been addressed by the loss assessments.	Yes, Other projects such as Dworshak have accounted for existing mitigation.	No, The lack of resolution on this issue does not affect the integrity or the loss assessment.	Yes, Accounting for possible mitigation listed by PNUCC is missing.
Net loss issues	Yes, net loss was poorly defined in the text but the HEP loss numbers are valid.	Yes, Net loss is defined differently for each project.	Marginal, net losses are difficult to understand.	No
HEP process	Yes	Yes, HEP was conducted differently for each project.	No	No

Table A-4. Key Issues Matrix for the McNary loss assessment.

Key Issues	Appropriate	Different	Unacceptable	Missing
Study Area	Yes	Yes, Included reservoir area and support facilities. Adjacent and downstream lands were not considered.	No	Yes, part of the impact area in the Hanford area was not assessed due to lack of pre-project photos. No action required.
Team Members	Yes, HEP team said PNUCC was asked to participate but that they declined.	Yes, PNUCC participated to some extent in other projects.	No	No
Adequate Budget	Yes	Not Applicable		
Goals	Yes, Included loss due to construction and operation (p. 1). HEP team said loss only applied to construction. Council goals not followed.	Yes, Other assessments did include loss due to operation.	Marginal, Goals of the assessment by itself are general. A problem occurs when the goals of one project are compared to another	Yes, Goals for the loss assessments should be expanded and perhaps standardized. Goals for mitigation should be reviewed and correlated between projects.
Species Selection	Yes, Well documented.	Yes, No endangered species selected. The mallard accounted for a large benefit for the reservoir. Other projects did not give such large benefits to species using the reservoir.	No, However comparisons to other projects should consider the great benefit given to the mallard.	No
Cover Types	Yes	Not Applicable	No	No

Table A-4. Continued.

Key Issues	Appropriate	Different	Unacceptable	Missing
Field Analyses	Yes, Field data was collected as per HEP guidelines.	Yes, Some teams did not collect habitat data.	No	No
HEP Models	Yes	Yes, Models were used in a quantitative manner.	No	No
Annualization	Yes, Was not used.	No.	Potential Bias, current loss assessment does not take project duration into account.	May want to consider some level of annualization.
Reservoir Benefits	Marginal, Credit given to mallard but not to goose.	No, HEP teams reached consensus.	No	No
Net Loss Issues	Marginal, accounting for wetlands that developed since the project was built is confusing.	Yes, McNary was different from other projects due to the net gain of wetlands over time.	No, wetland acres are relatively low. Impact is underestimated by a few percent.	No, Wetland accounting should be addressed during mitigation.
HEP Process	Yes, HEP process was straight forward.	Yes, HEP team measured and calculated HSI scores for different cover types.	No	No
Existing Mitigation	No, Crediting for existing wetlands is not clear. Crediting for other existing mitigation is not addressed. Potential benefit from the nearby wildlife refuges is not addressed.	Yes, Each project handled this issue differently.	Yes, The HEPs are not complete without mitigation analyses for existing project lands that might be providing benefit.	Yes, Existing mitigation should be accounted for.

Table A.5. Key Issues Matrix for the Dworshak loss assessment.

Key Issue	Appropriate	Different	Unacceptable	Missing
Study Area	Yes	Yes, Study area includes: reservoir, adjacent and downstream impact areas	Marginal, impacts for the reservoir and the hard core mitigation are combined. These combined impacts are presented separately from the downstream impacts.	Yes, the study area for the Lower Clearwater is not illustrated, but is defined by the HEP team. If operation impacts are revisited, the HEP would be improved by a well-defined study area for all evaluation species.
Team Members	Yes	Yes, PNUCC did not attend any meetings.	No	No
Adequate Budget	Yes	Yes, Funds were available for model validation.	No	No
Goals	Yes	Yes, Although not clearly stated, included downstream impacts	No	No
Species Selection	Yes, The HEP team seemed to be concerned that too many species received benefit from the project.	Yes, four species that might benefit from the project were selected. Other project teams selected fewer. Not all species used for impact were evaluated for mitigation.	Yes, The same species used for impact should be used for mitigation. Positive as well as negative aspects of mitigation should be considered.	Possible, additional study might be warranted to assess combined underestimates of impact.
Cover Types	Yes	Not Applicable?	No	No

Table A-5. Continued.

Key Issue	Appropriate	Different	Unacceptable	Missing
Field Analysis	Yes, Data collected by the team was supplied. A brief review indicated all analyses were appropriate.	Yes, Field data was collected by cover type. The method was similar to the method used by the McNary group, but dissimilar to the methods used by the Grand Coulee and Willamette teams.	No	No, Standardization of methods would make projects more comparable.
HEP Models	Yes	Yes, different models are to be expected	No	No
Annualization	Yes, Team chose not to annualize.	Yes, Team assumed impact was instantaneous.	No	No
Reservoir and Downstream Benefits	Yes, Benefits occurred for several species.	Yes, Other projects did not have as many species that received benefit.	No	No

Table A-6. Key issues matrix for the Lookout Point loss assessment.

Key Issues	Appropriate	Different	Inappropriate	Missing
Study Area	Marginal, area of impact included reservoir as well as adjacent lands.	Yes, Grand Coulee did not include adjacent lands.	No, as long as other projects consider adjacent lands.	No
Team Members	PNUCC and tribes didn't participate,.	Yes, PNUCC and tribes participated in other HEPs.	No	Yes, PNUCC and tribes did not participate.
Adequate Budget	Yes	Yes, less than others e.g. Dworshak	No	No
Goals	Yes	Yes, Work Plan was prepared	No	No
Species Selection	Yes	Yes, more species selected than other projects. Threatened species used.	No	No
Cover Type	Yes	Yes, cover type map prepared and presented in the report.	No	No
Field Analysis	Yes	Yes, collected HSIs for aggregates of cover types.	No	No
HEP Models	Marginal, Work sheets are very qualitative.	Yes, other HEP teams used more quantitative models.	No	No
Annualization	No, was not used.	Yes, there was an attempt to annualize.	Yes, bias likely due to impacts that would have occurred anyway.	No

Table A-6. Continued.

Key Issues	Appropriate	Different	Inappropriate	Missing
Reservoir benefits	Yes	Yes, benefits were approximately 10% of total losses.	No	No
Net loss	na			
Existing Mitigation	Marginal, Reservoir Management Plan was not addressed.	Yes, some mitigation has been implemented. There is likely more that I could not identify.	Possible if significant mitigation is identified.	No

B.1 Figures 6, 7 and 8, from Howerton et al. 1986.

