HABITAT EVALUATION PROJECT

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Purpose

The purpose of this document is to identify and discuss HEP protocol and crediting issues encountered by the Regional HEP Team (RHT) in the Upper Columbia River Sub-region (UCRS) and to share the RHT's perspective regarding the factors that contributed to creating the issues. This report also fulfills the Crediting Forum's recommendation that the RHT *identify inconsistencies in technical HEP applications throughout the Region* (NPCC 2011).

RHT Background

The RHT was established in 2004 to fulfill three purposes: to create a region-wide standard for Habitat Evaluation Procedures (HEP) protocols and crediting practices; to independently apply them fairly to all BPA wildlife mitigation projects throughout the Columbia Basin; and to provide HEP technical assistance to agency and tribe project managers and BPA staff. After 2004, the RHT carried out the majority of HEP surveys within the Columbia Basin and conducted HEP and habitat survey training for project managers, BPA staff, and other interested individuals.

In all actions and activities the RHT did the utmost to:

1. Ensure the RHT remained neutral and objective.
2. Ensure consistent application of HEP protocols and scientific principles on all HEP projects.
3. Ensure that HEP projects/sponsors throughout the Columbia Basin and BPA were treated in a consistent, fair manner.
4. Ensure that HEP results were credited appropriately and impartially.

Introduction

The UCRS includes Grand Coulee and Chief Joseph Dams located in north central Washington and Albeni Falls Dam found in northern Idaho. Due to the similarity between Grand Coulee Dam and Chief Joseph Dam loss assessments, compensation projects, and the close working relationship among project sponsors, discussion regarding the two Washington Dams is in one section while issues pertaining to Albeni Falls Dam are discussed in a separate section of this document. This approach takes into account state and tribal jurisdictional differences and recognizes the work of the Albeni Falls Dam Work Group, comprised of Idaho Department of Fish and Game (IDFG), the Kootenai Tribe of Idaho (KTOI), the Kalispel Tribe of Indians (KTI), and the Coeur D' Alene Tribe (CDA).

In Washington State, the Washington Department of Fish and Wildlife (WDFW), the Confederated Tribes of the Colville Reservation (CCT), and the Spokane Tribe of Indians (STOI) partnered with Bonneville Power Administration (BPA) to purchase/protect property to compensate for habitat losses from the construction and inundation (C&I) associated with Grand

Coulee and Chief Joseph Dams. In Idaho, BPA joined with IDFG, KTOI, KTI, and CDA to acquire/protect wildlife habitat to compensate for C&I losses at Albeni Falls Dam.

The Habitat Evaluation Procedures (HEP) process (Appendix A) was used to determine both C&I habitat unit losses and compensation site habitat unit (HU) gains. Hydro facility loss assessments were developed in the late 1980s and early 1990s. The Grand Coulee Dam loss assessment (Howerton and others 1986) was developed by WDFW, while the Chief Joseph Dam loss assessment (Berger and Kuehn 1992) was prepared jointly by the CCT and WDFW. The Albeni Falls loss assessment (Martin and others 1988) was produced by IDFG. Compensation site HEP analyses and final HEP reports were completed by project sponsors or the Regional HEP Team[1] (RHT).

HEP Model Species Matrix History and Background

Compensation site cover type/species matrices are constructed based on cover type/HU losses described in hydro facility loss assessments. When compensation site and loss assessment cover types are identical (i.e., in-kind, the same number and type of HEP species), the same models are used to evaluate compensation site cover types as were used to evaluate cover types listed in the credited hydro facility's loss assessment matrix. Likewise, when compensation site cover types are dissimilar or out-of-kind habitats[2], compensation site cover types are "paired" (Appendix B) with loss assessment cover types to determine the number of HEP species models ("stacking") to use to evaluate compensation site cover types (Appendix C).

Loss assessment HEP models may be used to evaluate dissimilar compensation site cover types if the HEP species models are biologically appropriate. If not suitable, loss assessment HEP models may be modified to fit compensation site habitat conditions or other HEP models may be substituted in place of loss assessment models to satisfy stacking requirements.

In all cases the credited hydro facility's loss assessment matrix is paramount to developing compensation site cover type/species matrices. In situations where a concise cover type/species matrix is not included in the loss assessment, like at Grand Coulee Dam, compensation site matrices are developed based on information found in the credited hydro facility's loss assessment document. However, compensation site cover type/species matrices constructed in this manner are subject to a higher level of interpretation.

Throughout the Region, project sponsors sought and used BPA funding to acquire "out-of-kind" habitat/cover types, that is, habitat/cover types other than those lost to dam construction and inundation and not associated with a specific loss assessment. In some cases acquisitions were available for purchase only as an "all or nothing" arrangement.

[1] The RHT occasionally collected habitat data and provided it to the project sponsor for HU calculations etc.
[2] Dissimilar cover types are those project cover types that are not listed in the credited hydro facility's cover type matrix.

These out-of-kind habitat/cover types were, in many instances, appropriately evaluated with HEP model species that were not listed in the credited hydro-facility's loss assessment, leading to HEP model substitutions. Since using out-of-kind HEP models conflicts with "In-kind" compensation (Appendix D), much of the mitigation accomplished across the Region is "equal" compensation; that is: "a HU[3] is a HU." Project sponsors with jurisdiction in the Washington State portion of the Upper Columbia River Sub-region generally focused on mitigating their share of the total number of loss HUs rather than the HU species type, which allowed project sponsors greater land acquisition/protection flexibility.

Grand Coulee and Chief Joseph Dams

Background

WDFW, CCT, and the STOI partnered with BPA early on in the mitigation/compensation process to protect wildlife habitat. Many of the wildlife mitigation/compensation land acquisition/habitat protection measures credited against C&I losses at Grand Coulee and Chief Joseph Dams occurred between FY 1992 and FY 2000, before the inception of the RHT in 2004.

Prior to the RHT, WDFW, CCT, and STOI wildlife biologists assisted each other conduct HEP surveys on many mitigation/compensation project sites, regardless of ownership or location. As a result, HEP protocols and crediting practices, which changed somewhat over time, were generally applied consistently by WDFW, CCT, and STOI both prior to and after the RHT was established. Furthermore, BPA Contract Officer Technical Representative (COTR) and project sponsor understanding and interpretation of HEP principles and protocols and crediting practices were largely in sync.

Consequently, there were no major issues concerning compensation site cover type/species matrices, HU stacking[4], HEP model species substitution, or HEP model modification experienced by the RHT. There are, however, several topics that require explanation or further consideration including:

1. The Grand Coulee Dam loss assessment cover type/species matrix
2. Grand Coulee and Chief Joseph Dam HU Crediting
3. Baseline and follow-up HEP stacking/crediting differences

While the three topics overlap, each topic is addressed separately in the following section.

[3] HU = habitat unit
[4] Stacking is the number of HEP species models used to evaluate each cover type. Loss assessment and compensation site "stacking" should be identical. This is necessary to accurately compare habitat gains, losses, and changes between the original loss assessment and compensation site cover types.

Topic 1 – Grand Coulee Dam Cover Type/HEP Model Species Matrix

Background

Because most compensation sites included out-of-kind cover types, project sponsors couldn't apply just the "in-kind" cover types and species models found in the loss assessment. Instead, the RHT and project sponsors developed compensation site matrices based on information found in the Grand Coulee Dam loss assessment (Howerton and others 1986), HEP protocol documents (USFWS 1980, 1980a, Stiehl 1995) and later guidance provided by NPCC's Crediting Forum (NPCC 2011). These matrixes were suited to the out-of-kind cover types found on the compensation sites and the species present on those sites. However, before developing compensation site cover type/species matrices, the RHT and project sponsors had to address a crediting anomaly found in the Grand Coulee Dam loss assessment (Howerton and others 1986) whereas two cover types were included as evaluation species (Table 1), which is contrary to established HEP protocols.

Table 1 Grand Coulee Dam evaluation species summary

Evaluation Species	Total HUs
Sage Grouse	2,746
Sharp-Tailed Grouse	32,723
Ruffed Grouse	16,502
Mourning Dove	9,316
Mule Deer	27,133
White-tailed Deer	21,632
Riparian Forest	1,632
Riparian Shrub	27
Total HUs	**111,711**

The RHT's opinion is that authors of the Grand Coulee Dam loss assessment (Howerton and others 1986) misconstrued the basic HEP precept dealing with HEP evaluation species, which is why riparian forest and riparian shrub cover types were included as Grand Coulee Dam HEP evaluation species along with associated loss HUs. The USFWS[5] (1980, 1980a) states that, "*Evaluation species, both terrestrial and aquatic, form the basis of a HEP analysis. An evaluation species can be a single species, a group of species, species life stage, or a species life requisite"…* The "*species life requisite*" component is food, cover, or water not a cover type. The cover types represent the *location* of the life requisite and cannot be HEP evaluation species.

Discussion

The RHT developed a Grand Coulee Dam cover type/species matrix that did not include riparian forest and riparian shrub as evaluation species (Table 2). To account for the 1,659 riparian forest/shrub "evaluation species" loss HUs listed in the loss assessment and NPCC's Table C-4,

[5] United States Fish and Wildlife Service

the RHT added one HEP evaluation species model to both the riparian forest and riparian shrub cover types, thus, increasing the number of HEP model species from two species per cover type to three species per cover type as shown in Table 2.

Table 2 Grand Coulee Dam cover type /species matrix

HEP MODEL	Shrub-steppe	Conifer Forest	Riparian Forest	Mixed Forest	Agriculture	Riparian Shrub	Riparian
Sharp-tailed grouse	x		X[a]		x	X[a]	
Sage grouse	x						
Ruffed grouse			x	x		x	
Mourning Dove					x		x
Mule Deer	x						
White-tailed deer		x	x	x		x	
TOTAL	3	1	3	2	2	3	1

[a] Added to account for the HUs listed for riparian forest and riparian shrub cover types shown as evaluation species in the loss assessment.

The RHT's Grand Coulee Dam cover type/species matrix and unmodified Chief Joseph Dam (Berger and Kuehn 1992) cover type/species matrix are presented in Appendix E. Regardless of which hydro facility was credited, the RHT collaborated with project sponsors to develop compensation site matrices.

Topic 2 – Crediting HUs at Grand Coulee and Chief Joseph Dams

Background

Unlike elsewhere in the Region, project sponsors agreed to allocate HUs to specific entities in the Grand Coulee Dam and Chief Joseph Dam loss assessments. They allocated Grand Coulee Dam and Chief Joseph Dam loss HUs to the CCT and WDFW while the STOI was allocated loss HUs from only Grand Coulee Dam,[6] as displayed in Table 3 and (Appendix F).

Table 3 Grand Coulee Dam/Chief Joseph Dam HU – Canada goose nest site allocations

	CCT HUs	STOI HUs	WDFW HUs	Total
Grand Coulee Dam HUs[a]	31,404	6,679	73,628	**111,711**
Chief Joseph Dam HUs[b]	4,416	0	4,416	**8,832**
HU Totals[c]	**35,820**	**6,679**	**78,044**	**120,543**
Percent of HUs	29.72%	5.54%	64.74%	**100.00%**
Canada Goose Island Nest Sites	10	20	44	74

[a] 70,000 acres were impacted at Grand Coulee Dam; HU/acre ratio = 1.59 HUs/acre

[b] 8,822 acres were impacted at Chief Joseph Dam; HU/acre ratio = 1.01 HUs/acre

[c] A total of 78,822 acres were impacted at both Dams; combined HU/acre ratio = 1.53 HUs/acre

[6] The STOI Reservation only borders Lake Roosevelt located upstream from Grand Coulee Dam. Chief Joseph Dam is located downstream from Grand Coulee Dam. Therefore, the STOI were not allocated loss HUs form Chief Joseph Dam.

In addition, area wildlife managers, operating as the Columbia Basin Fish and Wildlife Authority (CBFWA) Wildlife Committee, agreed as a matter of comity to restrict the transfer of HUs from one Basin to another Basin without approval/agreement from all Basin co-managers from where the HUs originated. Consequently, the HU allocations displayed in Table 3 were modified in 2002 when WDFW transferred 600 HUs to the CCT and 400 HUs to the STOI for allowing WDFW to transfer Grand Coulee Dam loss HUs out of Basin to provide BPA HU credit for the Schlee acquisition (Asotin Creek Wildlife Area) located in the Lower Snake River Sub-region. Modified/unmodified HU allocations are compared in Table 4.

Table 4 Modified/unmodified HU allocation comparison

	CCT HUs	STOI HUs	WDFW HUs	Total
Modified HU Allocations	36,420	7,079	77,044	**120,543**
Unmodified HU Allocations	35,820	6,679	78,044	**120,543**
Differences	600	400	-1,000	**0**

Discussion 1

Prior to guidance provided by NPCC's Crediting Forum (NPCC 2011), both WDFW and CCT occasionally credited a single project to both Grand Coulee and Chief Joseph Dams[7]. This occurred because WDFW and CCT regarded both dams as one large project, rather than two single projects, relative to crediting HUs. When HUs for a particular species were depleted at one dam, project sponsors credited the remaining HUs to the other dam if unmitigated HUs remained for the same species. Similarly, if a loss assessment evaluation species did not occur at both dams, project sponsors credited the HUs to the hydro facility listing the evaluation species.

In 2011, the Crediting Forum Technical Team (CFTT) recommended that compensation site HUs should not be credited to more than one hydro facility (Appendix G). As a result, HUs generated from the few HEP surveys conducted after 2011 were credited towards BPA's mitigation obligation at either Grand Coulee Dam or Chief Joseph Dam, but not both hydro facilities.

BPA, RHT, and CCT Wildlife Department staff[8] met in December 2014 to reconcile CCT HU data with HU data listed in Pisces[9] and HU data held by the RHT. The STOI (D. Wood, pers. comm.) provided crediting data that closely matched updated Pisces information and RHT data. WDFW mitigated HU totals were provided by the RHT and were reviewed by WDFW staff (P. Dahmer, pers. comm.) in January 2015.

[7] To date, no effort has been made to revisit/reconcile this crediting anomaly. The RHT doesn't believe reconciliation is necessary or cost effective since both Grand Coulee and Chief Joseph Dams are currently over mitigated.
[8] BPA staff and the RHT included Sandra Fife and Paul Ashley respectively while CCT Wildlife Department staff included Richard Whitney and Kelly Singer.
[9] BPA's wildlife mitigation accounting/reporting system

HU losses at Grand Coulee Dam and Chief Joseph Dam totaled 120,543 HUs (111,711 HUs and 8,832 HUs respectively). To date, 136,263 HUs have been credited towards BPA's mitigation obligation at Grand Coulee and Chief Joseph Dams. This is 15,720 HUs above the C&I HUs lost. The CCT and STOI exceeded their HU allocations by 45% and 5% respectively while WDFW has 1% (860 HUs) of its original UCRS mitigation allocation remaining (Table 5).

Table 5 Grand Coulee Dam/Chief Joseph Dam combined mitigated HU summary

	CCT HUs	STOI HUs	WDFW HUs	Total
Modified HU Totals	36,420	7,079	77,044	120,543
Mitigated HUs	52,647	7,432	76,184	136,263
HUs Remaining	-16,227	-353	860	-15,720
Percent Mitigated	**144.56%**	**104.99%**	**98.88%**	**113.04%**

However, the STOI suggests HU data displayed in Table 5 should be modified because the white-tailed deer HEP model (Ashley and others 1996) used to evaluate compensation site white-tailed deer habitat was not the same HEP model used at Grand Coulee Dam or the STOI's Blue Creek Project (Merker 1993). The pre-RHT white-tailed deer, mule deer, sharp-tailed grouse, and sage grouse HEP models were modified by WDFW and CCT wildlife mitigation staff with support from STOI wildlife biologists and others. HEP model modification occurred in response to assertions by species experts that extant HEP models were too simple and not robust enough to adequately describe/quantify key habitat elements required by wildlife species and, therefore, of little biological value. Wildlife biologists supported development of better habitat assessment "tools" to measure key ecological correlates and habitat structural conditions.

The pre-RHT assessment HEP models were modified based on new research and local habitat conditions. Furthermore, biologists thought every effort should be made to collect biologically useful data that otherwise would likely not be collected. The modified HEP models provided the framework for doing so. In all cases, HEP model modifications were made to improve the science aspect of HEP. As the HEP process dictated, impacts to HU crediting were not a consideration to wildlife biologists when modifying HEP models. Modifications were based solely on "best scientific practices" available at that time.

Although the STOI supported using the modified white-tailed deer HEP model to advance the science and further develop the HEP model, they contend that as policy all STOI compensation sites should be evaluated using the Blue Creek white-tailed Deer model (Merker 1993) to maintain crediting consistency between STOI compensation sites and the Grand Coulee Dam

loss assessment (Howerton and others 1986)[10]. To that end, STOI wildlife biologists recalculated compensation site white-tailed deer model HUs using the data collected by the RHT and provided the estimated results to the RHT.