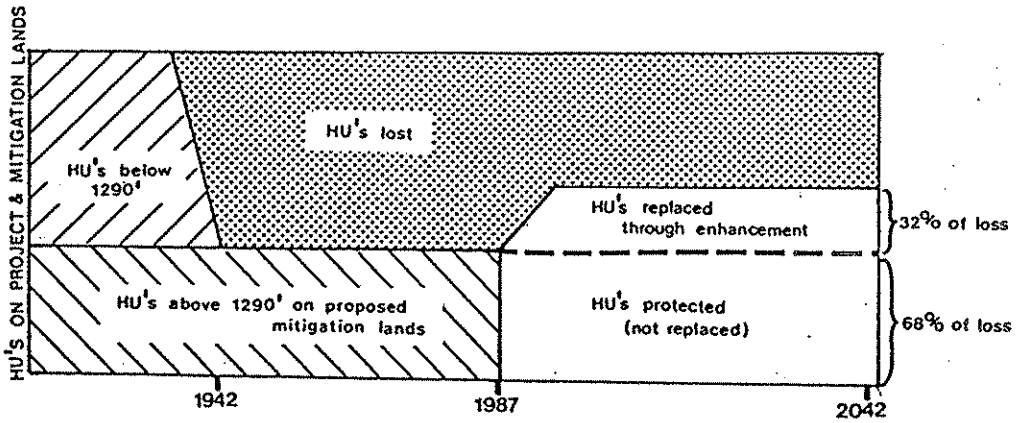


Figure 6. Habitat Unit changes with proposed mitigation.
Total HU's protected & replaced = HU's lost. Only 32% actually replaced.
Life of project is assumed to be 100 years. Habitat Units on both project lands and mitigation lands are shown.
1942 - Most Habitat Units eliminated from project lands with pool rise; Habitat Units on mitigation lands remain relatively unchanged.
1987 - Mitigation implemented over 10-year period.

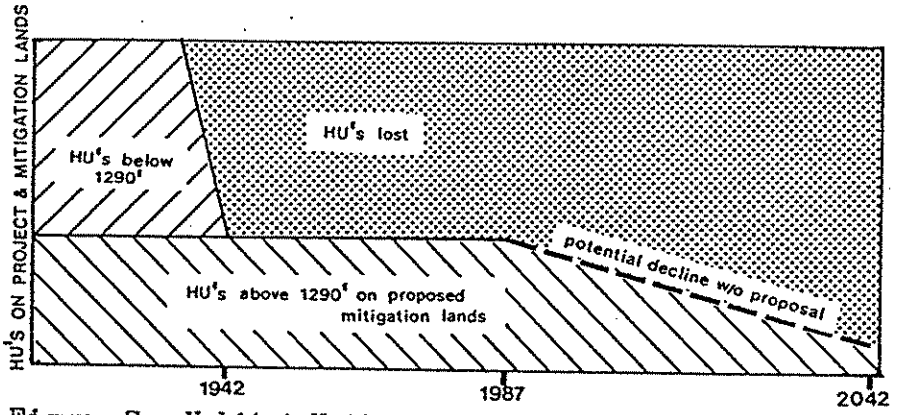


Figure 7. Habitat Unit changes without proposed mitigation.
Unprotected HU's potentially will decline due to development and losses will increase.

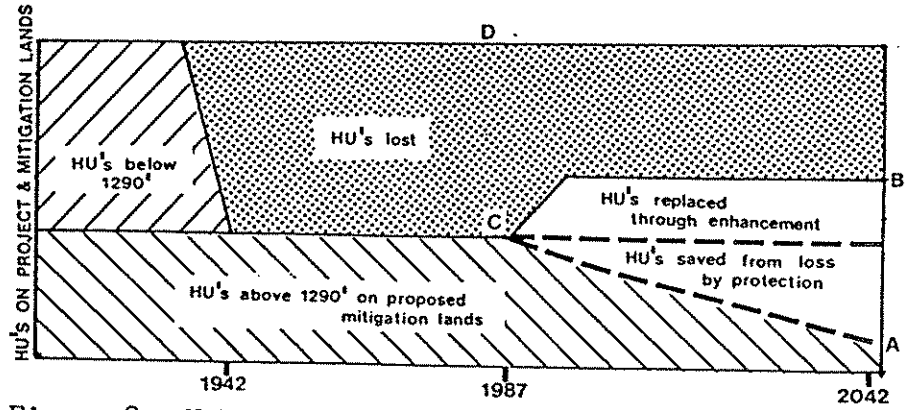


Figure 8. Habitat Unit net gains with proposed mitigation.
Since protection prevents future decline of habitat value, net gain of HU's may be considered to increase over time. Mitigation could reach 100% sometime in the future (i.e. when line AB = line CD).

B.2 HEP Annualization, Chapter 5, from U.S.F.W.S. 1980.

5. Habitat Assessments Using Habitat Units

Habitat assessments involve measurement and description of habitat conditions for baseline (present) assessments and impact (future with and without action) assessments. For baseline assessments, different areas can be compared in terms of HU's as a guide to further land use planning. Baseline assessments are point-in-time comparisons. For impact assessments, alternative future land use actions can be compared based on predicted future availability of HU's. The net impact of a proposed land use action is the difference in predicted HU's between the future with the action and the future without the action.

5.1 Habitat Unit analysis for one point in time - Baseline assessments. Baseline assessments are used to describe existing ecological conditions. The results of baseline assessments provide a reference point from which resource planners can: 1) compare existing conditions in two or more areas in order to define management capabilities or as a guide to future land use planning; 2) predict and compare changes that may occur without the proposed action, with the proposed action, or with compensation measures; and 3) design monitoring studies. Baseline assessments play a critical role in wildlife planning by identifying wildlife resource capabilities at one point in time so that proposed future actions can be directed toward or away from specific areas. A baseline assessment involves: 1) definition of the study limits, including definition of the study area, delineation of cover types, and selection of evaluation species (Chapter 3); and 2) characterization of the study area in terms of HU's (Chapter 4).

The objective in performing a baseline assessment is to calculate the number of HU's at one point in time for each evaluation species. The area of available habitat (Section 4.1) is multiplied by the mean HSI (Section 4.2) for each evaluation species to determine the total HU's for that species in the study area. The baseline HU's are evaluated and compared directly if the baseline assessment is designed to compare existing conditions in two or more areas. Additional calculations are required (Section 5.2) if the baseline data are to be used as a reference point for impact assessments.

5.2 Habitat Unit analysis for multiple points in time - Impact assessments. Impact assessments are performed by quantifying habitat conditions at several points in time throughout some defined period of analysis. Points in time (target years) can be selected at fixed intervals such as every year, or according to some other schedule.

The assessment of land use impacts is facilitated by dividing the study area into impact segments. An impact segment is defined as an area in which the nature and intensity of the future land use can be considered homogeneous, such as the flood pool area in a reservoir project, a recreational area, or the area of a particular agricultural practice. The advantage of dividing the study area into impact segments is that only one condition need be considered for each cover type within each impact segment. The effects of a

particular action may be analyzed over a large area by assuming that the same condition exists throughout each impact-segment-cover-type zone.

Habitat Units must be calculated for the evaluation species at each of the future points in time for future-with and future-without project conditions; this process includes predicting total available habitat and HSI for each evaluation species, using the same HSI models that were used for the baseline year.

A. Use of target years for future predictions. The impact assessment can be simplified by selecting target years (TY's) for which habitat conditions can be reasonably defined. At a minimum, target years should be selected for points in time when the rates of loss or gain in HSI or area are predicted to change. Rates of loss or gain in HSI or area are assumed to occur linearly between target years.