This HU recalculation effort reduced the number of STOI mitigated HUs displayed in Table 5 by 1,213 HUs leaving 860 HUs unmitigated as shown in Table 6. *This alternate crediting scenario could be included in settlement negotiation discussions.*

Table 6 Grand Coulee and Chief Joseph Dams mitigated HU summery with STOI HU modification

	CCT HUs	STOI HUs	WDFW HUs	Total
Modified HU Totals	36,420	7,079	77,044	120,543
Mitigated HUs[a]	52,647	6,219	76,184	135,050
HUs Remaining	-16,227	860	860	-14,507
Percent Mitigated	**144.56%**	**87.85%**	**98.88%**	**112.03%**

In summary, BPA funds were used to purchase WDFW, CCT, and STOI wildlife mitigation compensation sites and to support operations/maintenance (O&M) and enhancement activities on extant WDFW Wildlife Areas. In return, BPA took credit for all base-line and follow–up HEP survey HUs for property purchased with BPA funds and partial HU credit for funding O&M and enhancement activities on extant WDFW Wildlife Areas based on the WDFW crediting formula (Appendix H). Combined Grand Coulee Dam and Chief Joseph Dam acre and HU losses and gains are compared in Figure 1.

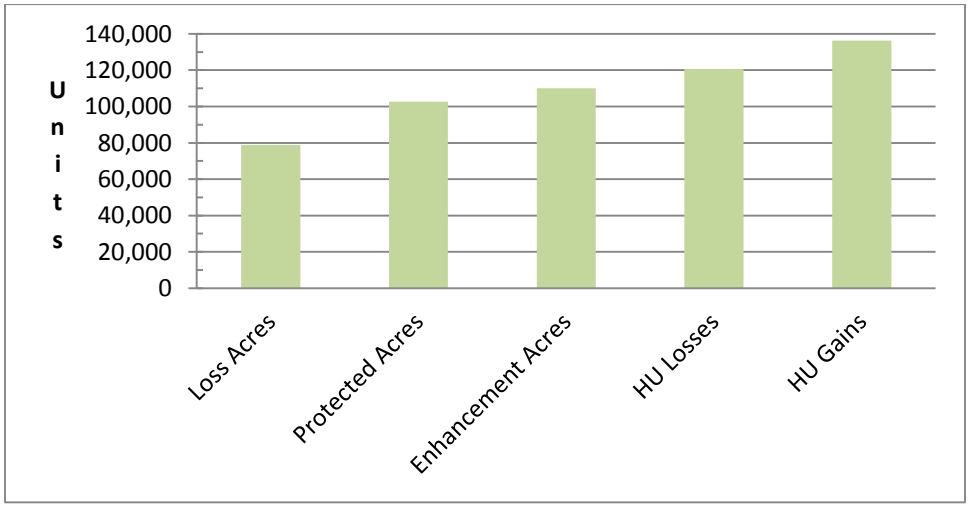

Figure 1 Combined acre/HU comparison for Grand Coulee and Chief Joseph Dams

[10] Note that the Crediting Forum's Technical Team (CFTT) (NPCC 2011) affirmed that managers should, "*consider validating new or significantly modified models with appropriate testing and review",* which is what project wildlife managers did during the white-tailed deer model modification process. The CFTT suggested other related Crediting Variation SOPS.

The "Enhancement Acres" column in Figure 1 represents WDFW property purchased with State funds that were subject to HU crediting based on the WDFW crediting formula. The HU Gains column includes approximately 40,472 HUs generated on 110,067 *enhancement acres* already owned by WDFW and 95,791 HU gains from parcels purchased by WDFW, CCT, and the STOI with BPA funds. See Attachment H: Summary WDFW Crediting Explanation. Since BPA was credited with only a fraction of the actual baseline HUs[11] generated on WDFW enhancement acres, the total number of HUs gained appear lower than expected relative to the number of protected and enhanced acres.

The number of HUs listed in Table 5 for CCT and STOI accounts for all C&I wildlife mitigation to date while WDFW mitigated HUs represent only a partial accounting of WDFW's total C&I wildlife mitigation efforts. WDFW also credited compensation projects towards HU losses at McNary Dam, John Day Dam, The Dalles Dam, and Bonneville Dam. Although compensation site HU gains exceed C&I HU losses at both Grand Coulee and Chief Joseph Dams, WDFW, CCT, and the STOI have not received compensation for island Canada goose nest sites lost due to pool inundation. *Nest site losses could be converted to "equal compensation" HUs or included as part of settlement discussions*.

Discussion 2

The assignment of HU losses to specific project sponsors by those sponsors in loss assessment documents occurred only at Grand Coulee and Chief Joseph Dams. BPA maintains that HU loss allocations listed in the loss assessments were agreed to by only loss assessment authors and, presumably, the agencies and tribes they represented. Furthermore, BPA remains neutral on the issue and believes it is not obligated to monitor or credit project sponsor HU gains to satisfy loss assessment HU allocations.[12]

The RHT contends, however, there is a difference between HU allocations listed in loss assessments and HU allocation agreements between project sponsors that are not included in loss assessments. NPCC carried forward and amended the Grand Coulee Dam and Chief Joseph Dam loss assessment HU losses into NPCC's 2009 Program. The 2009 Program, therefore, includes HU allocations *in the loss assessments.* The RHT believes that there is a Program level responsibility to ensure that the HU allocations are considered independently by BPA for each project sponsor, although BPA has not agreed with this view. The RHT's opinion is that this view is further supported in that CCT and STOI Tribal sovereignty precluded WDFW or other project sponsors from mitigating or crediting against Tribal HU allocations, leaving HUs

[11] BPA usually received 10% to 15% of the actual baseline HUs as per the WDFW Crediting Formula.
[12] In response to a question by Council members regarding an entity's right to an allocated share of BPA mitigation funding under the Northwest Power Act, their General Counsel recently prepared a written opinion that indicated no entity has a statutory claim or share of BPA mitigation funding. *See generally*, J. Shurts, Memorandum to Bill Booth and Tom Karier, Northwest Power and Conservation Council members (Aug. 29, 2014) (regarding nature of BPA's mitigation duty).

allocated to WDFW (Washington State) without equal protection/consideration and subject to possible mitigation by others[13].

WDFW's main concerns are that over mitigation by either the CCT or STOI could be counted against WDFW's unmitigated Upper Columbia River loss HU allocation and that lacking a HU allocation agreement or other HU allocation over-sight, the CCT, STOI, and others with jurisdictional rights in Washington State could theoretically mitigate WDFW's perceived remaining share of unmitigated loss HUs similar to what occurred in the Lower Columbia River Sub-region[14].

Since HU allocations were assigned specifically to each project sponsor, the RHT suggests that Upper Columbia River Sub-region project sponsors with unmitigated HUs remaining be allowed to mitigate their remaining HU allocation, or that unmitigated HUs be considered in settlement negotiations *regardless* of whether the total number of mitigated HUs for all project sponsors exceeds the total number of loss HUs at Grand Coulee and Chief Joseph Dams.

Topic 3 – Baseline and follow-up HEP stacking/crediting differences

Background

Many of the baseline HEP surveys credited against HU losses at Grand Coulee and Chief Joseph Dams occurred prior to establishment of the RHT and NPCC's Crediting Forum (NPCC 2011). In a number of baseline HEP surveys conducted prior to 2004, fewer HEP models were used to evaluate one or more baseline HEP cover types on a given project than would later be applied as the RHT reconciled the HEP model stacking issue.

Cover type/species matrices developed by the RHT often included more evaluation models per cover type than earlier matrices, and frequently resulted in noticeably more HUs reported for follow-up HEP surveys than expected from improved baseline habitat conditions alone. Substantial increases in HUs were often due more to the increased number of evaluation species than to changed habitat conditions. This had a significant impact on follow-up HEP survey results and the total number of mitigated HUs for both WDFW and the CCT.

[13] The USFWS credited a project against WDFW's HU allocation with WDFW's concurrence in 1993 under BPA contract 1993-058-00.

[14] Because there was no HU allocation agreement between project sponsors in the Lower Columbia River, WDFW (i.e., the state of Washington), mitigated approximately 10% of the loss HUs while the YN and Umatilla Tribes mitigated nearly 90% of available loss HUs.

Discussion 1

Early in the wildlife mitigation process wildlife managers agreed that BPA take baseline habitat HU credit[15] in exchange for allowing project sponsors to acquire/protect:

1. Out of kind cover/habitat types
2. Key habitats/parcels that were at risk for development
3. Sites with significant cultural, wildlife, and/or recreational values

As such, BPA took all or partial baseline HU credits generated on all wildlife mitigation parcels as well as follow-up HU credits from a relatively small number of the mitigation parcels Region wide. Although BPA is entitled to follow-up HU credits[i], this skewed HU accounting in favor of project sponsors that did not have follow-up HEP surveys. In other words, projects where just baseline HEP analyses occurred credited BPA with fewer HUs than projects where both baseline and follow-up HEP surveys were conducted. Follow-up HUs provided additional mitigation HU credits to BPA[16], but the inconsistency of application calls the fairness of these additional HU credits into question and suggests that there were discrepancies in mitigation between agencies and amongst parcels.

This is particularly relevant for project sponsors that are bound by HU allocation agreements like those found in the Grand Coulee Dam (Howerton and others 1986) and Chief Joseph Dam (Berger and Kuehn 1992) loss assessments. The additional HUs generated from follow-up HEP surveys increased WDFW's and CCT's final HU totals by an estimated 20 percent.

This situation is present Region wide. There are likely several solutions to applying what the RHT terms as the "fairness" principle in counting or not counting the additional HU's generated by follow-up HEP surveys. At this juncture, the RHT believes the easiest and least controversial approach is for BPA to consider this issue in settlement discussions with project sponsors.

Discussion 2

CCT, STOI, and WDFW helped BPA implement NPCC's mitigation program by voluntarily adhering to and using sound scientific principles, HEP protocols, and Crediting Forum guidelines (NPCC, 2011). This included constructing compensation site cover type/species matrices with appropriate stacking, as well as HEP model species substitution when needed. In contrast, the Albeni Falls Work Group did not uphold the same standards, specifically regarding HEP model stacking and species substitution. This inconsistency has led to what the RHT

[15] HEP protocols, as originally developed by the USFWS, allow only "enhancement" HU credit. Baseline HU credits are not awarded because acquiring the property, in of itself, does not equate to a net gain in HUs or an improvement in habitat quality. HEP protocols also only require that the responsible entity i.e., BPA acquire/protect "like" cover/habitat types. HEP protocols, however, also allow modification of HEP tenets as long as all involved parties agree to the change(s), which was the case in the Columbia River Wildlife Mitigation Program.

[16] Follow-up HEP surveys add HUs, resulting from improved habitat quality or corrected HEP model stacking, on an accounting basis while not actually increasing the acres of wildlife habitat protected.

considers a breakdown in the HU crediting process at Albeni Falls Dam and an incomplete accounting of BPA's mitigation credit.

Albeni Falls Dam

Background

Like other Upper Columbia River Sub-region project sponsors, Albeni Falls Work Group Members (CDA, KTI, KTOI, and IDFG) first acquired/protected mitigation compensation sites in the early 1990s, and continued to do so well into the next decade. During this early period of the program HEP surveys were conducted primarily by individual Work Group Members with occasional assistance provided by WDFW mitigation staff and others through 2004. After 2004 the RHT became more involved in the Albeni Falls HEP process.

HUs were not allocated to particular Work Group Members in the Albeni Falls loss assessment (Martin and others 1988) nor were individual project sponsors assigned a set number of acres to mitigate. The Work Group Members themselves were to govern the process of allocation and created a guidance document to do so, titled: "*Albeni Falls Interagency Work Group Operating Guidelines and Guiding Principles for Mitigation Implementation 1998"*.

> This document defined and explained the Work Group's purpose, its roles and responsibilities, the decision making process, and where mitigation implementation will occur. This document was officially recognized and signed by each Work Group Member; BPA was not involved in the creation of this document or a participant in its signing. The document also served to absolve BPA from having to "divide the pie" with respects to the Albeni Falls HU Ledger. The onus of parceling out the HU ledger was borne by Work Group Members. BPA was to ensure that mitigation efforts to the degree possible best paralleled the plan described within the "Albeni Falls Wildlife Protection, Mitigation and Enhancement Plan, Final Report 1987" (Martin and others 1988).

Early on in the Program when Work Group Members acquired mitigation parcels with portions of out-of-kind cover types, they provided BPA with "HEP" reports utilizing only the in-kind HEP evaluation species listed in the Albeni Falls loss assessment (Martin and others 1988). Moreover, each Work Group Member had its own interpretation as to how HEP model stacking and cover type/species matrices should be utilized[17]. As discussed in greater detail below, using

[17] At one point in time, there were four Albeni Falls species matrices, including one developed by BPA COTR staff. The RHT also independently developed an Albeni Falls matrix that was consistent with the HEP model stacking in the matrix developed by BPA staff. Most project sponsors later adopted the cover type/species matrix developed by KTI.

the in-kind cover types from the loss assessment and not using the same ratio for cover types/species stacking as the loss assessment resulted in compensation site reports that understated actual HU gains because they did not follow the scientific principles underlying HEP.

Once the RHT began assisting individual Work Group Members it became apparent the RHT's role in the process, as viewed by the Work Group Members, was going to vary considerably. Some Work Group Members limited the RHT role to performing singular tasks such as, collecting habitat variable data; while with others the RHT was to conduct full scale HEP surveys and draft reports. Given this experience, the RHT voiced crediting concerns to BPA staff in in 2007 and followed up with a white paper in 2008 on HU stacking, using Albeni Falls as an example (Appendix I). The Council included that paper as a cautionary measure in its 2009 Program.

The RHT recognized that the Work Group Members in their earlier individual survey efforts had not followed the standard HEP protocols or the crediting practices used by other project sponsors across the Columbia Basin. The RHT also perceived that Work Group Members shared a paradigm that viewed BPA as more of an adversary than a partner. What were considered principled compromises based on HEP protocols and later, Wildlife Crediting Forum (NPCC 2011) consensuses in other areas (e.g., applying proper HEP model stacking and substituting HEP models), seemed to appear to the Work Group as capitulating to BPA.

When the RHT performed HEP surveys applying appropriate cover type/species matrices, consistent HEP model species stacking, and Crediting Forum guidelines (NPCC 2011), Work Group Members objected to survey results. After a series of discussions between several individual Work Group Members, BPA, and the RHT, it was apparent that resolution of these issues would not be forth-coming, and that further deployment of the RHT to conduct Work Group Member HEP surveys was not a judicious use of the RHT's time, nor was cost effective. In response, BPA staff asked the RHT to:

1. Discontinue HEP work, including data calculations and final reports, on certain member projects until the cover type/species matrix issue was resolved.
2. Use cover type species matrices developed/supplied by individual Work Group members to reduce controversy. The RHT applied this to KTOI projects[18].
3. Continue to assist IDFG mitigation staff with the collection of habitat variable data.

Although a number of HEP related issues were experienced by the RHT while working with various Albeni Falls work group members, the primary issue common to all project sponsors was the lack of agreement on compensation site cover type/species matrices and HEP model stacking. Related issues included HEP model species substitution and the use of HEP models

[18] NPPC's Crediting Forum (NPCC 2011) guidelines included a crediting SOP for reconciling HUs that could be applied if warranted.

not listed in the Albeni Falls Dam loss assessment (Martin and others 1988). These issues are closely related and are addressed below.

Issue – HEP Model Stacking and Cover Type/Species Matrices

Background

The RHT used simple mathematics to determine that in the original loss assessment at least five or six HEP models were applied to each loss cover type to calculate BPA's HU mitigation obligation at Albeni Falls Dam. In contrast, Work Group Members generally supported using a maximum of three or four HEP models per cover type, which was significantly less than what the RHT determined was used at Albeni Falls Dam. Using fewer HEP models per cover type significantly reduced the amount of HUs available for BPA mitigation credit.

Data found in the Albeni Falls loss assessment (Martin and others 1988) and the Crediting Forum Report (NPCC 2011) supports the RHT's conclusion. Both documents report the loss of 28,658 HUs (Table 7) and 6,690 acres of habitat on two cover types (Table 8) due to C&I at Albeni Falls Dam. Dividing the acres inundated by the HUs lost results in a 4.3 HUs per acre loss ratio.

Table 7 Albeni Falls Dam loss assessment HUs

Albeni Falls HEP Models	Loss HUs
Mallard Duck	5,985
Canada Goose	4,699
Redhead Duck	3,379
Breeding Bald Eagle	4,508
Wintering Bald Eagle	4,365
Black-capped Chickadee	2,286
White-tailed Deer	1,680
Muskrat	1,756
Total	**28,658**

Table 8 Albeni Falls Dam loss assessment cover types and acres

Loss Cover Types	Acres
Herbaceous Wetland	4,376
Forested Wetland	2,314
Total	**6,690**

Work Group Members also generally did not support the use of substitute HEP models that would have been a better biological fit for the out-of-kind habitat conditions/cover types found on the multiple out-of-place mitigation properties they selected for acquisition. Instead, Work Group Members continued to support using only those in-kind models found in the Albeni Dam loss assessment (Martin and others 1988). In the opinion of the RHT there was not a science based rationale for using the loss assessment HEP species models that biologically did not fit mitigation site conditions or were clearly inappropriate to evaluate dissimilar cover types.

BPA attempts to assist the RHT in resolving matrix/stacking and substitution issues were largely unsuccessful. Work Group Members were unable to consolidate their views or unwilling to compromise their position(s). It also appeared that growing discord between the individual Work Group Members began to develop over issues such as the locations of land acquisitions, the distribution of funding within the Albeni program, how much mitigation remained, and how that remainder could or should be divided; further complicating resolution of HEP based issues.

It was unclear to the RHT whether efforts by BPA COTRs to facilitate negotiations were supported by BPA Fish & Wildlife Program Managers. What was clearly evident, however, was that the apparent fractionalization of the Work Group Members combined with the difficulty developing a unified approach across its entire wildlife program, BPA was unable to find a clear resolution at Albeni Falls. What developed out of this circumstance is the two tiered crediting now present in the UCRS (i.e. what RHT considers the science-based approach taken at Grand Coulee and Chief Joseph Dams and the unsupportable unscientific approach taken at Albeni Falls Dam). Crediting issues with all but one Work Group Member remains unresolved (the Kalispel Tribe of Indians recently negotiated an Accord agreement with BPA to resolve mitigation issues).

Discussion

HEP uses field-tested models to assess the quality of habitat for each species representing a cover type. Habitat quality, described by a "Habitat Suitability Index" (HSI), ranges between 1.0 (optimum habitat) to 0.0 (unsuitable habitat). Optimal habitat quality for a species (1.0 HSI) was rarely documented in loss assessments or compensation site HEP results as was totally unsuitable habitat quality (0.0 HSI).

Across the Fish and Wildlife Program, the RHT found that the preponderance of HEP model HSIs for both loss assessments and compensation sites ranged between 0.3 HSI and 0.8 HSI. The implication is that optimal habitat (1.0 HSI) rarely occurs and therefore is not a realistic consideration when estimating the number of HEP models used per cover type at Albeni Falls Dam.

To reverse engineer the loss assessment and determine the number of species per cover type used in the 1987 loss assessment, the RHT tested an assumption. Assuming all habitat inundated by Albeni Falls Dam was perfect for the species it supported, the HSI would be 1.0. Under this best case scenario, multiplying the 6,690 loss acres by 4 HEP models and the 1.0 HSI (6,690 x 4 x 1 = 26,760 HUs) shows that at least 4+ species per cover type are required (Table 9) to obtain the 28,658 loss HUs reported in the Albeni Falls Dam loss assessment.

Table 9 Albeni Falls loss HU example based on a 1.0 HSI

Loss Acres	Number of HEP Models	HSI	HUs
6,690	1	1.0	6,690
6,690	2	1.0	13,380
6,690	3	1.0	20,070
6,690	4	1.0	26,760
6,690	5	1.0	33,450
6,690	6	1.0	40,140

The RHT followed Crediting Forum standard operating principles (NPCC 2011) and adjusted the "HSIs" in Tables 10, 11, and 12 to calculate the minimum number of HEP species models needed to evaluate each cover type to support the Albeni Falls Dam 28,658 HU loss figure. Recognizing that the average HSI for all inundated habitat losses is less than the hypothetical 1.0 HSI (likely closer to 0.7 HSI), then the loss assessment's authors had to have used at least five and possibly six species per cover type to estimate the losses. The same number of species per cover type should be used to estimate BPA's mitigation credit.

Table 10 Albeni Falls HU loss example based on 0.9 HSI

Loss Acres	Number of HEP Models	HSI	HUs
6,690	1	0.9	6,021
6,690	2	0.9	12,042
6,690	3	0.9	18,063
6,690	4	0.9	24,084
6,690	5	0.9	30,105
6,690	6	0.9	36,126

Table 11 Albeni Falls HU loss example based on 0.8 HSI

Loss Acres	Number of HEP Models	HSI	HUs
6,690	1	0.8	5,352
6,690	2	0.8	10,704
6,690	3	0.8	16,056
6,690	4	0.8	21,408
6,690	5	0.8	26,760
6,690	6	0.8	32,112

Table 12 Albeni Falls HU loss example based on 0.7 HSI

Loss Acres	Number of HEP Models	HSI	HUs
6,690	1	0.7	4,683
6,690	2	0.7	9,366
6,690	3	0.7	14,049
6,690	4	0.7	18,732
6,690	5	0.7	23,415
6,690	6	0.7	28,098

Albeni Falls Work Group members, however, do not agree with the RHT's conclusions. Most Work Group members currently support a compensation site cover type/species matrix similar to the example cover type species matrix provided by S. Soultz (KTOI, pers. comm.) displayed in Table 13, which for the most part uses three species per cover type. In addition, the KOTI matrix is an in-kind/out-of-kind apples-to-oranges approach in that it includes only species listed in the Albeni Falls loss assessment (Martin and others 1988). By using only 3 species, instead of the RHT's recommended minimum of 5 to 6 species to evaluate each cover type, the KOTI matrix understates the mitigation BPA has funded and the credit it can claim by at least 25%. The RHT has worked with virtually every state, federal, and tribal wildlife management entity in the Columbia Basin and never found a matrix and stacking problem close to being as problematic as this one.

The RHT suggests that at least two additional HEP evaluation models are needed for each cover type to be consistent with stacking principles found in Crediting Forum guidelines (NPCC 2011). Moreover, to avoid the problem of using in-kind loss assessment species for out-of-kind mitigation projects, the added species should be biologically appropriate for compensation site cover types.

Table 13 Albeni Falls work group cover type/species matrix example

HEP Species Models	Riverine Wetland / Deciduous Forest Wetland	Scrub-shrub Wetland	Emergent Wetland	Uplands	Open Water
Bald Eagle (B)	X				
Bald Eagle (W)	X				X
Black-capped Chickadee	X	X[a]		X	
Canada Goose			X		X
Mallard	X (100m)[a]	X	X	X (100 m)[a]	X[a]
Muskrat			X		X (veg)[a]
White-tailed Deer	X	X		X	
Yellow Warbler		X		X	
Redhead Duck			X[a]		X
Total Species Per Cover Type[b]	**4+**	**3+**	**3+**	**3+**	**3+**

[a] Dependent on HSI and related habitats

[b] The "+" means that the additional species denoted by "a" in the table are added only under special conditions e.g., the mallard model is applied within 100m of water.

The RHT modified the KTOI matrix shown in Table 13 to illustrate how the KTOI matrix might appear if appropriate HEP model stacking requirements were followed (Table 14). Added

species are displayed in "red" and are only examples (actual compensation site HEP models would vary depending on cover types, evaluation species' importance to project sponsors, and other related criteria).

Table 14 RHT's modified KTOI cover type/species matrix example

HEP Species Models	Riverine Wetland / Deciduous Forest Wetland	Scrub-shrub Wetland	Emergent Wetland	Uplands	Open Water
Bald Eagle (B)	X				
Bald Eagle (W)	X				X
Black-capped Chickadee	X	X[a]		X	
Canada Goose			X		X
Mallard	X (100m)[a]	X	X	X (100 m)[a]	X[a]
Muskrat			X		X (veg)[a]
White-tailed Deer	X	X		X	
Yellow Warbler		X		X	
Redhead Duck			X[a]		X
Mink	X	X	X		
Downy Woodpecker	X				
Osprey					X
Blue Heron		X	X		
Red-tailed hawk				X	
Western Meadowlark				X	
Lesser Scaup					X
Total Species Per Cover Type[b]	**6+**	**5+**	**5+**	**5+**	**5+**

[a] **Dependent on HSI and related habitats**

[b] **The "+" means that the additional species denoted by "a" in the table are added only under special conditions e.g., the mallard model is applied within 100m of water.**

Applying the modified cover type/species matrix would result in crediting additional HUs for each acre acquired/protected resulting in a closer alignment between the Albeni Falls Dam HU to acre ratio, and compensation site HU to acre ratios[19]. This adjustment would increase the number of HUs BPA could claim for credit and also leave fewer unmitigated HUs. As such it would be consistent with crediting practices called for by the Council, adopted as standard

[19] When compensation site stacking is consistent with loss assessment stacking, HU to acre ratios are generally similar.

operating procedures by the Wildlife Crediting Forum (NPCC 2011), and applied elsewhere in the Region.

To date, BPA reports that based on project sponsor data 16,686 HUs have been mitigated leaving 11,972 unmitigated HUs (L. Watts, personal comm.). Based on this HU data, the RHT calculates that BPA would have to acquire an additional 8,756 acres, for a total of 20,959 acres, to mitigate habitat losses identified in the Albeni Falls loss assessment (Martin and others 1988). This is more than three times the number of acres lost due to C&I (Figure 2).

Figure 2 Albeni Falls Dam acre losses and gains comparison

For over a decade, the RHT has consistently observed that when appropriate stacking and HEP models are used, compensation sites HU to acre ratios are similar to loss assessment HU to acre ratios[20]. This suggests that loss and gain acres should be similar and comparable to projects elsewhere in the Region. Work Group Members have adopted practices that result in unreliable HEP crediting reports on compensation sites that significantly underreport the amount of mitigation completed and credit available for BPA to take. Not applying proper stacking generally results in the skewed acre data displayed in Figure 2.

The RHT believes HU gains currently listed in the Pisces data base credited towards Albeni Falls Dam HU losses are largely inaccurate or under-reported and, therefore, should not be used to infer the crediting status at Albeni Falls Dam. Nor are the HU gains precise enough for any realistic HU comparison between hydro facilities.

In what the RHT believes was an effort to bring consistency to wildlife mitigation crediting at Albeni Falls Dam and perhaps to limit controversy, BPA staff discussed/negotiated with the Work Group members to set aside the biologically based HEP approach in favor of Work Group

[20] The Albeni Falls HU per acre ratio is 4.3 HUs per acre.

Members agreeing to a guarantee of 2.25 "HU's" credit for each acquired/protected acre. Although this is compromise is far from the 4.3 loss HUs per acre ratio described in the Albeni Falls loss assessment, L. Watts (BPA, pers. comm.) reports that the majority of the Work Group Members do consider that the 2.25 value represents a reasonable averaging of the HU's across the total spectrum of mitigation acreage under management. If adopted, HUs would no longer have biological relevance and should be considered "negotiated HUs". As of now, it's unclear whether Work Group members responded formally to the "HUs per acre" approach[21].

The RHT firmly believes that the biologically based HEP process is no longer the appropriate "tool" for crediting C&I HU gains at Albeni Falls. Rather than spend additional time, effort, and funding to find an equitable biologically based HEP resolution (which is extremely unlikely), the Program would benefit more, and likely be less expensive, if remaining unmitigated HU losses and questions were resolved in negotiated settlement discussions.

Based on this history, the RHT suggests that the number of unmitigated HUs remaining at Albeni Falls needs to be *estimated* by either adjusting HEP baseline HU results to reflect appropriate HEP model/HU stacking, or through applying the Albeni Falls HU to acre ratio, which is 4.3 HUs for each compensation site acre acquired/protected. If neither of these solutions is acceptable to all parties, then some other *reasonable* HU factorial to calibrate Albeni Falls mitigation with the rest of the basin is recommended.

Closing Comments

The number of unmitigated HUs directly impacts the amount of property tribes and agencies can acquire/protect and ultimately defines the size of a project sponsor's C&I mitigation program and potential settlement. As such there is sometimes an apparent incentive to reduce the number of HUs credited towards BPA's mitigation obligation[22]. It also appears that as the number of unmitigated HUs diminish, the perceived value of the remaining HUs increases.

The number of HUs credited for a given compensation project can vary significantly, through use of incomplete/inappropriate compensation site cover type/species matrices, which define HU stacking, and by evaluating compensation site cover types with biologically inappropriate HEP models. This does not imply that any project sponsor purposely used this as a strategy to gain additional HUs or engaged in any wrong doing.

When HEP surveys are not conducted consistently with established HEP protocols or crediting practices, it almost always results in fewer HUs credited towards BPA's wildlife mitigation

[21] Lee Watts (BPA, pers. comm.) indicated that the recent KTI agreement was based roughly on 2.25 HUs per acre.

[22] Although no longer the case, at least one Work Group member did not initially credit BPA HUs for compensation site cover types not listed in the Albeni Falls Dam loss assessment (Martin and others (1988).

obligation and NPCC's crediting ledger. This can create equity and fairness questions for those project sponsors throughout the Region who followed the "rules" and credited the ledger with more HUs than project sponsors who did not follow the same standard.

A number of project sponsors across the Region have expressed to the RHT that, "Following HEP protocols/crediting practices may work against them by potentially lowering the value of final C&I mitigation settlements". In addition, the same managers ask, "Why should they follow established protocols when there are apparently no consequences for not following the guidelines"? Some have gone as far as to suggest that they, "should cut their reported HUs in half" since discrepancies in crediting have crept into the system. The RHT believes the principled way to address these concerns is to have the Council and BPA ensure that mitigation crediting reports and estimates adhere to the Crediting Forum's standard operating procedures.

Regardless of wildlife mitigation process short comings, it must be recognized that NPCC's Wildlife Mitigation Program has significantly benefited wildlife and fish resources and society alike throughout the greater Columbia Basin Region. In the Upper Columbia River Sub-region alone, at least 116,660 acres of wildlife habitat has been permanently protected.

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Appendix A – Habitat Evaluation Procedures Synopsis

HEP, developed by the U.S. Fish and Wildlife Service (USFWS), is used to quantify the impacts of development, protection, and restoration projects/measures on terrestrial and aquatic habitats by assessing changes, both negative and positive, in habitat quality and quantity (USFWS 1980), (USFWS 1980a).
HEP is a habitat based approach to impact assessment that documents change through use of a habitat suitability index (HSI). The HSI value is derived from an evaluation of the ability of key habitat components to provide the life requisites of selected wildlife and fish species.

The HSI value is an index to habitat carrying capacity for a specific species or guild of species based on a performance measure (e.g. number of deer per square mile) described in HEP species models. The index ranges from 0.0 to 1.0. Each increment of change is identical. For example, a change in HSI from 0.1 to 0.2 represents the same magnitude of change as a change from 0.2 to 0.3, and so forth. A HSI of 0.3 indicates that habitat quality/carrying capacity is marginal while a HSI of 0.7 suggests that habitat quality/carrying capacity is relatively good for a particular species (Table 1).

Table 1 HEP verbal equivalency rating

Habitat Suitability Index	Verbal Equivalent
0.0 < 0.2	Poor
0.2 < 0.4	Marginal
0.4 < 0.6	Fair
0.6 < 0.9	Good
0.9 ≤ 1.0	Optimum

Habitat units are determined by multiplying the habitat suitability index by the number of acres of habitat (cover type) protected. For example, if the HSI output for a mule deer HEP model is 0.50 and the number of acres of shrubsteppe habitat protected is 100, then the number of HUs are 50 (0.50 HSI x 100 acres = 50 HUs).

Habitat variables, suggested mensuration techniques, and mathematical aggregations of assessment results are included in HEP evaluation species models. In some cases, habitat variable measurement techniques have been modified to take advantage of current global information system (GIS) data/capabilities.

Appendix B – Cover Type Pairing Background

Cover type "pairing" was a concept developed in the early years of the Columbia River Wildlife Mitigation Program as a method to guide how BPA received credit for acquiring "out of kind/dissimilar" cover types[23]. BPA and the Northwest Power Conservation Council (NPCC) supported Columbia River wildlife mitigation project managers who wanted the ability to acquire high quality functional habitat and important high value "out of kind" cover types. In exchange, wildlife managers agreed to give BPA credit for all lands acquired with BPA wildlife mitigation funds, thus establishing the need to develop the cover type "pairing" concept[24]. Cover type "pairing" addressed the question, "how are out of kind/dissimilar cover types, HEP models, and habitat units credited against a given loss assessment"?

Pairing "in kind" loss assessment and project cover types is simply aligning "like" cover types and, in most cases, evaluating like cover types with the same number of HEP models (stacking) and the same species listed in the credited loss assessment. For example, the project area grassland cover type would correspond to the loss assessment grassland cover type. If four HEP models were used to evaluate the grassland cover type in the loss assessment, then four HEP models would be used to evaluate the project area grassland cover type.

Similarly, "pairing" "out of kind" project cover types with loss assessment cover types involves "pairing" project cover types with loss assessment cover types comprised of "similar" habitat elements or structural conditions such as shrubs, trees, and snags. For example, a compensation site upland deciduous shrub cover type may be "paired" with the riparian shrub cover type listed in a loss assessment matrix because the "similar" habitat element/structural condition shared by both cover types is the shrub component; specifically, deciduous shrubs.