There are several requirements for the selection of target years. The HU-time analysis must begin at a baseline year (TY-0). A baseline year is defined as a point in time before proposed changes in land and water use result in habitat alterations in the study area. In most cases, the baseline year will be existing or current year conditions. However, in some cases, current habitat conditions may reflect proposed action influences. For example, landowners or managers may begin clearing bottomland timber from flood prone sites located downstream from an anticipated flood control project before baseline studies can be initiated. In such cases, baseline year conditions will be those that existed in some previous year. Judgment is required in defining baseline year habitat conditions when present conditions reflect proposed action influences.

In addition to a baseline year, there must always be a target year 1 and an ending target year which defines the future period of analysis. Target year 1 is the first year land and water use conditions are expected to deviate from baseline conditions. The habitat conditions (HSI and area) described for each target year are the expected conditions at the end of that year.

B. Predicting future area of available habitat. For each proposed action, the area of available habitat must be estimated for future years. Some cover types will increase in total area, others will decrease, and in some cases new cover types will be created or existing ones totally lost under projected future conditions.

The user must constantly check to ascertain that the total area of the study does not vary from the baseline area. The recommended method for determining the future area of cover types is the use of cover type maps. The method of developing a cover type map for a future year is to overlay impact segment boundaries on the baseline cover map previously developed (Section 3.2). Baseline cover types will either be unaltered, altered (i.e., variables such as % vegetation cover may change), or converted to new cover types depending on such factors as land use within the impact segment, vegetation successional trends, and management. Areas converted to new cover types through succession or impacts are given a new cover type designation. Altered cover types are designated a subtype (e.g., deciduous forest altered by flooding). An overlay of impact segment boundaries may be required for each target year. Each proposed action requires its own series of overlays in order to determine changes in area of available habitat between selected target years. Figure 5-1 illustrates how a baseline cover type map could be used in conjunction with impact segments to produce cover type maps for future conditions.

C. Predicting future HSI. The same models that were used to determine baseline HSI values must be used to determine future HSI values. If, for example, a mathematical model was used to calculate baseline HSI, a related word model cannot be used to predict future HSI values, or vice versa.

Estimating HSI values for future years requires predictions of changes in the physical, vegetative, and chemical variables of each cover type. Impact segment overlays can be used as an aid in estimating these variables. For example, seasonal flooding could alter a forest understory but not the canopy closure. Changes in interspersion relationships due to creation of new cover types or conversion of existing cover types also can affect HSI model output and can be easily measured on future cover type maps (impact segment overlays).

D. Annualization of impacts. Most Federal agencies use annualization as a means to display benefits and costs, and the habitat analysis should provide data that can be directly compared to the benefit/cost analysis. The annualization process will be described in detail, although it is not the only mechanism with which to display future habitat changes. Federal projects are evaluated over a period of time that is referred to as the "life of the project" and is defined as that period between the time that the project becomes operational and the end of the project life as determined by the construction, or lead, agency. However, in many cases gains or losses in wildlife habitat may occur before the project becomes operational, and these changes should be considered in

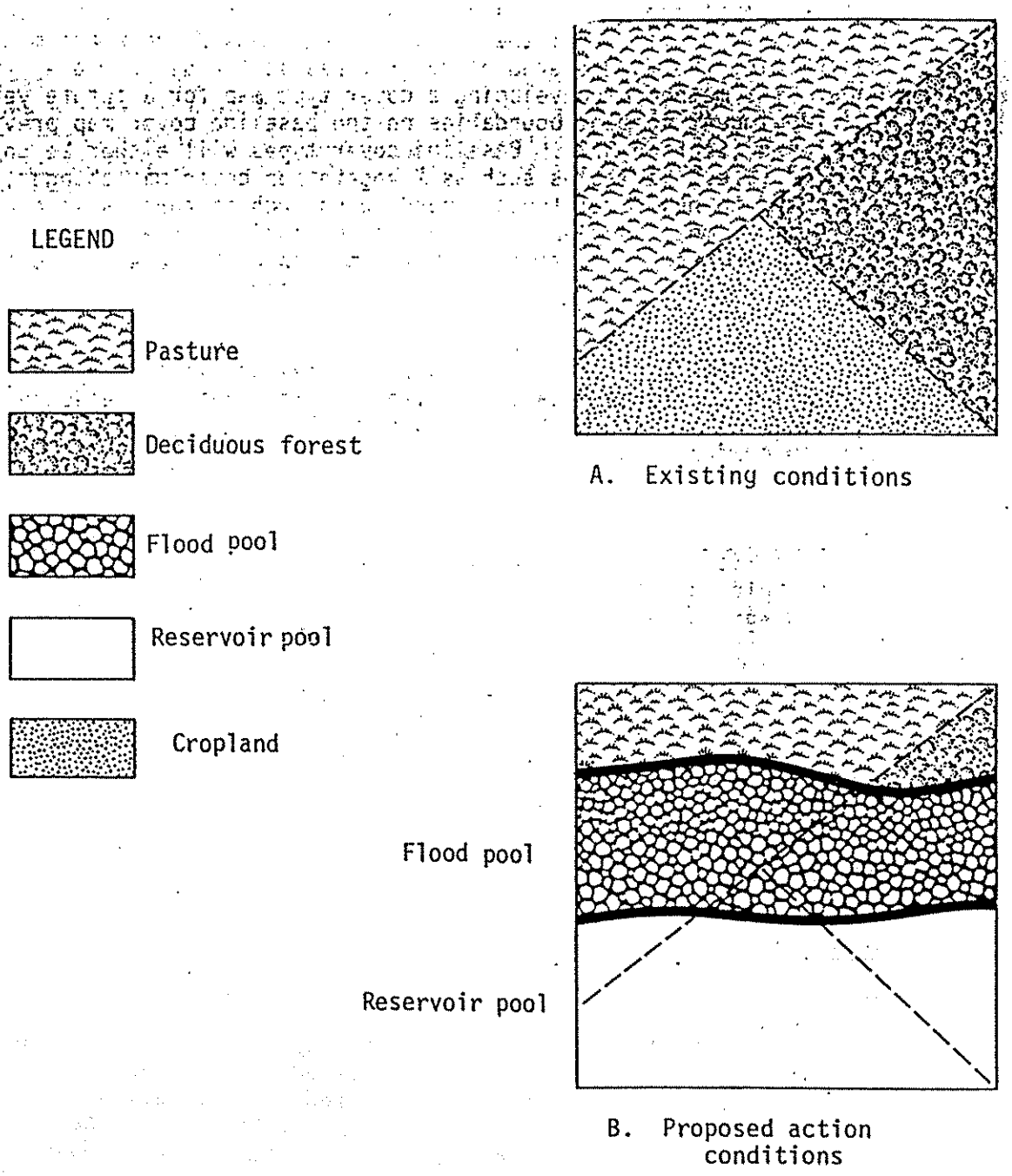


Figure 5-1. An example of a cover type map illustrating existing habitat conditions (A) and predicted conditions for target year 20 with a proposed action (B).

the impact analysis. Examples of such changes include construction impacts, implementation of a compensation plan, or other land use changes. The habitat assessment incorporates these changes by use of a period of analysis that includes prestart impacts (Figure 5-2). However, if no prestart changes are evident, then the life of the project and the period of analysis are the same.