A secondary consideration is the HEP species models associated with the "paired" loss assessment cover type. If habitat elements/structure conditions are similar between a compensation site cover type and more than one loss assessment cover type, the RHT generally "paired" the compensation site cover type with the loss assessment cover type that included the most HEP models having the best biological fit for compensation site cover type conditions. Note that "pairing" dissimilar cover types does not automatically equate to total HEP model species substitution.

[23] "Out of kind/dissimilar cover types" are cover types that are not identified as "losses" in a given loss assessment document.

[24] Standard HEP protocols (USFWS 1980) suggest that compensation acquisition and easement cover types should be identical (in-kind) to the cover types identified in the applicable loss assessment document unless another alternative is agreed upon by the involved parties. The mitigation program that BPA funds has become an out-of-kind equal compensation mitigation program by default because wildlife managers chose project lands that, in many cases, include large areas of out-of-kind cover types that are not identical to those identified in the loss assessments.

Appendix C – Stacking Definition and Standard Operation Procedures

Definition

The Crediting Forum Technical Team (NPCC 2011) stated, "Stacking occurs when multiple species are used to characterize the quality of a single cover type. It becomes a crediting issue when the same number of species used to assess losses is not in turn used to characterize the compensation lands. Stacking is an issue of how you adjust the credits of the mitigation sites to be in balance with the number of species used to characterize the losses. Loss assessments are what they are and should not be revised or replaced to address stacking issues".

Stacking Standard Operation Procedures (SOP)

- SOP options to address stacking issues include:

  a. Use the same number of species to characterize the out of kind cover types as were used to characterize the loss assessment cover types (see example table at bottom of page).

  b. If using fewer species to characterize the mitigation site cover type than were used to characterize the losses, average the HSIs of the out of kind mitigation cover types and multiply by the number of species used in the losses. However, species selection must be peer reviewed and approved by the regional HEP team, BPA and the project proponent.

  c. If incidental out of kind cover types (inclusions) are associated with a mitigation acquisition, assume the same HSI as the adjacent cover type.

  d. Do not credit the same acres of a given cover type between two or more hydro-projects with a combination of species from both.

"Paired" Grand Coulee Dam Cover Type/HEP Model "Stacking" Matrix Example				
Grand Coulee Dam Cover Types	**Riparian Forest**	**Shrubsteppe**	**Agriculture**	**Riparian Shrub**
Number of Models	3	3	2	3
"Paired" Project Example Cover Types	**Deciduous Forest**	**Shrubsteppe**	**Agriculture and Pasture**	**Deciduous Shrub**
Number of Models	3	3	2	3

Appendix D – HEP Compensation Type Descriptions

In Kind/Equal/Relative Compensation

Three types of compensation i.e., in kind, equal, and relative, as described in HEP manuals, (USFWS 1980) are listed below along with pertinent comments related to the Columbia Basin Wildlife Mitigation Program's use of HEP.

In-kind (no trade-off)

This compensation goal is to precisely offset the HU loss for each evaluation species. Therefore, the list of target species must be identical to the list of negatively impacted species" (USFWS 1980). Typically, this involves acquiring the same cover types as those impacted. In addition, "in kind" compensation does not suggest that HEP species can be applied to evaluate inappropriate cover types (forcing a "square peg" in a "round hole"), or that HEP models can't be modified if necessary.

Equal replacement (equal trade-off)

This compensation goal is to precisely offset the HU losses through a gain of an equal number of HUs. With this goal, a gain of one HU for any target species can be used to offset the loss of one HU for any evaluation species. The list of target species may or may not be identical to the list of impacted species" (USFWS 1980). In addition, there is no requirement to acquire the same habitat/cover types lost due to dam construction.

Relative replacement (relative trade-off)

"This compensation goal specifies that the gain of one HU can be used to offset the loss of one HU at a differential rate depending on the species involved" (USFWS 1980) e.g., two grassland HUs could be traded for one emergent wetland HU. This procedure has not been used for crediting in the Columbia Basin.

Appendix E – Grand Coulee and Chief Joseph Dam Matrices

RHT Grand Coulee Dam Cover Type/Species Matrix							
HEP Models	Shrub-steppe	Conifer Forest	Riparian Forest	Mixed Forest	Agriculture	Riparian Shrub	Riparian
Sharp-tailed grouse	x		X[a]		x	X[a]	
Sage grouse	x						
Ruffed grouse			x	x		x	
Mourning Dove					x		x
Mule Deer	x						
White-tailed deer		x	x	x		x	
TOTAL	3	1	3	2	2	3	1
[a] Added to account for the HUs listed for riparian forest and riparian shrub cover types shown as evaluation species in the loss assessment.							

Chief Joseph Dam Cover Type/Species Matrix									
HEP Models	**Shrubsteppe**	**Rock**	**Sand, Gravel, Cobble**	**Island - Sandbar**	**Mixed Forest**	**Agric.**	**Riparian-Macrophyllus Shrub**	**Riverine**	**Palustrine**
Sharp-tailed grouse	**x**						**x**		
Sage grouse	**x**								
Spotted Sandpiper			**x**	**x**					
Yellow Warbler							**x**		**x**
Mule Deer	**x**				**x**				
Bobcat		**x**							
Lewis' Woodpecker					**x**				
Pheasant						**x**			
Mink								**x**	
Canada Goose				**x**					
TOTAL	**3**	**1**	**1**	**2**	**2**	**1**	**2**	**1**	**1**

Appendix F – Grand Coulee and Chief Joseph Dams HU Allocations

Excerpt from Grand Coulee Dam loss assessment (Howerton and others 1986)

TABLE 20. **SUMMARY OF HABITAT UNITS AND NEST SITES LOST DUE TO PROJECT.** One Habitat Unit equals one acre of optimum habitat for the specified indicator species or indicator habitat.

	Habitat Units			
Habitat Unit type	Colville	Spokane	State	Total
Sage grouse	893	0	1,853	2,746
Sharp-tailed grouse	8,833	**2,609**	21,281	32,723
Ruffed grouse	4,152	974	11,376	16,502
Mourning dove	1,923	653	6,740	9,316
Mule deer	10,827	1,087	15,219	27,133
White-tailed deer	3,982	1,180	16,470	21,632
Riparian forest	780	176	676	1,632
Riparian shrub	14	0	13	27
	Secure Island Nest Sites			
Canada goose	10	20	44	74

Grand Coulee Dam HU Losses				
Evaluation Species	**Colville Tribe HUs**	**Spokane Tribe HUs**	**Washington State HUs (WDFW)**	**Total**
Sage Grouse	893	0	1,853	**2,746**
Sharp-Tailed Grouse	8,833	2,609	21,281	**32,723**
Ruffed Grouse	4,152	974	11,376	**16,502**
Mourning Dove	1,923	653	6,740	**9,316**
Mule Deer	10,827	1,087	15,219	**27,133**
White-tailed Deer	3,982	1,180	16,470	**21,632**
Riparian Forest	780	176	676	**1,632**
Riparian Shrub	14	0	13	**27**
Total HUs	**31,404**	**6,679**	**73,628**	**111,711**
Percent of HUs	28.11%	5.98%	65.91%	**100.00%**
Canada Goose Island Nest Sites	10	20	44	74

Excerpt from Chief Joseph Dam loss assessment (Berger and Kuehn 1992)

Washington Department of Wildlife

Target Species	Target Habitat	Habitat Units 1/
Sharp-tailed Grouse	Shrub-steppe/riparian draws	1145.05
Sage Grouse	Shrub-steppe	589.57
Yellow Warbler	Ponds/slackwater	29.03
Canada Goose	Islands/sandbar	106.59
Ring-necked Pheasant	Agriculture	119.34
Lewis' Woodpecker	Ponderosa pine/mixed forest	143.02
Mink	Riverine	460.20
Mule Deer	Shrub-steppe/mixed forest	996.06
Bobcat	Rock/rockland	200.35
Spotted Sandpiper	Sand/gravel/cobble	627.23

Colville Confederated Tribes

Target Species	Target Habitat	Habitat Units
Mule Deer	Shrub-steppe/mixed forest	996.06
Sharp-tailed Grouse	Shrub-steppe	1145.05
Canada Goose	Island/sandbar	106.59
Sage Grouse	Shrub-steppe	589.57
Bobcat	Rock/rockland	200.35
Mink	Riverine	460.20
Yellow Warbler	Ponds/slackwater	29.03
Lewis' Woodpecker	Ponderosa Pine/mixed forest	143.02
Ring-necked Pheasant	Agriculture	119.34
Spotted Sandpiper	Sand/gravel/cobble	627.23

1/ These figures reflect the combined loss of respective wildlife habitat that resulted from land loss due to inundation and uplands affected by original construction of Chief Joseph Dam.

Chief Joseph Dam HU Losses			
Evaluation Species	**Colville Tribe HUs**	**Washington State HUs (WDFW)**	**Total**
Sage Grouse	590	590	**1,180**
Sharp-Tailed Grouse	1,145	1,145	**2,290**
Yellow Warbler	29	29	**58**
Canada Goose	107	107	**214**
Ring-necked Pheasant	119	119	**238**
Lewis' Woodpecker	143	143	**286**
Mink	460	460	**920**
Mule Deer	996	996	**1,992**
Bobcat	200	200	**400**
Spotted Sandpiper	627	627	**1,254**
Total HUs	**4,416**	**4,416**	**8,832**
Percent of HUs	50.00%	50.00%	**100.00%**

Appendix G – Abbreviated Crediting Forum Report

Wildlife Crediting Forum Report on Forum Deliberations
January 2010 – May 2011

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A. HEP Crediting Subcommittee Report

(Appendices B through G not included due to data download issues)

EXECUTIVE SUMMARY

The Council chartered the Forum to provide advice on the crediting and accounting of wildlife habitat mitigation associated with the construction and inundation impacts of the Federal Columbia River Power System (FCRPS). The Forum consists of wildlife program managers representing tribes (14 in all) and state fish and game departments (Oregon, Washington, Idaho) impacted by the FCRPS, the U.S. Fish and Wildlife Service (USFWS), and representatives from the Bonneville Power Administration (BPA) and BPA Customers. The State of Montana is not a participant as wildlife mitigation issues relating to the FCRPS have been settled by prior agreement between BPA and the state.

The instructions to the Forum were to make recommendations regarding the NPCC Wildlife Crediting Program (Program) with respect to:

- Developing a commonly accepted "ledger" of habitat units acquired by BPA
- Developing a common database for tracking, assigning and recording habitat units
- Resolving issues about accounting for habitat units
- Other issues related to wildlife crediting, including the use of Habitat Evaluation Procedures (HEP) or alternative evaluation procedures

The charter also allowed for the development of strategies that will allow the parties to achieve long-term agreements.

The Forum and several subcommittees have been meeting since January, 2010 to address Program issues. Much of the Forum's early deliberations focused on the difficulty of coming to collective agreement on all issues posed by the Council's Fish and Wildlife Program. Crediting issues were found to differ depending on geographic area, specific hydropower projects, and the entities involved in specific crediting decisions. The methodologies involved in crediting decisions have also changed and evolved over time, been interpreted and applied in differing ways, and in some cases crediting has been resolved through individual project agreements. Reflecting on these factors, the Forum felt that the many technical and recordkeeping issues with the ledger, overlaid with unresolved policy issues, would make full resolution at the Forum level difficult, and decided that "agreements" were more likely to be an effective means of resolution. At the same time, the Forum indicated that the technical analysis of the ledger should continue in order to help

resolve or make clear as many outstanding issues as possible. The Forum dedicated considerable effort over several months and while not every issue or dispute was resolved, and while significant anomalies remain, the commonalities developed by the Forum provide a solid basis for bringing this portion of the Program to a successful conclusion. Major areas of accomplishment include:

- Establishment of a ledger depicting the current status of Bonneville-funded wildlife mitigation activities
- Development of Standard Operating Procedures for future applications of HEP
- Development protocols for determining the amount of credit Bonneville should receive for management actions that occur on Federal lands
- Development of protocols for determining the amount of credit that Bonneville should receive for fish mitigation projects that benefit wildlife
- Acceptance of the Fish and Wildlife Program loss assessments as the agreed upon measure of wildlife losses

However, several policy-related issues remain unresolved including:

- Agreement on the application of the crediting ratio established in the Fish and Wildlife Program
- Agreement on how to deal with wildlife species benefiting from open water habitats resulting from reservoirs associated with dam construction
- Agreement on how to account for mitigation that occurred prior to the 1980 Northwest Power Act

While these issues remain unresolved, the report provides important background information on them which can form the basis for negotiations focused on agreements and for future Council policy deliberations associated with future Fish and Wildlife Program amendment processes.

PURPOSE

The purpose of this summary report is to capture the work conducted by the Wildlife Crediting Forum (**Forum**). The Forum was chartered in late 2009 by the Northwest Power and Conservation Council (**NPCC**) to provide input on the Council's Columbia River Basin Fish and Wildlife Program (Program). This summary report provides an overview of the Forum's discussions and direction through December 2, 2010. This summary report and appendices also reflect the additional work conducted in January and February 2011 with Bonneville Power

Administration (BPA) and Columbia Basin Fish and Wildlife Authority (CBFWA) staff to further analyze Program records by subbasin.

This summary report only reflects the input of individual Forum members and does not necessarily represent the policy position(s) of the tribes, agencies, and stakeholders they represent. Forum members have been made aware that they serve only in an advisory role to NPCC.

BACKGROUND

NPCC chartered the Forum to provide advice on the quantifying and accounting system (informally known as the **Ledger**) for the wildlife habitat mitigation credits associated with the construction and inundation impacts of the Federal Columbia River Power System (**FCRPS**) within the Columbia River Basin (**Basin**). The database that currently houses the Ledger is called **Pisces**. The Program was initiated in 1981, and has been modified from time to time (most recently in 2009) by NPCC in updating the overarching **Northwest Power Plan, which by law includes the Program as a component**.

The Forum consists of wildlife co-managers representing the 14 tribes and 3 state fish and game departments (Oregon, Washington, Idaho) impacted by FCRPS; and representatives of the U.S. Fish and Wildlife Service (USFWS), BPA, and BPA Customers. The State of Montana is not a Forum participant, as wildlife mitigation issues relating to FCRPS have been settled by prior agreement between BPA and that state. CBFWA and NPCC staff acted as advisors to the Forum. A private consulting firm (Parametrix) was engaged to facilitate Forum processes and to provide for augmented technical analysis of the Ledger.

The original Forum charter called for the development of recommendations with respect to:

- Developing and recommending to the Council a commonly accepted ledger of habitat units acquired by the Bonneville Power Administration.
- Recommendations to the Council on ways to resolve issues about accounting for habitat units.
- Developing a common data base for tracking, assigning and recording habitat units.
- Reviewing issues related to wildlife crediting, such as the frequency and use of the Habitat Evaluation Procedure (HEP) following the initial baseline evaluation. The forum could also provide recommendations on acceptable alternative evaluation procedures.

The Forum met eight times in 2010 to address the Program issues. The Forum also convened three sub- committees to discuss specific issues (credits for fish projects, Federal lands, and general Ledger issues). Each of these subcommittees met one or two times, and produced

reports which were provided to the full Forum. The Forum conducted wildlife crediting issues orientation and reviews over the course of its first three meetings. Starting in May 2010, the Forum focused on the difficulty of coming to collective agreement on the resolution of even the first issue specified in its NPCC charter (see above). Several factors contributed to this challenge:

- Over the course of nearly 30 years, the NPCC has modified the Program from time to time. In addition, some changes have not been uniformly interpreted by the co-managers or BPA.

- Wildlife mitigation is largely, though not exclusively, out-of-place and out-of-kind, which means the areas and species used for mitigation are not necessarily the same as those lost through the construction and inundation of FCRPS dams. Thus, the habitats and species used in the loss assessments were in many cases not the same as those needing crediting on the mitigation sites.

- Crediting issues were found to differ depending on geographic area, specific hydropower projects, and the tribes or agencies involved.

The database system housing the Ledger has also changed and evolved, and some ad-hoc
"workarounds" have been made to fit data into database formats.

- The methodologies involved in the Program have changed and evolved, and interpretation and application has varied in the field, across different subregions, and as entered in the ledger.

- The tool used to evaluate the quality of habitat being acquired or enhanced (the Habitat Evaluation Procedure or HEP) was not designed to provide comparability across a region as large and diverse as the Columbia River Basin.