Habitat Unit gains or losses are annualized by summing HU's across all years in the period of analysis and dividing the total (cumulative HU) by the number of years in the life of the project. In this manner prestart changes can be considered in the analysis. This calculation results in Average Annual Habitat Units (AAHU's).

The area of the shaded portion of the graph in Figure 5-3 represents the cumulative HU's for all years in the period of analysis and is calculated by summing the products of HSI and area of available habitat for all years in the period of analysis as follows:

$$\text{Cumulative HU's} = \sum_{i=1}^{p} H_i \, (A_i) \qquad (1)$$

where H_i = HSI at year i

A_i = area of available habitat at year i

p = the period of analysis (e.g., 100 years)

This is a generalized formula and requires that the HSI and area of available habitat be known for each year. However, a formula that requires only target year HSI and area estimates is:

$$\text{Cumulative HU's} = (T_2 - T_1)\left[\frac{A_1H_1 + A_2H_2}{3} + \frac{A_2H_1 + A_1H_2}{6}\right] \qquad (2)$$

where T_1 = first target year of time interval

T_2 = last target year of time interval

A_1 = area of available habitat at beginning of time interval

A_2 = area of available habitat at end of time interval

H_1 = HSI at beginning of time interval

H_2 = HSI at end of time interval

3 and 6 = constants derived from integration of HSI x Area for the interval between any two target years

Formula (2) is applied to the time intervals between target years. For the example in Figure 5-3, the formula must be applied for three time intervals: baseline to year 1, year 1 to year 20, and year 20 to year 100. The formula was developed to precisely calculate cumulative HU's when either HSI or area or both change over a time interval. The rate of change of HU's may be linear (either HSI or area is constant over the time interval), or curvilinear (both HSI and area change over the time interval); the formula will work in either case.

E. Calculating net impacts of a proposed action. The preceding example illustrates the calculation of AAHU's for one set of future conditions. However, determining the net impact of a proposed action requires that two future analyses be performed and compared to one another: 1) expected future conditions with the proposed action; and 2) the future without the proposed action. When comparing future conditions, the same baseline year and period of analysis must be used for each. Table 5-1 presents a hypothetical set of data for white-tailed deer habitat for the future with and the future without a proposed action.

Table 5-1. Target year habitat conditions for white-tailed deer for both the future with and the future without a proposed action.

Condition	Target year	Area (acres)	HSI value	Total HU
With proposed action	Baseline	1000	0.75	750
	1	500	0.70	350
	20	500	0.20	100
	100	500	0.20	100
Without proposed action	Baseline	1000	0.75	750
	1	1000	0.75	750
	20	900	0.60	540
	100	600	0.60	360

Using formula (2) for cumulative HU's, the AAHU calculations for the future with the proposed action are as follows:

5. Habitat Assessments Using Habitat Units

Baseline - 1

A. $(1 - 0)\left[\frac{1000(0.75) + 500(0.70)}{3} + \frac{500(0.75) + 1000(0.70)}{6}\right] = 545.8$

Years 1-20

B. $(20 - 1)\left[\frac{500(0.70) + 500(0.20)}{3} + \frac{500(0.70) + 500(0.20)}{6}\right] = 4275$

Years 20-100

C. $(100 - 20)\left[\frac{500(0.20) + 500(0.20)}{3} + \frac{500(0.20) + 500(0.20)}{6}\right] = 8000$

Cumulative HU's = 545.8 + 4275 + 8000 = 12820.8

AAHU's = $\frac{12820.8}{100} = 128.2$

The AAHU calculations for the future without the proposed action are as follows:

Baseline - 1

A. $(1 - 0)\left[\frac{1000(0.75) + 1000(0.75)}{3} + \frac{1000(0.75) + 1000(0.75)}{6}\right] = 750$

Years 1-20

B. $(20 - 1)\left[\frac{1000(0.75) + 900(0.60)}{3} + \frac{900(0.75) + 1000(0.60)}{6}\right] = 12,208$

Years 20-100

C. $(100 - 20)\left[\frac{900(0.60) + 600(0.60)}{3} + \frac{600(0.60) + 900(0.60)}{6}\right] = 36,000$

Cumulative HU's = 750 + 12,208 + 36,000 = 48,958

AAHU's = $\frac{48,958}{100} = 489.6$

5. Habitat Assessments Using Habitat Units

The net annual impact of the proposed action on white-tailed deer is calculated by using the formula:

$$\text{NET IMPACT} = AAHU_{WITH} - AAHU_{WITHOUT}$$

$$= 128.2 - 489.6$$

$$= -361.4 \text{ AAHU}$$

The net impact figure reflects in AAHU's the difference between future with and future without the proposed action conditions. An average of 361.4 fewer HU's will be available for deer every year during the life of the proposed action than would be available if the proposed action was not implemented. Figure 5-4 illustrates this relationship.

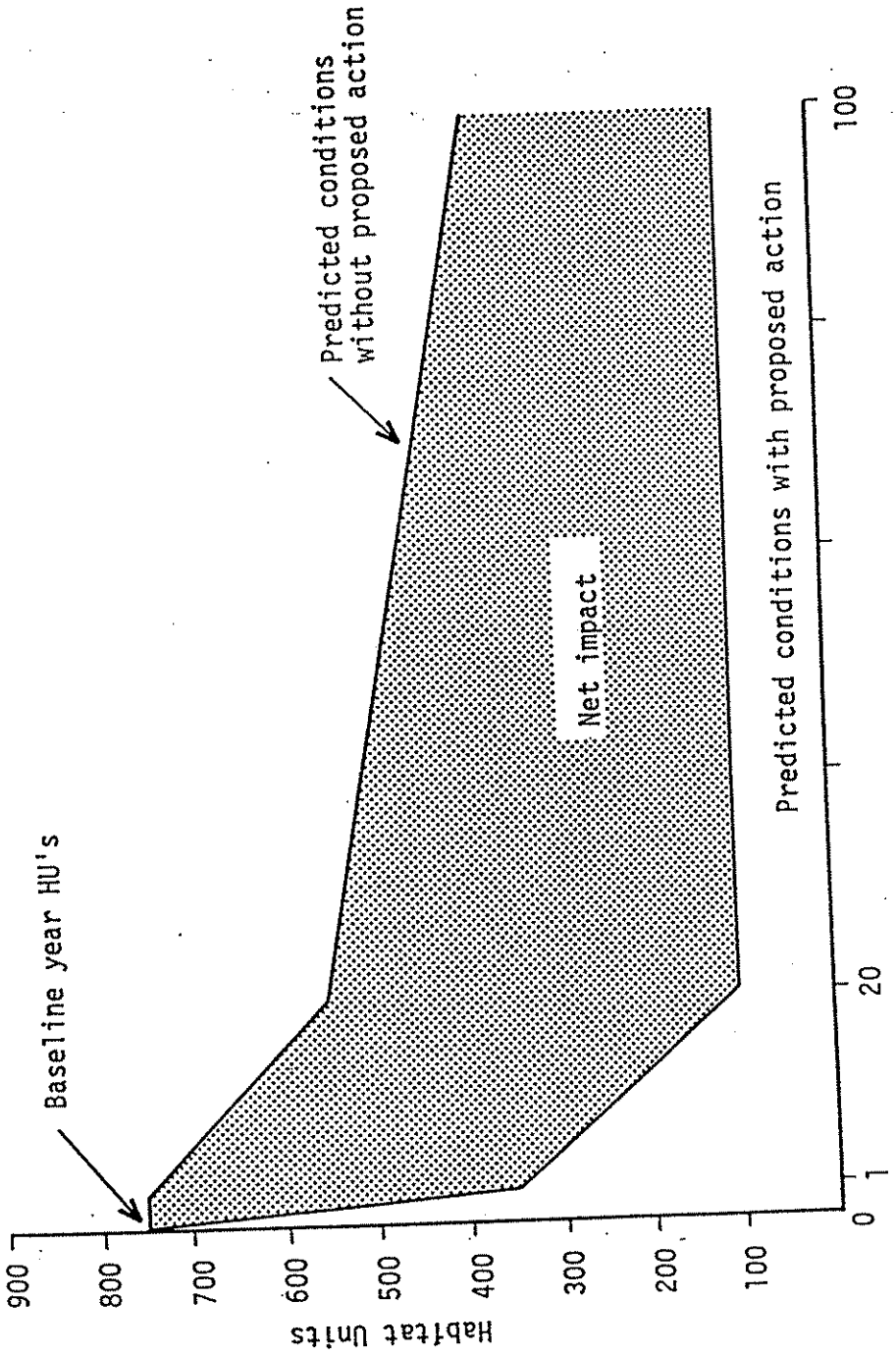
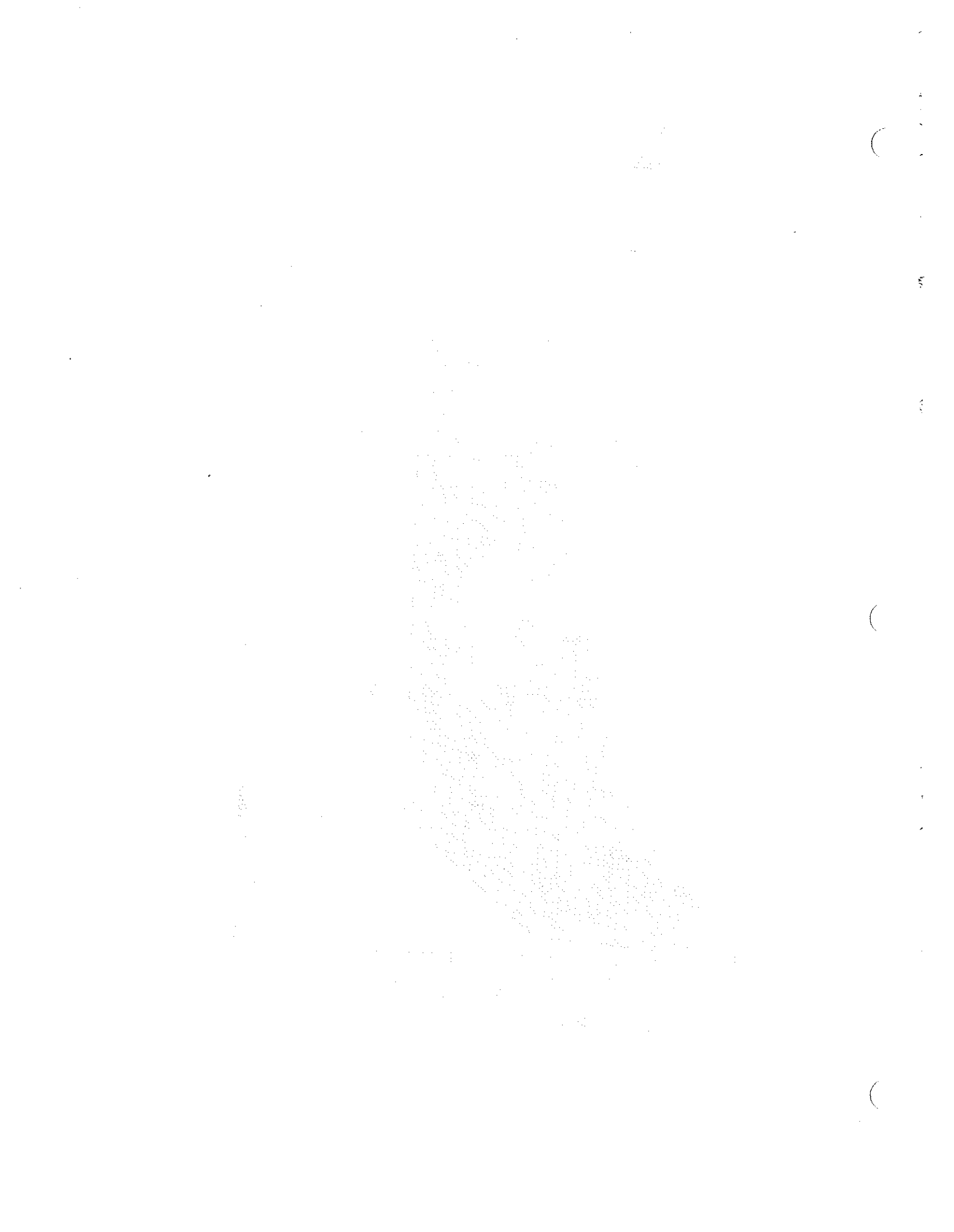


Figure 5-4. Relationship between baseline, conditions without a proposed action, conditions with a proposed action, and net impact.



B.3 BPA Wildlife Expenditure: 1983-1995, Supplied by PNUCC.