In some cases, (e.g. Montana, Dworshak, Willamette) crediting has been resolved through individual wildlife mitigation agreements. Generally, these types of agreements have resulted in a comprehensive resolution of wildlife mitigation issues. *NOTE: the use of individual agreements is permitted by the Program.*

Reflecting on these factors, the Forum concluded that the many technical and recordkeeping issues with the Ledger, overlaid with unresolved policy issues, would make full resolution in accordance with the original NPCC charter difficult. The Forum discussed, therefore, the possibility of "settlement agreements" as a more effective means of resolution. At the same time, the Forum indicated that the technical analysis of the Ledger should continue to help resolve or make clear as many outstanding issues as possible. NPCC concurred with this overall "revised" approach and goals at its July 2010 meeting.

NOTE: The possibility of shifting to a "settlement agreement" option is referenced as an acceptable alternative in the original Forum charter: ".... or strategies that will allow parties to achieve long-term settlement agreements." In October 2010, a settlement for the Willamette River Subbasin of the FCRPS was signed between BPA and the State of Oregon (Oregon participated during the early phases of the Forum, but discontinued participation following completion of the Willamette Wildlife Agreement).

On December 2, 2010, the Forum met and discussed ongoing issues and concerns. NPCC staff and the consultants recommended that additional basinwide technical analysis was becoming more costly than merited by the resulting understanding or improvements to the ledger. The suggestion was made that the most valuable additional analysis would be that conducted at the subregional level. A considerable effort with respect to this detailed technical analysis was undertaken **up through May 20, 2011**. The outcomes of these subregional reviews are attached as Appendix D.

Also at the Forum's December 2 meeting, a matrix prepared by NPCC and Parametrix staff was presented that estimated the level of agreement (high, medium, low) by sub-region for each of the remaining issue topics. A version of this matrix, revised as per sub-region reviews, is included in each of the attached sub- region appendices.

NOTE: Inclusion of the following issue topics in this summary report does not mean that the Forum has reached full consensus on any given item. Each may require additional discussion on the part of the full Forum and/or at the subgroup level. Accordingly, specific recommendations are not included. Some divergent viewpoints remain (an example being over the 2:1 crediting ratio). It is also important to keep in mind that within the context of developing settlement agreement(s) a full resolution of many of the remaining Ledger issues identified herein may be moot, as settlement(s) may simply supplant the issue irrespective of the degree to which it is technically resolved (or not).

VARIABILITY AND EXPECTATIONS OF HEP

NOTE: This issue was referred to an ad-hoc subcommittee of the Forum. The summary below reflects the deliberations of that subcommittee. In addition, this particular subcommittee addressed other Crediting issues. ***The full report of the subcommittee is attached as Appendix A.***

At the May meeting of the FORUM, the Ledger Subcommittee provided a report that identified a number of technical and policy issues that would need to be addressed in order to develop a comprehensive and consistent crediting ledger based on habitat unit accounting. The subcommittee was tasked with working through known issues such as: lack of consistency in the use of the Habitat Evaluation Procedure (HEP), HEP models, data collection, "stacking" and other related issues.

Inherent Variability in HEP

However, the subcommittee acknowledged at the outset that a major cause of the variation in the region is the nature of the HEP tool itself. The HEP tool was designed and is very effective as a comparative tool to address mitigation for specific losses. The habitat units provided through the HEP process provide relative value, but should not be seen as an absolute value. HEP was not intended as a comprehensive accounting tool tracking progress over a broad geographic area and over a long period of time. For that reason, the group recognized and accepted there is great variation, either positive or negative, in the habitat units attributed to any given property.

Other Issues

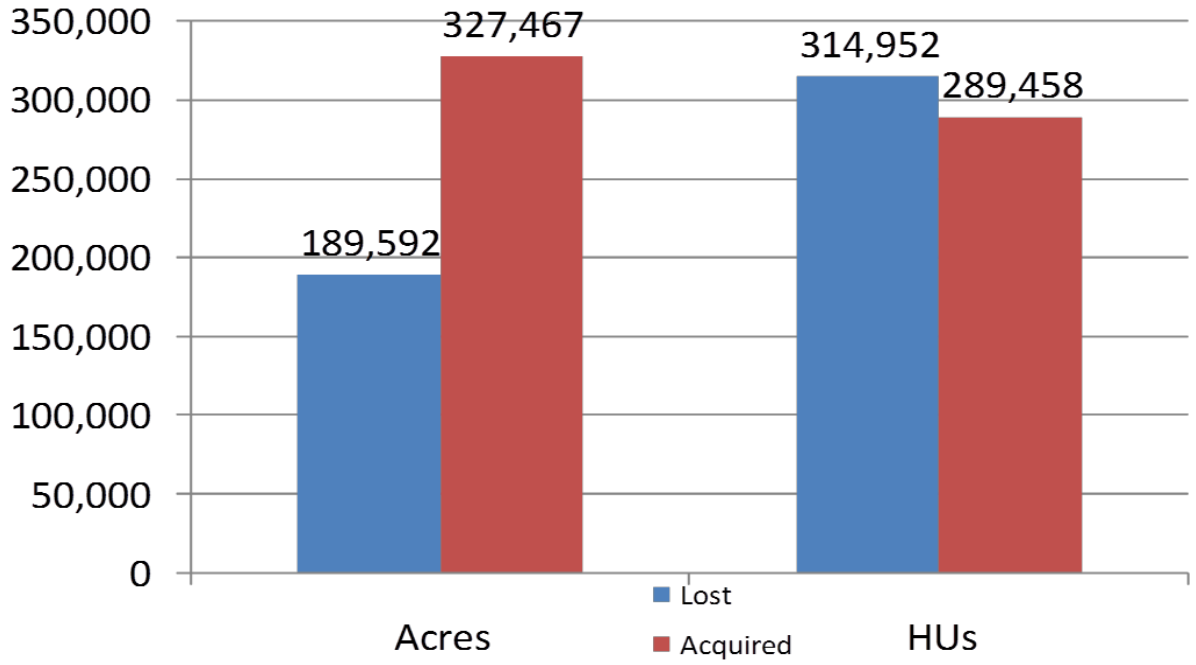
The subcommittee worked through the many issues identified above. Appendix A includes a summary of each of the issues and recommended standard operating procedures for the following:

- HEP Methods
- Stacking
- Crediting

Team Recommendation

In recent years, however, the application of HEP has been relatively consistent among projects. The subcommittee identified that Program crediting issues were found to differ depending on geographic area, specific hydropower projects, and the entities involved in the specific crediting decisions. The methodologies involved in crediting decisions have also changed and evolved over time, been interpreted and applied in differing ways, and in some cases crediting has been resolved through individual project agreements. Reflecting on these factors, the Forum felt that the many technical and recordkeeping issues with the ledger, overlaid with unresolved policy issues, would make full resolution at the Forum level difficult, and discussed the possibility of “agreements” as a more effective means of resolution. At the same time, the Forum indicated that the technical analysis of the ledger should continue to help resolve or make clear as many outstanding issues as possible while recognizing the numerical values from such an exercise are subject to the inherent discrepancies described above.

Figure 1 Acres and Habitat Units Lost and Acquired.



ISSUES RESOLVED

STANDARD OPERATING PROCEDURES FOR HEP

The quality of habitat varies widely between watersheds, subbasins, and major regions across the basin. Thus the number of HUs per acre will also vary from watershed to watershed, subbasin to subbasin, etc. (Figure 1). The type of protection method also varies greatly. These variables were recognized by the Forum as a "fact of life" across such a large region, and such variation cannot be necessarily construed as inequity. The ledger subcommittee's suggestions focused primarily on resolving such issues in future applications of HEP through the development of standard operating procedures to address the following issues:

- Sources of Variation in Crediting Due to HEP Methods: Methodological choices beginning with how habitat types are delineated for analysis and ending with the species models and inputs used can dramatically alter HEP results and therefore the HUs credited.

- Species Stacking: Using fewer species per cover type in the crediting HEP than were used in the loss assessments results in underreporting of HU credit.

- Crediting for Actions on public and other non-Permanent or Unsecured Mitigation: Either HUs on such sites have not been credited yet, or the credit was agreed to absent clear consistent guidance.

See Appendix A for a complete listing of the standard operating procedures recommended by the ledger subcommittee.

CREDITS ON FEDERAL LANDS

NOTE: This issue was referred to an ad-hoc subcommittee of the Forum. The summary below reflects the deliberations of that subcommittee.

Some management actions included in the Program occur on federal lands. This raises the question of how much credit BPA should receive for these actions. The Forum has concluded that for all future projects involving federal lands, the following considerations need to be addressed.

- Whether Bonneville funded actions on federal lands that are generally creditable, but have happened or would have happened anyway based on a Federal agency's usual and customary responsibilities should be included.
- Whether the federal agency's usual and customary responsibilities are such that the protections for wildlife values are assured over time.

This Forum subcommittee suggested that the following standards be applied to the question of crediting of federal land projects:

- Must meet the current Program criteria for wildlife projects
- Must be "permanently" protected – minimum of an easement with a term of equal to the life of the FCRPS, or an appropriately formulated and adopted federal management plan
- Must primarily benefit priority wildlife habitat, species or populations (as defined by federal, state, or tribal wildlife management plans or subbasin plans).
- Subject to a completed wildlife management plan
- Subject to an "adequately funded" long-term restoration and/or maintenance agreement
- Located in the same province as the FCRPS hydroelectric dam against which it is being credited

The subcommittee also suggested that BPA receive credit for any enhancement provided by the management actions taken by the Federal agency, subject to:

- The enhancement credit shall be determined through the use of baseline HEP data if available, or from existing Federal agency data sets if HEP data are not available

- The enhancement credit being in "perpetuity" (e.g.: life of the FCRPS), unless there is a change in the management plan employed by the federal agency that results in the reduction of enhancement values. In such cases, the enhancement credits would be adjusted to reflect the reduced value.

CREDITS FOR FISH MITIGATION

NOTE: This issue was referred to an ad-hoc subcommittee of the Forum. The summary below reflects the deliberations of that subcommittee.

This Forum subcommittee clearly recognized that acquisition and restoration projects primarily, or even exclusively, designed for the purposes of mitigating for fish losses resulting from the FCRPS hydroelectric dam system could and does benefit wildlife. The subcommittee identified the need to develop guidelines for future habitat projects; and the need to state upfront what type of benefits were being sought (e.g.: what are the benefits for fish and wildlife?). The subcommittee also felt that projects that have joint benefits to fish and wildlife should be encouraged.

The subcommittee suggested the following should apply for fish projects to receive wildlife credits:

- Specific wildlife management plans for the project area need to be completed, approved and implemented
- Long-term operations and maintenance funding for wildlife species/habitats must be in place and "adequate"
- Appropriate permanent land protections (easements) should be applied, in perpetuity and with adequate protection language
- The protected wildlife species/populations/habitats should be "priority" and so defined by existing Federal, state or tribal management and subbasin plans
- Located in the same province as the FCRPS hydroelectric dam against which it is being credited

The subcommittee also reviewed a specific list of such projects (Table 1). Projects were classified into four tiers. Tier 1 includes wildlife projects supported by anadromous fish funds that should be credited. The projects shown as Tier 2 were left as subject to "further review." Projects in the Lower Columbia Estuary were flagged as "special case" and included as Tier 3. These Tier 3 projects were identified by the subcommittee as potentially available as operational loss offsets for projects elsewhere in the FCRPS. Tier 4 projects are special existing projects on federal lands that may be considered for credit but in some cases may be difficult to categorize because they are located in areas not directly affected by hydroelectric development. These three projects (Bear Valley, Deer Creek, and Elk Creek) were moved by the Forum from the Federal Lands topic of this summary report and were directed to be included

in Table 1. These types of projects potentially could lead to “overmitigation” in some subregions. However these issues could be addressed as part of an agreement, as was the case with the Dworshak Settlement Agreement or as part of operational losses in the future.

Table 1: Candidate Fish Projects for Wildlife Credits

Parcel Name	Proponent	Subbasin	Acres	Tier
Forrest Conservation Area	CTWSRO	John Day	4,232	1
Oxbow Conservation Area	CTWSRO	John Day	1,022	1
Pine Creek (Wagner Conservation Area)	CTWSRO	John Day	9,000	1
Rainwater Wildlife Area (Part II)	CTUIR	Walla Walla	2,340	1
Yakama Nation Riparian/Wetlands Restoration	Yakama Nation	Yakima	5,000*	1
Yakima Side Channels (Lower Naches)	Yakama Nation	Yakima	376	2
Colville Fish Habitat Projects	Colville Tribes	Okonogan	176	2
Cottonwood Farms / Witte Place	NFWF, Methow Conservancy	Methow	54	2
Hancock Springs	NFWF, Methow Conservancy	Methow	122	2
Heath	NFWF, Methow Conservancy	Methow	140	2
Mid-Methow / Lehman	NFWF, Methow Conservancy	Methow	93	2
Oak Flats (Naches River)	WDFW	Yakima	289	2
Red River Wildlife Area (Little Ponderosa)	IDFG	Clearwater	1,300	2
Sandy River Delta	Forest Service	Sandy	1,400	2
Yakima Side Channels (Upper Yakima)	Yakama Nation	Yakima	544	2
Zumwalt Prairie Preserve (Camp Creek Ranch)	Nature Conservancy	Imnaha	27,000	2
Crims Island	Columbia Land Trust	Columbia Estuary	451	3
Crazy Johnson Creek	Columbia Land Trust	Grays	305	3
Crooked Creek (F&W)	Columbia Land Trust	Columbia Estuary	60	3
Elochoman River	Columbia Land Trust	Columbia Estuary	183	3
Germany Creek	Columbia Land Trust	Columbia Estuary	155	3
Walker Island	Columbia Land Trust	Columbia Estuary	100	3
Willow Grove	Columbia Land Trust	Columbia Estuary	312	3
Bear Valley	IDFG/ShoBan	Salmon	n/a	4

Deer Creek	IDFG/ShoBan	Salmon	n/a	4
Elk Creek	IDFG/ShoBan	Salmon	n/a	4

LOSS ASSESSMENTS

The Forum chose not to reconsider prior loss assessments, and generally accepted *Wildlife Crediting Program Table C-4* (as published in the NPCC-approved 2009 Program) as an agreed to measure of loss assessments (Program Table C-4 is attached as Appendix B to this summary report).

The Forum's determination notwithstanding, in 2009 the Shoshone-Bannock Tribe, Shoshone-Paiute Tribe, Idaho Department of Fish and Game (IDFG) and CBWFA staff re-examined the Anderson Ranch, Palisades, Black Canyon, Minadoka, and Deadwood loss assessments in Southern Idaho for accuracy and consistency relative to other loss assessments across the Basin, and for the number of HUs credited against hydro facilities. HU losses reported in *Program Table C-4* were found by this group to be in error for the number of HUs listed for the Anderson Ranch, Black Canyon, and Palisades projects. In one instance, HUs were listed for sharp-tailed grouse, which was not a target species in any of the SE Idaho loss assessments and yellow-rumped warbler were not listed for Deadwood when they were included in the loss assessment.

NOTE: BPA's position is that it is not responsible for Deadwood Dam mitigation.

Southern Idaho loss assessment calculations subtracted estimated post-project HU gains from the total losses in reporting "net" losses. Because most other loss assessments show just the "total" losses, the "net" HU losses reported in Southern Idaho were 4,835 fewer than if the Southern Idaho loss assessments had listed only the "total" HU losses (as was the case in other parts of the Basin). Wildlife managers now believe that Habitat units gained from Southern Idaho mitigation projects should be examined and subtracted from the losses shown in *Program Table C-4*. .

NOTE: Program Table C-4 as published also included habitat gains.

ISSUES UNRESOLVED

CREDITING RATIO

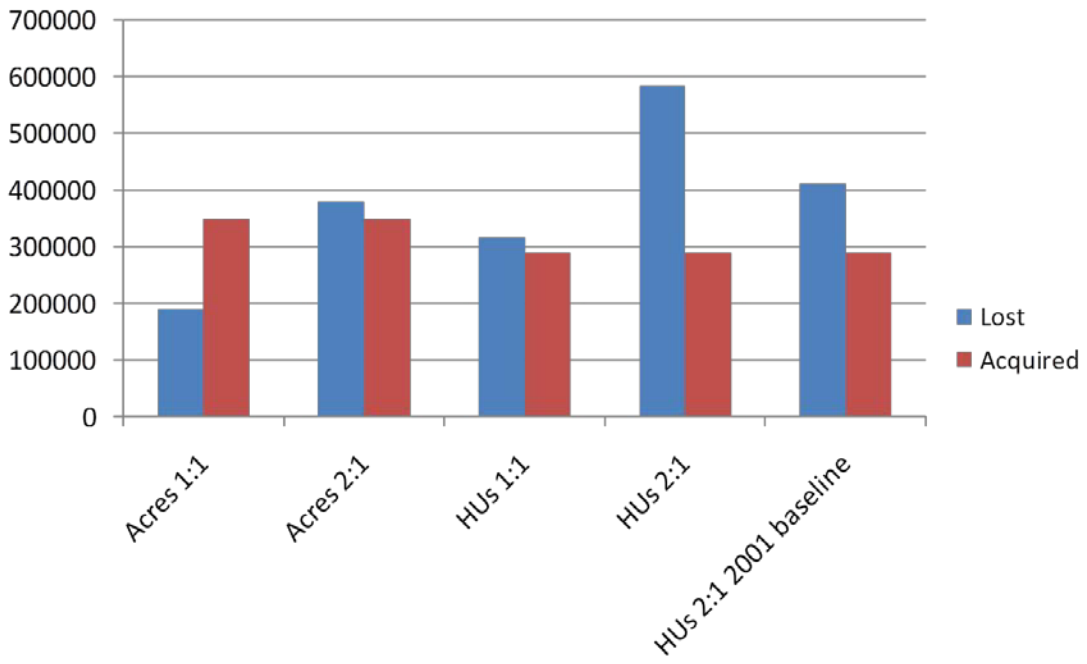
The 2000 Program applied a 2:1 ratio to all remaining habitat units (HUs) in the Ledger that had not been previously satisfied by habitat acquisitions and projects, and went into effect on April 1, 2001. The balance of HUs that remained on April 1, 2001 were to be doubled as a means of "settling" questions over the actual mitigation work remaining to reach full compensation for dam inundation and construction losses. NPCC specified that all credits from projects prior to April 2001 were to remain at the levels previously agreed to by BPA and project proponents.