Feb. 1992

DRAFT

BPA
Wildlife Expenditures: 1983 - 1995

Year

		Project	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	Total
shington	86-074	Grand Coulee Wildlife Mitigation Plan				$93,000										$93,000
shington	88-044	Chief Joseph Wildlife Loss/Mit. Plan						$67,000			$178,000					$245,000
shington	91-061	PRabbit/STGrouse Phase 1								$90,000						$90,000
shington	91-062	Blue Creek Winter Range-Spokane Tribe									$23,000					$23,000
		Total	$0	$0	$0	$93,000	$0	$67,000	$0	$90,000	$201,000	$0	$0	$0	$0	$451,000
egon	84-036	Willamette Loss Assessment		$87,000	$75,000	$18,000										$180,000
egon	86-064	Wilamette Proj Wildl Mit Plan				$121,000										$121,000
egon	86-064	Willamette Wildlife Mitigation Plan				$138,000										$138,000
egon	90-092	Conforth Ranch								$19,000						$19,000
egon		Burlington Bottoms *									$400,000					$400,000
		Total	$0	$87,000	$75,000	$277,000	$0	$0	$0	$19,000	$400,000	$0	$0	$0	$0	$858,000
aho	84-037	Palisades Loss Assessment		$13,000												$13,000
aho	85-001	BCanyon/ARanch Loss Assessment			$94,000	$3,000										$97,000
aho	86-014	Cabinet Gorge Eagle Study				$115,000	$19,000									$134,000
aho	86-073	UpSnake Wildlife Mitigation Plan				$70,000	$80,000									$150,000
aho	87-043	Albeni Falls Wildl Loss & Mitg Plan					$95,000									$95,000
aho	87-111	Dworshak Wildlife PME Planning (86-071)					$70,000									$70,000
aho	87-406	Dworshak Dam Wildlife Mit. Plan (87-407)					$46,000									$46,000
aho	88-044	Minidoka Wildlife Impact Assessment						$68,000								$68,000
aho	88-154	Dworshak Wildlife Mitigation Plan						$180,000	$19,000							$199,000
aho	90-050	Minidoka Wildlife Mitigation Plan								$95,000						$95,000
aho	90-051	Lower Clearwater Aquatic Mammal Study								$69,000						$69,000
aho	90-051	Lower Clearwater Aquatic Mammal Study									$113,000					$113,000
aho	90-091	Dworshak Oldgrowth								$43,000	$500,000					$543,000
aho	91-060	Kalispel/P.O. Wetlands Acquisition									$487,000					$487,000
aho	91-063	S.Fork Snake-Phase 1									$96,000					$96,000
		Total	$0	$13,000	$94,000	$188,000	$310,000	$248,000	$19,000	$207,000	$1,196,000	$0	$0	$0	$0	$2,275,000
/S	83-478	Wildlife Mitigation Status Reports	$156,000	$238,000												$394,000
/S	87-110	Bonneville Dam Wildlife Loss Study					$95,000									$95,000

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Wildlife Expenditures: 1983 - 1995

'e		ect	1983	1984	1985	1986	1987	19[illegible]	1989	1990	1991	1992	1993	1994	1995	Total
FWS	87-110	Lwr.Col Loss Study/Mit. Plan					$95,000									$95,000
FWS	88-012	Lwr. Col. Wild. Mit. Plan						$156,000								$156,000
FWS	90-025	Lwr. Col. Wildlife Mit. Plan								$104,000						$104,000
		Total	$156,000	$238,000	$0	$0	$190,000	$156,000	$0	$104,000	$0	$0	$0	$0	$0	$844,000
Montana	83-464	HHorse/Clark Fork Effect on Wildlife	$65,000	$90,000	$7,000											$162,000
Montana	83-498	Flathead Geese-Water Level Impacts				$102,000										$102,000
Montana	84-038	BHSheep Habitat Improvement		$35,000		$33,000	$60,000									$128,000
Montana	84-039	BHSheep Mitigation		$90,000		$90,000	$198,000									$378,000
Montana	86-097	BHSheep Video Production				$6,000										$6,000
Montana	87-055	Libby Wildlife Habitat Enhancement						$44,000								$44,000
Montana	87-055	Libby Dam Wildlife Mitigation (NW Montana)					$431,000			$155,000	$12,000					$598,000
Montana	87-060	Wildlife Ease./Land Acquisition					$58,000	$63,000								$121,000
Montana	88-113	HHorse Wildlife Habitat Enhancement						$82,000								$82,000
Montana	88-147	Montana Wildlife Conservation Easement						$400,000								$400,000
Montana	89-023	Montana Wildlife Habitat Protection							$36,000	$500,000						$536,000
Montana	89-023	Montana Wildlife Habitat Protection							$15,000							$15,000
Montana	89-052	Montana Wildlife Trust								$2,000,000	$2,000,000	$2,000,000	$2,000,000	$2,000,000	$2,500,000	$12,500,000
Montana	90-049	Libby Dam Wildlife Enhancement Proj.								$75,000						$75,000
		Total	$208,000	$571,000	$268,000	$534,000	$747,000	$589,000	$51,000	$2,730,000	$2,012,000	$2,000,000	$2,000,000	$2,000,000	$2,500,000	$16,210,000
Region	89-091	Overhead Costs M. Wildlife Program							$6,000	$2,000	$35,000	$15,000				$58,000
Region	92-038	OverheCosts E. Wildlife Program										$2,200,000				$2,200,000
Region	92-034	Overhead Costs E. Wildlife Program										$2,200,000				$2,200,000
		Total	$0	$0	$0	$0	$0	$0	$6,000	$2,000	$35,000	$4,415,000	$0	$0	$0	$4,458,000

* Estimated Cost

Grand Total $25,096,000

Estimated Budget	$5,500,000	$10,000,000	$13,000,000	$13,000,000		

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B.4 Memo to file, from Whitney, P. and C. Curry, June 8, 1992.

BEAK MEMO

To: File 73485

From: Paul Whitney and Chris Curry

Regarding: Search for information on project lands adjacent to the four lower Columbia River Projects

Date: June 8, 1992

Beak talked to several groups to ask for help locating lands associated with the four lower projects on the Columbia. We had a list of lands presented in a PNUCC letter (September 10, 1991). The list was prepared by the Corps (Woodruff, E.). A brief summary of our effort is presented below.

1. Bill Bradley, Yakima Tribes. Bill was interested in helping but he did not have any maps for lands adjacent to these projects.

2. Larry Rasmussen, Fish and Wildlife Service. No information was available. He supplied a map of the cover type mapping for the John Day project. This map, prepared by Judith Glad, showed cover type mapping (with 5 acre resolution) for lands up to three miles from the reservoir. This map and similar maps for other projects would likely be a good source of data for assessing wildlife value of project lands. The main drawback for these maps is the lack of ground registration.

3. Tom Wolcott, BPA. He was not aware of any information base that would help with locating project lands adjacent to projects.

4. Bob White, BPA. Bob reviewed GIS layers that were available. Based on this review, we concluded that approximately 50% of the project lands identified in the PNUCC letter would likely be in areas that had GIS data available.

5. Dan Troglin, Corps. Dan gave us several Corps documents that presented information on project lands adjacent to the lower Columbia River projects. We reviewed this information and concluded the following:

   - there was little geographical registration information on any of the maps. Consequently, all of the maps would have to be scaled, planimetered, and cross checked with the PNUCC list. An alternative would be to digitize the information for each parcel. There was no way to tell whether or not the maps and areas in the Corps documents were the same areas listed in the PNUCC letter.

   - there was little information on property boundaries. One would surely assume land survey information would be available for each parcel in the Corps documents but it was not. This basic information would have to be searched for. We assumed that a qualified lands person in the Corps or the BPA could find the necessary information and list it out in a week. This sounds like a lot of time but most of the parcels appeared to be 10 to 20 acres or a total of over 4000 parcels.

- there was no covertype information on the maps in the Corps documents. We assumed that 50 percent of the parcels would have cover type information on the maps prepared for the loss assessments. Use of this information would require registering both the cover type maps and the report maps.

- information that would likely help us was available from various Corps offices. Susan Sanpini would have information for the Walla Walla area lands (i.e., McNary), Bob Willis for the Bonneville project, and Dan Troglin for the John Day and The Dalles.