Moreover, the findings section of the Program acknowledged that "the Council recognized existing mitigation project agreements, even if such agreements have a crediting ratio of 1:1. The 2009 Program reaffirmed the 2:1 crediting ratio (see Appendix E for 2009 Program language).

At its April 2010 meeting, the NPCC responded to questions put by some Forum members with respect to this policy, and confirmed its earlier policy decision establishing a 2:1 ratio effective April 1, 2001. Notwithstanding the NPCC's recent confirmation, Forum members indicated that there is either disagreement with or different interpretations of the Council's position. Further, members indicated that not all entities had made a formal policy decision relative to the Council's 2:1 position. (See Appendix F for a more complete discussion of this issue).

The application of the 2:1 mitigation ratio and its varying interpretations results in changes in the total habitat units outstanding for mitigation. Figure I-2 shows the increase in habitat units or acreage needed to meet the mitigation obligation with the 2:1 ratio applied.

Figure 2.



HYDROELECTRIC FACILITY CREDIT ASSIGNMENTS

Credits are assigned to specific FCRPS hydroelectric facilities. In some cases, credits have been assigned to hydro facilities in different subbasins from the actual project, to facilities that are more distant from projects than other hydro sites or to more than one facility. Although to an extent a recordkeeping issue, this practice has resulted in uncertainty over what HUs remain in any given subregion, whether mitigation has been adequately met for a given dam (or even

overmitigated), and concern that other subregions may end up being “short changed” when mitigation responsibilities are rolled up to the system-wide total. Figure 3 maps the location of wildlife projects and shows the relationship with facilities mitigated by the projects.

Forum members asked that the assignment of wildlife projects to multiple dams be evaluated. The available data does not specify the specific division of HUs to each dam. The way the data is stored in the ledger prevents double counting of credits when applied to multiple projects, but it does create new groupings of dams in addition to individual dams. Accordingly, a single dam may not easily be reviewed based on mitigation projects. Another concern raised by the Forum was the sets of species used for HEP evaluation when spread across multiple dams. The available data does not indicate the species used, or if the species at the dam site are the same as at the wildlife project site.

It also should be noted that the Loss Assessments for the Lower Snake River Dams included in the Fish and Wildlife Program are aggregated for all four dams. Because of the complex relationship of these projects with the Lower Snake River Compensation Plan and other federal responsibilities no individual loss assessments were performed.

Ideally, the geographic distribution of projects effectively assigns projects to the closest dam. In some cases this can be a considerable distance, such as in the lower Snake. However, these projects are in the watershed nearest to the facilities. The Forum has indicated a preference that projects assigned to a hydro facility should at a minimum be in the same province as that hydro facility.

Additionally, it is also important to note that BPA does not believe that it has a mitigation responsibility for losses caused by the construction and operation of Deadwood Dam.

INUNDATION GAINS

The permanent dam reservoir pools resulting from inundation created a significant expansion of open- water habitat on the Columbia River. Not all wildlife species benefiting (and expanding) from new open water were those that lost suitable habitat due to inundation. Tribes and agencies (WDFW and IDFG) concurred that allowing credit for such species did not appear to be appropriate. The following species appear to have increased as a result of open-water gains created by inundation:

Table 2: Species and Gains from the 2009 Wildlife Program

Species	Habitat Units
Bald Eagle	5,693
Black-capped Chickadee	68
Common Merganser	1,042
Greater Scaup	820
Lesser Scaup	20,577
Mallard	174
Mallard (wintering)	13,744
Marsh Wren	207
Osprey	6,159
Redhead	4,475
Other Waterfowl	423
Western Grebe	273
Yellow Warbler	8
Total	**53,663**

PRE-ACT MITIGATION

Prior to the Northwest Power Act of 1980, official mitigation efforts in response to FCRPS system impacts were undertaken by Federal water resource managers (U.S. Army Corps of Engineers, Bureau of Reclamation) and the U.S. Fish and Wildlife Service. Some mitigation actions go back as far as the 1910s, and in many cases are very difficult or impossible to fully document and assess. Wildlife mitigation prior to 1980 was in part generated through consultation with the U.S. Fish and Wildlife Service under the Fish and Wildlife Coordination Act of 1934, and the subsequently more rigorous requirements from amendments in 1946 and 1958. The majority of the pre-Act mitigation is associated with the McNary and John Day dams. The 1991 Geiger Report and 2004 USFWS Coordination Act Report identified 50,938 acres of Pre-Act mitigation and recommended that 14,032 HUs be credited as mitigation (see Appendix D for Giger Report). Because this issue affects each of the sub-regions differently, the impact of the recommended credits will be addressed among the parties within each of the sub-regions.

AGREEMENTS

Following a lengthy discussion of the issues related to the use of HEP, the Forum agreed that resolution of many of these issues would require reevaluation and assessment of many of the original HEPs and a number of the subsequent project HEPs. The Forum concluded that these efforts likely would be both labor intensive and time-consuming, and that it was likely that a better course of action would be to focus on long-term agreements that address the unique

situations represented in the various geographic areas. HEP analysis to date can form the underpinnings of agreements. The intent of this report is to help guide the resolution of these issues.

Agreements can provide benefits to both the wildlife managers and to BPA. For managers, they provide an assured funding stream for project implementation and maintenance and greater management flexibility. For BPA the advantages are greater certainty in budgeting and the ability to complete its mitigation responsibility for wildlife construction and inundation losses.

AGREEMENT SUBREGIONS

The Forum suggests that several agreements are more feasible than a single basin-wide settlement agreement. Several sets of subregions based on groupings of hydroelectric projects were identified. The Forum decided on the following subregions on which to base further technical analysis and potentially to define agreement groups:

- Lower Columbia (Bonneville, The Dalles, John Day, McNary)
- Lower Snake (Ice Harbor, Little Goose, Lower Monumental, Granite)
- Upper Snake (Anderson Ranch, Palisades, Black Canyon, Minidoka, and Deadwood)
- Northern Idaho (Albeni Falls)
- Upper Columbia (Chief Joseph, Grand Coulee)

AGREEMENT LENGTH & “CURRENCY”

The term of the mitigation is either in perpetuity or for the life of the hydro project(s) to which losses are credited. However, the term of any agreement(s) conceptually could range from 10 years, as with the Fish Accords to the life of the federal hydroelectric system (FCRPS). The recent Willamette River Basin Memorandum of Agreement Regarding Wildlife Habitat Protection and Enhancement (Willamette MOA)specifies a term of 15 years to complete the purchases associated with the agreement which was deemed to be an adequate period for remaining mitigation obligations to be satisfied in that subbasin.

An issue to consider is the consequences of any events, natural or human-made, that may change habitat conditions over the term of the agreement(s). This requires predicting those natural events that would increase or change the calculations of the remaining habitat needed for “full” mitigation, or identifying the impacts of other agreements in the basin, such as the Fish Accords.

The value of the agreement could also vary based on the term and the type of losses to be mitigated. For example, the value of the Willamette MOA varies across several increments within

its overall term. Settlement agreement(s) could also potentially use a variety of “currencies,” including habitat units, acres, or funding. Agreements based on lump-sum payments are considered most desirable by many Forum members although there are challenges around how this may occur based on appropriate Federal funding levels and regulatory compliance issues for BPA.

PRIOR AGREEMENTS

Prior BPA-to-tribe/agency agreements, Memoranda of Agreements, or contracts may inform and/or affect how agreement(s) are reached. Some of these prior agreements include specific decisions about issue topics discussed in this summary report (for instance the 2:1 ratio), as well as including differing terms and requirements. The Forum recognizes the impact such prior agreements may have on settlement considerations.

OPERATION AND MAINTENANCE (O&M)

The success of mitigation projects often relies on active and ongoing management to maintain the habitat benefits obtained from land acquisition and restoration. Properties are purchased based on a number of criteria and. many properties purchased are not in pristine condition so O&M costs may vary considerably, particularly for the first several years after purchase. However, the 2007 Independent Economic Analysis Board (IEAB) report, "Investigation of Wildlife O&M Costs" concluded that Program costs for O&M are generally comparable to other land management agencies costs Settlement agreements should address this issue.

Other key findings relevant to the charter of the Forum include:

- O&M cost data in Pisces is very coarse and needs to be more detailed to provide support for informed comparisons. Current data on O&M does not allow for parcel to parcel comparisons.
- IEAB recommended data be added to Pisces to capture the other non-BPA cost shares and the expected life of investments.

AGREEMENT PROCESS

For any settlement agreement(s) to be funded, a series of steps must first occur, including NEPA review, budgeting and inclusion in a future rate case for BPA. These steps are identified in Appendix C as requested by the Forum, including estimated time requirements for each step. Appendix C assumed a certain timeframe for initiating negotiations, but as these are not definitive, this information should only be treated as an EXAMPLE of the relative time scale of any settlement process.

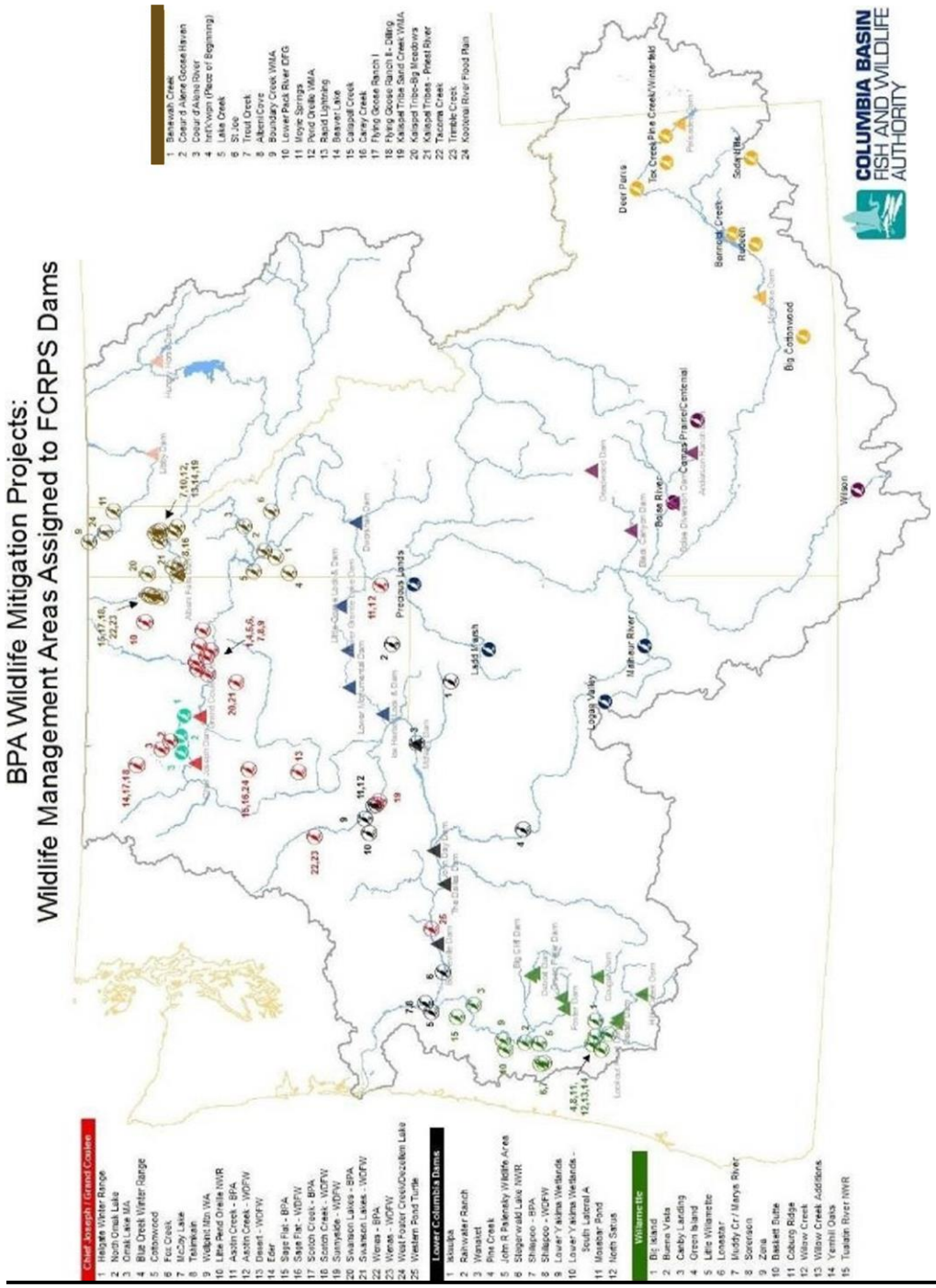


Figure 3: Projects and Facilities Mitigated

April 20-21, 2010 Crediting Forum Technical Team Meeting

The Crediting Technical Team addressed technical HEP issues that make reconciling the crediting ledger difficult and contribute to the different interpretations within the region on crediting. We identified issues in three tiers with the first tier representing technical HEP issues, the second tier focusing more on subregional issues that have policy implications for some but not all managers or areas in the region, and the third tier being primarily overarching, regional policy issues needing resolution. We sought to establish a foundation for greater consistency to the extent possible while recognizing the limitations of existing agreements. The following are working notes from the meeting and have not received regional peer review or input.

Tier 1 Issues: Technical HEP w/ little or no policy implications Sources of Variation in crediting due to HEP methods

1. Cover Typing - Delineation of cover type boundaries
2. Similarity (or lack thereof), between habitats characterized in losses and compensation lands
3. Choice of HEP species- for original losses and compensation lands
    - *Should be a good representation of habitat quality*
4. Lack of peer review or consistency of HEP models chosen for losses or compensation lands.
5. Choice of substitute HEP species when out of kind-
    - Covering same habitat attributes with same number of species
6. Modification or lack of suitable modification of HEP models.
    - Appropriate/inappropriate selection of model
    - Use of updated models for mitigation while losses are static with old models.
    - Appropriate/inappropriate alteration of equations to address site specific realities.
    - Real world differences in application of model from original area

7. Field Data Collection techniques

    - Changes in Techniques and intensity of survey
    - Changes in survey staff
    - Season of survey/phenology
    - Under represented or over represented cover types

Variation SOP

- *Use tools, models, and methods that most accurately reflect the quality and quantity of the habitats being protected and managed.*
- *HEP methods used should reflect the site specific habitat parameters and management goals of the property and may differ from the HEP methods used in determining the losses.*

- *When disagreements arise, the project proponent should seek resolution through consultation with BPA, HEP team, and subbasin or provincial co-managers to assure consistency and accuracy.*
- *Consider validating new or significantly modified models with appropriate testing and review.*

Species Stacking

Stacking occurs when multiple species are used to characterize the quality of a single cover type. It becomes a crediting issue when the same number of species used to assess losses are not in turn used to characterize the compensation lands. *Stacking is an issue of how you adjust the credits of the mitigation sites to be in balance with the number of species used to characterize the losses. Loss assessments are what they are and should not be revised or replaced to address stacking issues.*

Stacking SOP

- *SOP options to address staking issues include:*

    a. Use the same number of species to characterize the out of kind cover types as were used to characterize the loss assessment cover types.

b. If using fewer species to characterize the mitigation site cover type than were used to characterize the losses, average the HSIs of the out of kind mitigation cover types and multiply by the number of species used in the losses. However, species selection must be peer reviewed and approved by the regional HEP team, BPA and the project proponent.

c. If incidental out of kind cover types (inclusions) are associated with a mitigation acquisition, assume the same HSI as the adjacent cover type.

d. Do not credit the same acres of a given cover type between two or more hydro projects with a combination of species from both.