6. Jim Blanchard, Bureau of Reclamation. Jim indicated he didn't have the type of information we were looking for.

B.5 Letter to P. Whitney, from J. Hansen, Sept. 3, 1992.

IDAHO FISH & GAME
600 South Walnut
P.O. Box 25
Boise, ID 83707-0025

September 3, 1992

Dr. Paul H. Whitney
Beak Consultants Incorporated
317 S. Alder, Suite 800
Portland, Oregon 97204-2583

Dear Dr. Whitney:

Enclosed are additional materials and information on the Dworshak wildlife impact assessment, as per your attached June 12, 1992 letter.

1) The Corps Design Memorandum 15 (1977) identified the development of elk habitat on project lands and lands specifically acquired for mitigation upstream of Grandad Bridge. I have enclosed portions of the draft 1977 plan and the draft 1985 supplement to DM 15, which supersedes the 1977 plan. I have also enclosed a handout from an interagency field trip in 1987, which outlines locations and amounts of browse fields created at Dworshak.

2) Indeed, the successional change from open coniferous cover types under pre-construction conditions to dense coniferous under post-construction conditions reduced the overall impacts to pileated woodpeckers. This was not discussed in detail in the Phase II report, although page 34 includes a statement that plant successional changes have also occurred on project lands, in addition to other habitat alterations.

   The figures in Table 22 do not include reductions in pileated woodpecker habitat in the hard core mitigation area, as the work group did not quantify negative impacts to one target species (pileated woodpeckers) from specific mitigation for another target species (elk).

3) I have enclosed raw data sheets of the white-tailed deer HSI calculations. Please call me if you have any questions.

4) The Corps withdrew the hard core mitigation area from BLM ownership. The BLM had previously obtained the hard core area from two private timber companies through a land

exchange. I have enclosed the Environmental Assessment for the Dworshak withdrawal, which makes reference to what may have occurred on BLM lands had the withdrawal not been approved. I have also enclosed a January 16, 1978 BLM memo which provides additional descriptions of the hardcore area. I believe that it is possible that we have over-credited the Corps elk mitigation efforts by assuming that "without" mitigation conditions did not include the creation of additional openings and browsefields by regular timber havest.

5. I have enclosed meeting notices and minutes from the Dworshak impact assessment. PNUCC's was invited to all meetings and field activities but chose not to participate.

In closing, I hope this information is useful to you. Please give me a call if I can provide you with any additional information.

Sincerely,

H. Jerome Hansen

H. Jerome Hansen
Wildlife Mitigation Specialist

B.6 Memo to BLM Director (322), from State Director, Idaho, Jan. 16, 1978.

Memorandum

DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
Idaho State Office

IN REPLY REFER TO:
I-13325 (943)

A

Dworshak File

Reed from Dick Faber 1/18/78 jm

TO : Director (322)

FROM : State Director, Idaho

Date: JAN 16 1978

SUBJECT: Proposed Corps of Engineers Withdrawal, Dworshak Wildlife Mitigation Project (I-13325)

The subject case file and all supporting data is enclosed for your review and necessary action. Please note the separately enclosed memorandum signed by Assistant Secretary Guy Martin, dated December 15, 1977, which urges early consummation of the matter.

It is our understanding that Secretary Andrus has strong feelings toward approving the entire acreage (4027.56 acres) of the subject withdrawal as originally proposed by the Corps of Engineers. The Idaho Department of Fish and Game has also indicated in written correspondence to the Corps that the entire acreage was originally acquired by BLM through exchange for the purpose of wildlife mitigation and that the withdrawal of the 4027 acres, as proposed, is only a fraction of the acreage needed to mitigate wildlife habitat losses (the Dworshak Reservoir flooded 17,000 acres of prime, low elevation wildlife habitat). They say these lands were proposed for withdrawal because they were the easiest lands to acquire at the time and that they were all the political climate would allow. They also point out that emphasis during negotiations for the withdrawal has been for elk winter range, but that other habitat values were lost, i.e., habitat for spring, summer and fall use by elk (see correspondence in case file).

In support of the Fish and Game Department's contention that BLM is obligated to withdraw the entire 4027.56 acres, the Department has furnished congressional correspondence concerning the proposed action. A May 27, 1970 letter from Senator Frank Church to Secretary Hickel indicates the entire area (4027.56 acres) should be acquired through exchange and that this tract would be managed exclusively for wildlife and would meet the needs of the elk herd in the area, also, that this solution was acceptable to the Corps of Engineers, Fish & Wildlife Service, Idaho Department of Fish and Game, Potlatch Forests and BLM. The Secretary's response, dated August 3, 1970, implied the exchange would be made as quickly as possible and that development of the entire tract in question was needed for the mitigation program.

A letter from this office, dated June 2, 1972 was also furnished, indicating the appraisal for the land exchange had been approved and that the government interests involved had the right to enter the lands for the purpose of developing wildlife habitat. The authority for entering the lands was cited as Article III, paragraph 1 of the land exchange agreement (see agreement in case file).

The Corps of Engineers concurs in all of the comments made by the Fish and Game Department and contends that BLM acquisition of Potlatch Forests lands under the land exchange agreement was intended solely as a vehicle for eventual Corps acquisition of the land for the Dworshak Project mitigation requirements and that this must have been BLM's justification to make the exchange (see correspondence in case file). A review of past correspondence by your office resulted in a memorandum to the Assistant Secretary on December 27, 1977 indicating there was no commitment by the Bureau to consummate a withdrawal.

The Coeur d'Alene District Manager has made a thorough analysis of the withdrawal proposal in light of FLPMA and the public interest and has concluded that only those lands north of the reservoir are subject to wildlife enhancement and could be withdrawn under FLPMA standards.

The total area under application north of the reservoir is 2125.16 acres. The land area under application south of the reservoir amounts to 1902.40 acres (see attached map and page 69 of land report).

An on-the-ground evaluation of those lands north of the reservoir indicates they meet, for the most part, the required criteria for use to mitigate the big game winter range loss. Though some hazards and undesirable features exist, i.e. erodible soils and roads, enough good big game winter habitat can be developed on these lands to justify their dedication to this purpose. Plans have been made and are in process to develop winter range habitat on those lands north of the main reservoir. Achievement of wildlife benefits could also be done under a cooperative agreement with the State Fish and Game Department.