Tier 2 Issues: Subregional issues with policy implications

Crediting public lands actions, trust lands, and non-permanent or unsecured lands mitigations

- How to credit BLM lease for range lands.
- How to credit State DNR Land mitigations.
- How to credit BIA Trust lands leases or easements
- How to credit leases or easements on fee lands
- How to credit areas where BPA contributed to but did not fully provide protection or operations and maintenance funding.
- How to credit BPA where they were not involved in the protection of the habitat but provide all or part of the O&M and enhancements.

Crediting SOP

- *Project proponents must provide minimum irreducible HU letter for each compensation site including statements on each of the following issues:*

  a. Hydro project being mitigated

  b. Cover type(s) and target species used to characterize habitat quality on the compensation site

c. Commitment to follow SOPs to quantify and qualify habitat

d. Minimum number of habitat units being credited from the site

- *Crediting of Non-permanent protection- The Crediting Technical Team recommends that the region have a Crediting SOP covering sites without permanent protection. The specific operating procedure adopted needs to be further defined and agreed to.*

- *Partial purchase- credit for proportion of protection funding provided.*

- *Partial O&M or enhancements- credit for HU increases proportional to 10 year average investment.*

- *Credit for leases that may not provide permanent protection- credit against operational or secondary losses or normal full credit when the protection and credit from a non- permanent compensation site gets rolled over to another non-permanent site with an equal or greater amount of habitat value*

- *Credit for lands protected with partial lease such as the purchase of an annual grazing lease on Indian trust lands or a federal grazing allotment - receive credit for cover types enhanced by the annual protection and O&M. Assumption of replacement with similar lease if lease terminated.*

Tier 3 Issues: Policy level resolution required

1. Socio-political issues of crediting projects that are out of kind and out of place from impacts.

2. Allocation HUs among resource managers.

    a. Crossing political boundaries with mitigation actions.
    b. Crossing ecological/population boundaries.

3. Crediting of fish projects against construction and inundation wildlife losses.

4. Crediting non-permanent or unsecured lands

5. How to deal with “over mitigation”?

Where do we go from here?

1. Regional Agreements on SOPs after vetting through all Forum members.

2. Direct the HEP team to work with project managers at each compensation site to address technical shortcomings identified above.

    - For new projects, do this with baseline HEPs.
    - For existing projects, do this with follow-up HEPs.
    - Consider adding to HEP team’s contract an express mandate and responsibility to identify inconsistencies in technical HEP applications throughout the region.

3. Incorporate fish credit findings and recommendations as appropriate.

4. Reassign credits within lower four mainstem Columbia River dams.

    - Unlike other areas in the basin, the lower four crediting can be reassigned based on existing HEP reports, so no need to wait or gather additional data.

5. Develop draft ledger for recommendation to Council for review and approval.
    - The ledger will report HUs protected and enhanced through the Council’s Fish and Wildlife Program.

Appendix B - Loss Assessment Summary, Table C-4, 2009 Program

Table C-4 Estimated Losses and Gains Due to Hydropower Construction
(losses are preceded by a "-", gains by a "+")

Species	Total Habitat Units
Albeni Falls	
• Mallard Duck	-5,985
• Canada Goose	-4,699
• Redhead Duck	-3,379
• Breeding Bald Eagle	-4,508
• Wintering Bald Eagle	-4,365
• Black-Capped Chickadee	-2,286
• White-tailed Deer	-1,680
• Muskrat	-1,756
• Yellow Warbler	+171
Lower Snake Projects	
• Downy Woodpecker	-364.9
• Song Sparrow	-287.6
• Yellow Warbler	-927.0
• California Quail	-20,508.0
• Ring-necked Pheasant	-2,646.8
• Canada Goose	-2,039.8
Anderson Ranch	
• Mallard	-1,048
• Mink	-1,732
• Yellow Warbler	-361
• Black Capped Chickadee	-890
• Ruffed Grouse	-919
• Blue Grouse	-1,980
• Mule Deer	-2,689
• Peregrine Falcon	-1,222 acres*
* Acres of riparian habitat lost. Does not require purchase of any lands.	
Black Canyon	
• Mallard	-270
• Mink	-652
• Canada Goose	-214
• Ring-necked Pheasant	-260
• Sharp-tailed Grouse	-532
• Mule Deer	-242
• Yellow Warbler	+8
• Black-capped Chickadee	+68
Deadwood	
• Mule Deer	-2080
• Mink	-987
• Spruce Grouse	-1411
• Yellow Warbler	-309

Table C-4 (cont.) Estimated Losses and Gains Due to Hydropower Construction (losses are preceded by a "-", gains by a "+")

Species	Total Habitat Units
Palisades	
• Bald Eagle	-5,941 breeding -18,565 wintering
• Yellow Warbler	-718 scrub-shrub
• Black Capped Chickadee	-1,358 forested
• Elk/Mule Deer	-2,454
• Waterfowl and Aquatic Furbearers	-5,703
• Ruffed Grouse	-2,331
• Peregrine Falcon*	-1,677 acres of forested wetland -832 acres of scrub-shrub wetland +68 acres of emergent wetland
* Acres of riparian habitat lost. Does not require purchase of any lands.	
Willamette Basin Projects	
• Black-tailed Deer	-17,254
• Roosevelt Elk	-15,295
• Black Bear	-4,814
• Cougar	-3,853
• Beaver	-4,477
• River Otter	-2,408
• Mink	-2,418
• Red Fox	-2,590
• Ruffed Grouse	-11,145
• California Quail	-2,986
• Ring-necked Pheasant	-1,986
• Band-tailed Pigeon	-3,487
• Western Gray Squirrel	-1,354
• Harlequin Duck	-551
• Wood Duck	-1,947
• Spotted Owl	-5,711
• Pileated Woodpecker	-8,690
• American Dipper	-954
• Yellow Warbler	-2,355
• Common Merganser	+1,042
• Greater Scaup	+820
• Waterfowl	+423
• Bald Eagle	+5,693
• Osprey	+6,159
Grand Coulee	
• Sage Grouse	-2,746
• Sharp-tailed Grouse	-32,723
• Ruffed Grouse	-16,502
• Mourning Dove	-9,316
• Mule Deer	-27,133
• White-tailed Deer	-21,362
• Riparian Forest	-1,632
• Riparian Shrub	-27
• Canada Goose Nest Sites	-74

Table C-4 (cont.) Estimated Losses and Gains Due to Hydropower Construction (losses are preceded by a "-", gains by a "+")

Species	Total Habitat Units
McNary	
• Mallard (wintering)	+ 13,744
• Mallard (nesting)	-6,959
• Western Meadowlark	-3,469
• Canada Goose	-3,484
• Spotted Sandpiper	-1,363
• Yellow Warbler	-329
• Downy Woodpecker	-377
• Mink	-1,250
• California Quail	-6,314
John Day	
• Lesser Scaup	+14,398
• Great Blue Heron	-3,186
• Canada Goose	-8,010
• Spotted Sandpiper	-3,186
• Yellow Warbler	-1,085
• Black-capped Chickadee	-869
• Western Meadowlark	-5,059
• California Quail	-6,324
• Mallard	-7,399
• Mink	-1,437
The Dalles	
• Lesser Scaup	+2,068
• Great Blue Heron	-427
• Canada Goose	-439
• Spotted Sandpiper	-534
• Yellow Warbler	-170
• Black-capped Chickadee	-183
• Western Meadowlark	-247
• Mink	-330
Bonneville	
• Lesser Scaup	+2,671
• Great Blue Heron	-4,300
• Canada Goose	-2,443
• Spotted Sandpiper	-2,767
• Yellow Warbler	-163
• Black-capped Chickadee	-1,022
• Mink	-1,622
Dworshak	
• Canada Goose-(breeding)	-16
• Black-capped Chickadee	-91
• River Otter	-4,312
• Pileated Woodpecker	-3,524
• Elk	-11,603
• White-tailed Deer	-8,906
• Canada Goose (wintering)	+323
• Bald Eagle	+2,678
• Osprey	+1,674
• Yellow Warbler	+119

Table C-4 (cont.) Estimated Losses and Gains Due to Hydropower Construction (losses are preceded by a "-", gains by a "+"	
Species	**Total Habitat Units**
Minidoka	
• Mallard	+174
• Redhead	+4,475
• Western Grebe	+273
• Marsh Wren	+207
• Yellow Warbler	-342
• River Otter	-2,993
• Mule Deer	-3,413
• Sage Grouse	-3,755
Chief Joseph	
• Lesser Scaup	+1,440
• Sharp-tailed Grouse	-2,290
• Mule Deer	-1,992
• Spotted Sandpiper	-1,255
• Sage Grouse	-1,179
• Mink	-920
• Bobcat	-401
• Lewis' Woodpecker	-286
• Ring-necked Pheasant	-239
• Canada Goose	-213
• Yellow Warbler	-58

(Appendices C through G not included due to data download issues)

Appendix H – WDFW Crediting Formula Explanation

Excerpt from Ashley (2008)

HEP Model Selection and "Stacking"

HSI models were selected from appropriate loss assessments for each mitigation project cover type. In cases where cover types were either dissimilar[25] or not included in loss assessments, substitute HEP models were selected to evaluate habitat quality and determine HUs. Similarly, HEP species model substitutions occurred based on WDFW management priorities for specific areas e. g., the pygmy rabbit (*Brachylagus idahoensis*) HSI model replaced the sharp-tailed grouse (*Tympanuchus phasianellus*) model in areas where pygmy rabbits were the top management priority.

HEP model substitutions also occurred when an extant plant community did not support a target species, or would not support the target species in the future. For example, steppe grasslands devoid of sagebrush (*Artemisia* spp.) or shrublands comprised of bitterbrush (*Purshia tridentata*) do not supply the life requisites needed by sage grouse (*Centrocercus urophasianus*), which feed almost exclusively on sagebrush in winter. Without the presence of sagebrush, the sage grouse HEP model output is zero.

If the management priority for a grassland site was to maintain it as grassland, it follows that the sage grouse model habitat suitability index (HSI) would always be zero. Likewise, if management of a shrubland was to maintain it as a bitterbrush plant community devoid of sagebrush, the HSI again would always be zero for sage grouse. In these situations, the western meadowlark (*Sturnella neglecta*) HEP model was a more appropriate model to evaluate steppe grasslands than the sage grouse model.

The previously described situation was also a "fairness" issue. Both WDFW and BPA were and still are highly committed to applying HEP in a fair, consistent manner.

Habitat unit "stacking" found in the loss assessments was also replicated. For example, if three HSI models were used to determine shrubsteppe habitat unit losses in a given loss assessment, three shrubsteppe HSI models were used to credit BPA.

Habitat Unit Computations

BPA received baseline (protection) and enhancement habitat unit credit for all mitigation project lands. There were, however, differences in how HUs were credited based on whether the project included in whole or in part:

1. New land acquisitions.

[25] Dissimilar refers to cover types that are given the same moniker as that found in a loss assessment, but have different physical/flora characteristics e. g., a "bog" may be comprised of a very different plant community and abiotic characteristics when compared to a "cattail dominated" emergent wetland; however, both may be cover typed as emergent wetland. As a result, HEP models used to evaluate a cattail dominated emergent wetland may be inappropriate for a bog.

2. Washington Department of Natural Resources (DNR) lands.
3. Extant WDFW wildlife management areas.

Consistent with crediting across the Columbia Basin Region, BPA received full baseline (protection) credit for new acquisitions as determined by HEP surveys. Follow-up HEP surveys occurred at five-year intervals to reassess habitat quality and update the number of habitat units credited to BPA. Likewise, BPA received full baseline and follow-up habitat unit credit (protection) on DNR lands where BPA funds were used to pay lease fees.

BPA received both protection and enhancement HUs on WDFW wildlife management areas already owned by WDFW or acquired through funding sources other than BPA[26]. Initial baseline HUs, however, were calculated based on the *potential* decrease in habitat quality that would likely occur *within 10-years* without the infusion of BPA funds[27]. Modified baseline HUs for lands owned by WDFW were calculated based on the following five steps:

1. HEP surveys were conducted to determine the baseline HSI for each HEP species model.
2. HEP model baseline habitat variable suitability results were reviewed relative to the following questions, “Would individual model variables change in ten years without the infusion of BPA funds?” If so, how?
3. Individual habitat variable suitability indices (SIs) were then modified as needed to reflect probable changes in habitat variable suitability. Occasionally, habitat condition projections did not differ from baseline conditions and were not modified.
4. Species model HSIs were recalculated based on projected changes to individual variable suitability indices.
5. Differences between baseline HSIs and projected HSIs were used to calculate HU credit.

The following example illustrates this process. A baseline HEP survey (step 1) determined that the habitat suitability index is 0.5 as shown in Figure 1 (line B).

[26] There is one exception to this policy. BPA received full baseline credit on new acquisitions at West Foster Creek that were acquired with State funds in order to make BPA whole for funds and HUs associated with removing the Cleman Mountain Unit from the Wenas WMA mitigation project.

[27] It was assumed that habitat quality on WMAs would decrease without additional O&M funds. WDFW was unable to adequately fund basic O&M operations such as weed control, fence maintenance, reseedings etc., on WMAs due to limited state funding. Without adequate weed control and associated reseedings and fence maintenance (protection from livestock encroachment), etc., wildlife habitat quality would likely decrease over time. As a result BPA dollars were used to fund operations and maintenance measures on WMAs to maintain and/or improve habitat quality.

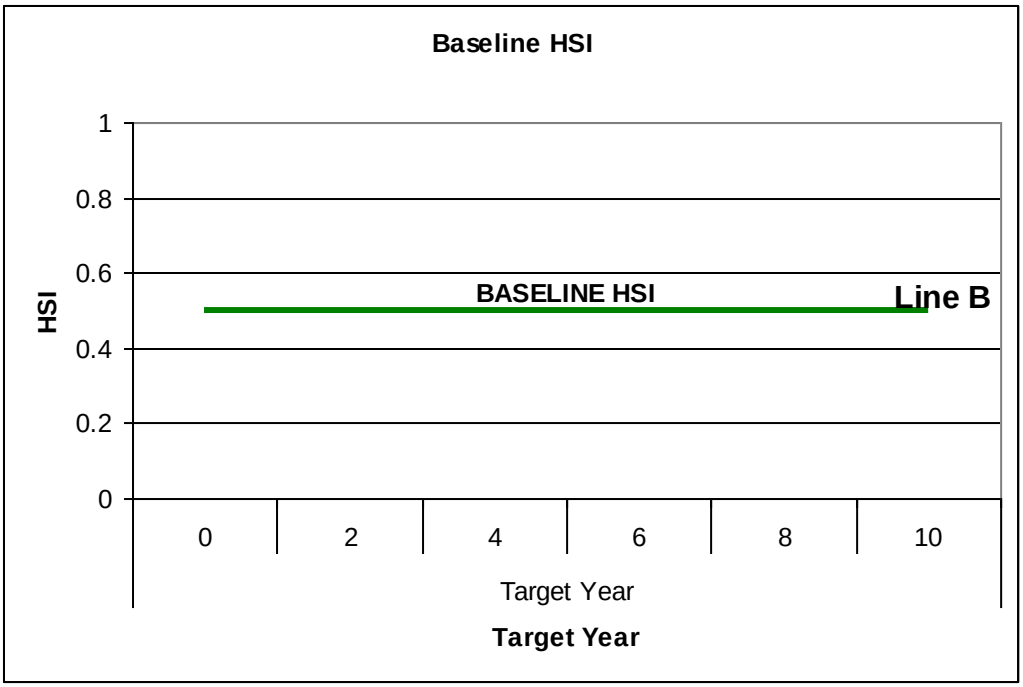


Figure 3 Baseline habitat suitability index example

Individual HEP model variable suitability indices were then modified to reflect projected changes in habitat variables over a ten-year period (steps 2 and 3). The HEP model HSI was recalculated (step 4) and was reduced to 0.40 as illustrated in Figure 2 (line C).