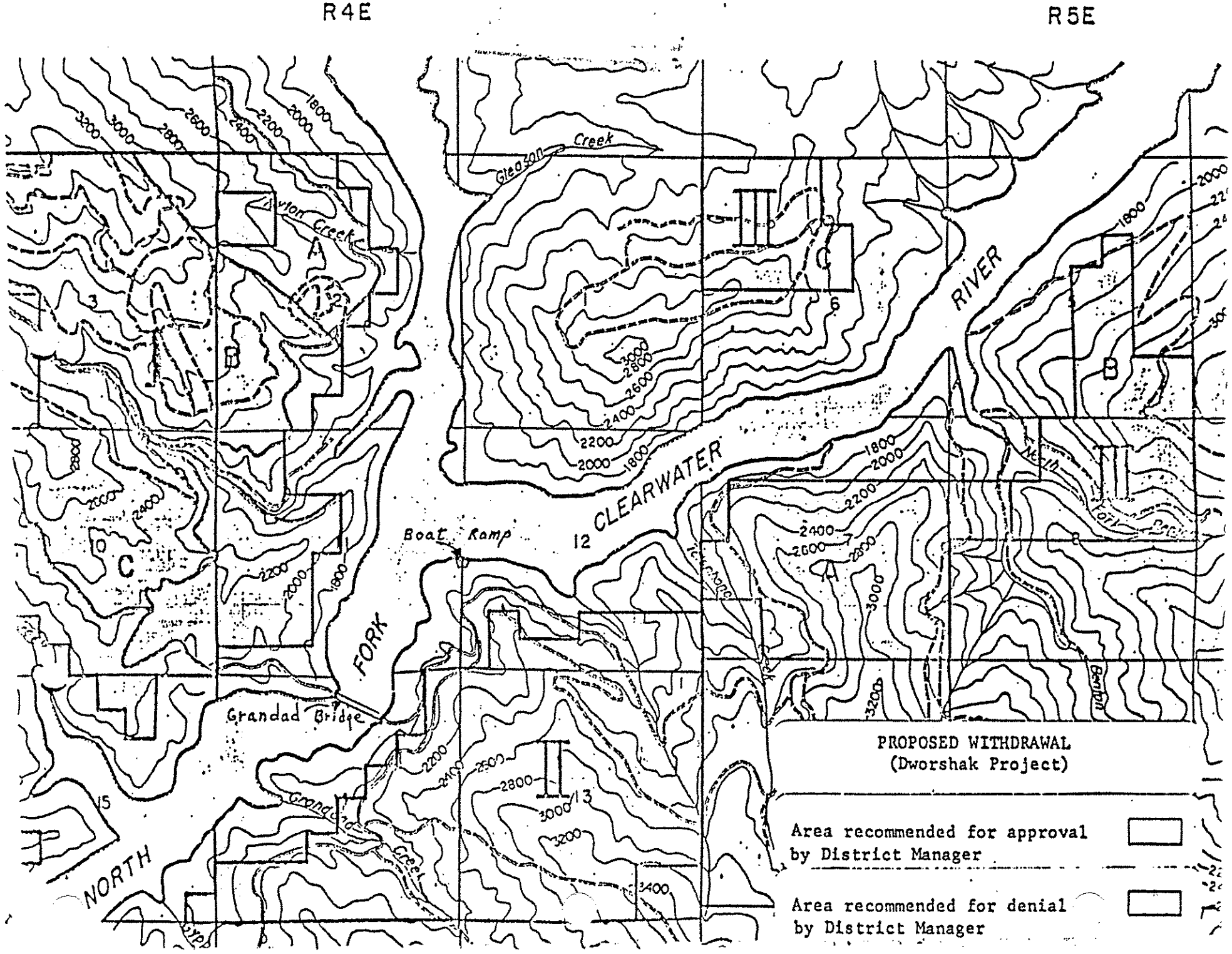
The lands south of the reservoir do not have the characteristics needed for development of significant winter range. These lands are, for the most part, north-facing, steep lands receiving heavy snow cover during the winter months. Deer and elk have not wintered on these lands because of these limitations. Habitat could be developed on these lands, but it would be primarily for spring-summer-fall use and not the needed winter use. Use by big game during the spring, summer and fall months would also be limited by a proposed new state road and major all-weather logging roads which will bisect the mitigation area south of the reservoir. These roads will serve as main access routes so it is not feasible to limit their use. A proposed boat launching ramp in the area will compound the problem by adding additional summer traffic. These developments could be expected to sharply curtail even spring-summer-fall big game use of the area. This will be particularly true of elk, which are less tolerant of human habitation.

In light of recent discussions with your office we want to emphasize the political sensitivity of this issue. We have relied upon a Corps of Engineer ES on the Dworshak Dam Project to satisfy the environmental

requirements and have relied upon the detailed environmental data contained in the Coeur d'Alene District Land Report to provide specifics about the withdrawal area.

From a resources standpoint, it is apparent the best alternative is to deny the withdrawal for those lands south of the reservoir. However, in view of prior actions taken by the Department and the strong feelings of the Congressional Delegation and the Secretary that the entire area be withdrawn, it appears that approval in total is inevitable. Accordingly, it is our recommendation that the entire acreage originally applied for by the Corps be withdrawn.

Enclosures


R4E
R5E
Gleason Creek
Dalton Creek
RIVER
CLEARWATER
Boat Ramp
FORK
Grandad Bridge
NORTH
PROPOSED WITHDRAWAL
(Dworshak Project)
Area recommended for approval by District Manager
Area recommended for denial by District Manager

B.7 Letter to K. Bedrossian, from P. Keough, June 7, 1984.

DEPARTMENT OF THE ARMY
PORTLAND DISTRICT, CORPS OF ENGINEERS
P. O. BOX 2946
PORTLAND, OREGON 97208

June 7, 1984

+time/annualization issue is addressed.

Planning Division (NPPPL-FW)

Oregon Department of Fish and Wildlife
506 S.W. Mill Street
P.O. Box 3503
Portland, OR 97208

ATTN: Karen Bedrossian, Wildlife Biologist
Environmental Management Section

Dear Ms. Bedrossian:

We have reviewed each objective and associated tasks as requested in your May 31, 1984 letter. We do not see the need to "throw out" the high and low ratings prior to obtaining an average habitat unit value. We stress that the process should be coordinated extensively throughout the development and analysis phases to ensure an orderly process. Biologists on my staff should definitely be included during selection of target species.

An important question remains regarding the specific time, relative to each project, for which "loss estimates" would be derived. Our previous understanding was that "loss estimates" would be associated with the loss of wildlife habitat at construction. However, during the 30 May 1984 coordination meeting, there was discussion that "loss estimates" should be derived on the basis of expected conditions for the site in question as if there had been no project constructed. Please clarify, relative to each project, the specific time for which "loss estimates" will be derived. If the second approach identified above will be used, your method of analysis needs to be more clearly defined, and considerably more coordination with Portland District will be required.

To more clearly define the problem we foresee, the following example is provided:

A 2400-acre old growth forest known to contain two breeding pairs of spotted owls is cleared and inundated by a Corps hydroelectric project in the Cascade Mountains in 1962.

Based on land practices in the region from 1962 - present, the area would have been clear cut in increments until at present it would contain a mosaic of successional stages that supported a herd of 36 Roosevelt elk, 150 black-tailed deer, and no spotted owls. For which "loss" will the project be analyzed for: 1) spotted owls; 2) elk and deer; or, 3) both 1 and 2. Given the existing resource agency management programs for these species and the aforementioned problem, how does the Wildlife Mitigation and Enhancement Plan at Federal Hydroelectric Facilities (NWPPC) tie into existing management programs? As can be seen from the example, clear guidelines need to be established prior to conducting loss analyses for the various projects. Further comments would be more appropriate once we are aware of the exact direction of your effort.

Sincerely,

Patrick J. Keough, P.E.
Chief, Planning Division