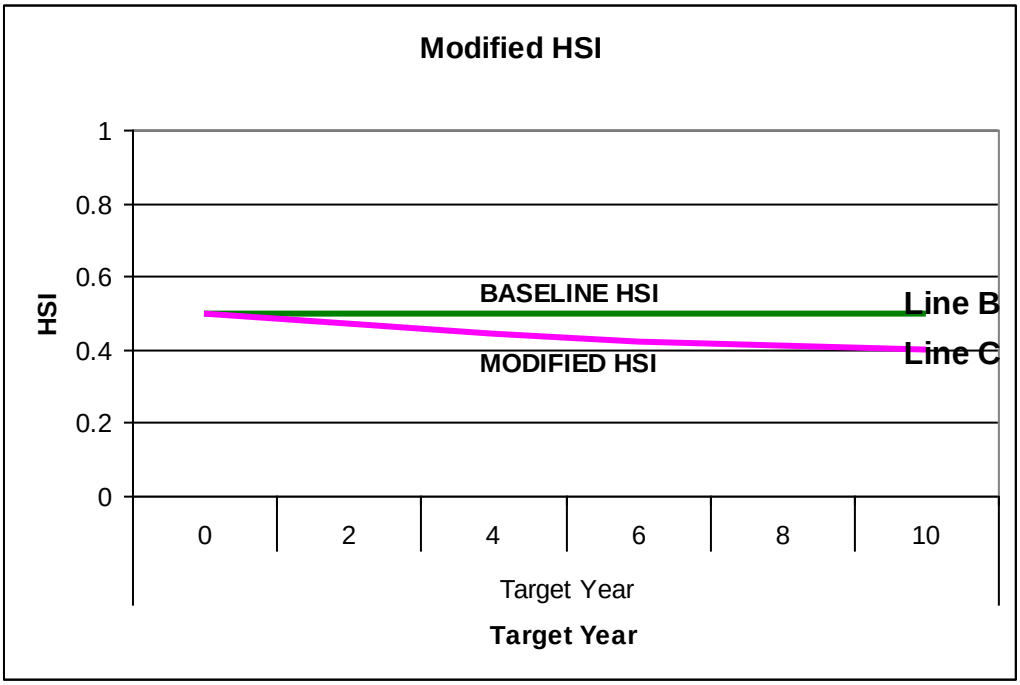


Figure 4 Modified habitat suitability index example

The difference between the baseline HSI of 0.50 (line B) and the modified HSI of 0.40 (line C) was 0.10 HSI (step 5). HUs were then recalculated based on the 0.10 change in HSI.

If habitat quality/HSI projections increased beyond the baseline HSI (line B) through enhancement measures (line A, Figure 3), total credited habitat units were calculated based on the difference between line A (0.65 HSI) and line C (0.40 HSI), or 0.25 HSI as depicted in Figure 4.

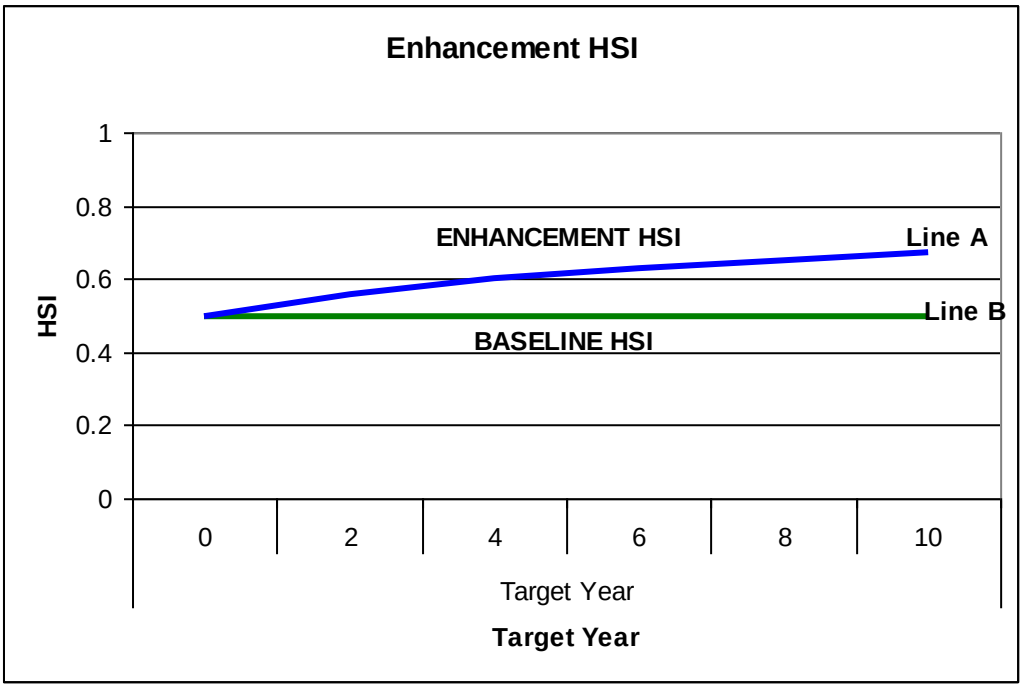


Figure 5 Enhancement habitat suitability index example

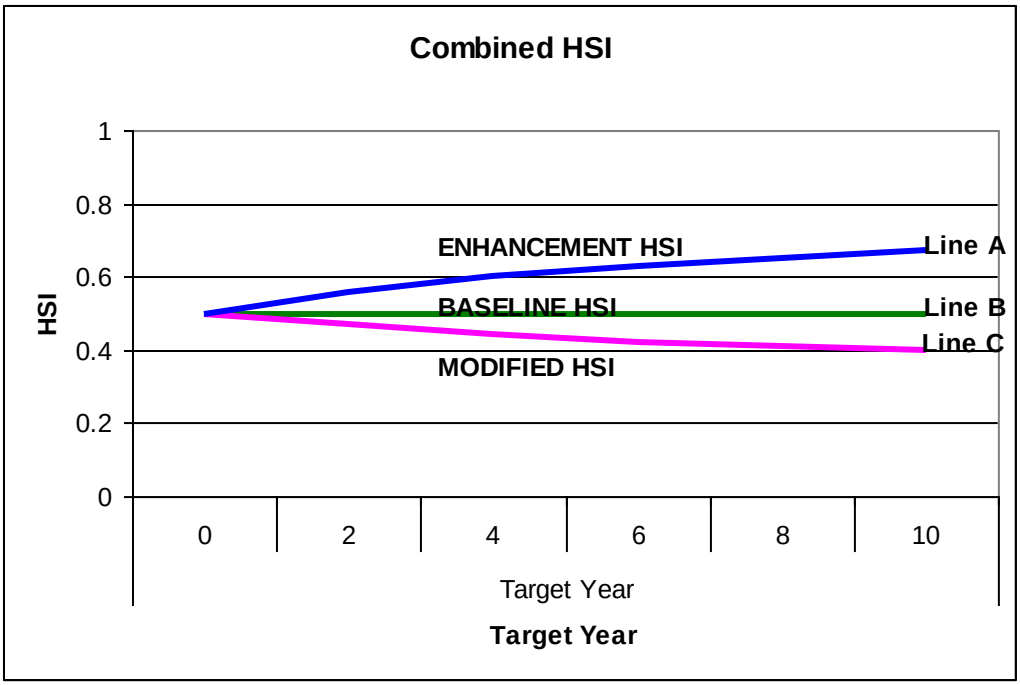


Figure 6 Combined baseline and enhancement suitability index example

Continuing the previous example, in Table 3 the BPA acquisition baseline HSI is 0.50 (Figure 1) generating 500 HUs while the enhancement credit HSI is 0.15 (Figure 3) generating 150 HUs[28]. BPA receives a combined total of 650 habitat units for acquiring and enhancing 1,000 acres of wildlife habitat.

Table 15 Habitat unit comparison example for a new acquisition and land owned by WDFW

Project Type	Credit Type	HSI	Acres	HUs
BPA Acquisition	Baseline	0.50	1,000	500
	Enhancement	0.15	N/A	150
BPA Totals			**1,000**	**650**
WDFW Lands	Baseline	0.10	1,000	100
	Enhancement	0.15	N/A	150
WDFW Totals			**1,000**	**250**

In contrast, the baseline HSI for a 1,000 acre project area owned by WDFW is 0.10 (i.e., 0.50 - 0.40 = 0.1) (Figure 2) generating 100 habitat units while the enhancement HSI is

[28] Habitat units are determined by multiplying the HSI by the number of acres.

0.15 (i.e., 0.65 – 0.50 = 0.15) (Figure 4) equaling 150 HUs. BPA is credited with only 250 habitat units on lands owned by WDFW. Note that BPA received the same number of HUs for enhancements regardless of ownership or acquisition funding source. In summary, BPA was credited with only a portion of all baseline HUs generated on lands owned or acquired with State funds and received full credit for enhancements and/or lands acquired with BPA mitigation funds.

Swanson Lakes WA Spreadsheet Example

Actual baseline, projected (10-year), and follow-up habitat suitability indices and associated habitat units for the Swanson Lakes Wildlife Area are illustrated in Table 4. HSI and HU computations are shown for both lands owned by WDFW and properties purchased by BPA. Spreadsheet computations in Table 4 are explained briefly in the following paragraphs.

Baseline (measured) HSIs and HUs are listed for both WDFW and BPA ownership (TY[29] 0 HSI and TY O HUs). Further HU computations stopped for lands purchased with BPA mitigation funds until a follow-up HEP analysis was completed in TY 16. Habitat units derived from TY 16 follow-up HEP analysis supplanted baseline HUs. Net HU gains can be determined by subtracting baseline HUs from TY 16 HUs.

On parcels owned by WDFW, the columns titled "W/O[30] Project HSI" and "W/O Project HUs" reflect the projected decrease in habitat quality and habitat units without the infusion of BPA funds for O&M and enhancement activities (notice that the "W/O Project HSI" dropped below the baseline HSI at this project site). The projected "TY 10 HSI" column is the predicted HSI resulting from BPA funding O&M and enhancement activities over a 10-year period. The "Net HSI Gain" is the difference obtained by subtracting the "W/O project HSI" from the "TY 10 HSI." Credited HUs were derived by multiplying cover type acres by "Net HSI Gain."

[29] TY is an acronym for "target year."
[30] W/O is "without project". The term "project" refers to BPA mitigation funding in this instance.

Table 16 Habitat unit crediting spreadsheet example for Swanson Lakes Wildlife Area

PROJECT	PARCEL	ACRES	PURCHASE ENTITY/OWNER	COVER TYPE(S)	ACRES	HEP MODEL	TY 0 HSI (Baseline)	TY 0 HUs (Baseline)	W/O PROJECT HSI	W/O PROJECT HUs	TY 10 HSI (Projected)	NET HSI GAIN	CREDITED HUS
SWANSON LAKES			WDFW	Shrubsteppe	3,749	Sharp-tailed Grouse	0.20	749.80	0.10	374.90	0.30	0.20	749.80
						Mule Deer	0.40	1,499.60	0.30	1,124.70	0.40	0.10	374.90
						Sage Grouse	0.20	749.80	0.10	374.90	0.30	0.20	749.80
	Hatton/Tracy/Finch	4,905		Grassland	359	Sharp-tailed Grouse	0.20	71.80	0.10	35.90	0.40	0.30	107.70
	Nelson	320				Mule Deer	0.00	0.00	0.00	0.00	0.10	0.10	35.90
						Sage Grouse	0.10	35.90	0.00	0.00	0.20	0.20	71.80
				Agriculture	1,117	Sharp-tailed Grouse	0.00	0.00	0.00	0.00	0.40	0.40	446.80
						Mule Deer	0.00	0.00	0.00	0.00	0.10	0.10	111.70
						Sage Grouse	0.00	0.00	0.00	0.00	0.30	0.30	335.10
	WDFW Sub-total	5,225			5,225			3,106.90		1,910.40			2,983.50
	PARCEL	ACRES	PURCHASE ENTITY/OWNER	COVER TYPE(S)	ACRES	HEP MODEL	TY 0 HSI (Baseline)	TY 0 HUs (Baseline)	W/O PROJECT HSI	W/O PROJECT HUs	TY 16 HSI (Actual)	NET HSI GAIN/ LOSS	TY 16 CREDITED HUS
			BPA	Shrubsteppe	14,047	Sharp-tailed Grouse	0.20	2,809.40	N/A	N/A	0.29	0.09	4,073.63
	Roloff/Welch	13,280				Mule Deer	0.40	5,618.80	N/A	N/A	0.46	0.06	6,461.62
	L&C Dynasty	40				Sage Grouse	0.20	2,809.40	N/A	N/A	0.45	0.25	6,321.15
	Baker	160		Grassland	793	Sharp-tailed Grouse	0.60	475.80	N/A	N/A	0.32	-0.28	253.76
	Koch	80				Mule Deer	0.00	0.00	N/A	N/A	0.38	0.38	301.34
	DNR Lease	1,280				Sage Grouse	0.40	317.20	N/A	N/A	0.20	-0.20	158.60
	BPA Sub-total	14,840			14,840			12,030.60					17,570.10

PROJECT TOTALS		**20,065**			**20,065**			**15,137.50**		**1,910.40**			**20,553.60**

HSI – HU Computation Epilogue

The HSI/HU projection concept was a mechanism by which BPA could receive partial credit for funding O&M and enhancement measures on existing WDFW wildlife management areas without incurring acquisition costs (a “win-win” situation for both WDFW and BPA). Habitat unit/HSI projections also ensured that WDFW did not over mitigate relative to the Agency’s “share” of available HUs and also removed the need to conduct follow-up HEP surveys on lands purchased with state funds (HSI projections served the same purpose as follow-up HEP surveys; albeit, projections are less robust).

WDFW further agreed to follow-up the original 10 year HSI projections on lands owned by WDFW with 20 year HSI projections, which were accomplished in 2008. Twenty year HSI projections were determined in the same manner as the 10 year HSI projections and are included in the Results Section of this report. *Based on the results of recent follow-up HEP surveys conducted on parcels acquired with BPA mitigation funds, it appears that HSI projections were fairly accurate on similar cover types such as shrubsteppe. It is recommended, however, that follow-up HEP surveys be conducted on mitigation wildlife areas to ensure that HSI projections truly reflect estimated habitat conditions. This could be accomplished efficiently by assessing a small representative sample on target/priority cover types.*

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Appendix I – Habitat Unit Stacking White Paper

(Paul Ashley – February 19, 2008)

Introduction

The primary purpose of this paper is to review habitat unit (HU) "stacking" concepts and examine how habitat unit stacking is applied by various wildlife managers to credit Bonneville Power Administration (BPA) for terrestrial mitigation/ compensation projects. In addition to HU stacking, hydro facility habitat unit loss to project gain ratios will also be looked at in this document. Because of my limited knowledge and experience with mitigation in Southern Idaho, I have limited this discussion to three mitigation areas including the main-stem Columbia River, the Willamette River Basin[31], and Albeni Falls.

Background

Habitat Evaluation Procedures (HEP), developed by the U.S. Fish and Wildlife Service (USFWS), was used to quantify both negative and positive changes in habitat quality and quantity resulting from hydro facility construction and associated pool area inundation on the Columbia River and elsewhere throughout the Columbia Basin Region within Washington, Oregon, Idaho, and western Montana. HEP is a habitat based approach to impact assessment that documents change through use of a habitat suitability index (HSI). The HSI value is derived from an evaluation of the ability of key habitat components to provide the life requisites of selected wildlife and fish species as described in habitat suitability models (USFWS 1980, 1980a).

The HSI value is an index to habitat carrying capacity for a specific species or guild of species based on a performance measure (e.g. number of deer per square mile) described in HEP species models. The index ranges from 0.0 to 1.0 (USFWS 1980, 1980a). An HSI of 0.0 equates to poor habitat quality while an HSI of 1.0 is optimum habitat quality for a given species.

HEP utilizes habitat units (HUs) as "currency." Habitat units are determined by multiplying the habitat suitability index by the number of acres of habitat (cover type) protected (USFWS 1980, 1980a). One acre of optimum habitat (HSI = 1.0) is equal to one habitat unit i.e., 1.0 HSI x 1.0 acre = 1 HU. Similarly, if the HSI output for a mule deer HEP model is 0.5 and 100 acres of shrubsteppe habitat is protected, then the number of HUs are 50 (0.5 HSI x 100 acres = 50 HUs).

Selection of HEP models for habitat quality evaluation purposes is generally based on three factors:

[31] The "Willamette" mitigation area includes hydro facilities on Willamette River tributaries such as Dexter Dam etc.

1. The relative importance of impacted wildlife species to state and federal wildlife management agencies, tribes, non-government organizations (NGOs), and the public.
2. The availability of "published" and/or "accepted" models.
3. Habitat attributes of concern. For example, Wildlife managers may be concerned about tree species, tree height, canopy cover, snags (DBH, decay class, etc.), basal area, shrub species, shrub height, percent shrub cover, stratum complexity, palatability of browse and forage, and herbaceous vegetation data in forested habitats.

Within the Columbia River Wildlife Program, factors "one" and "three" appeared to have influenced species model selection the most when hydro facility loss assessments were drafted.

Concomitant wildlife species are generally dependent upon different key ecological correlates and structural conditions within a given cover type (some "overlap" does occur) as well as perform different functions i.e., cavity excavators, burrow diggers etc. Most HEP species models rely on ≤ five habitat variables to determine habitat quality HEP species models were designed to provide a relatively "quick and easy" habitat quality assessment. Therefore, the number of habitat variables within a given HEP model is limited. For example, in riparian forest areas the downy wood pecker model (two variables) is often selected to represent snag habitat attributes and tree basal area, while the white-tailed deer model may be used to evaluate tree canopy and palatable shrub cover. Similarly, the beaver model may be applied to document tree diameter breast height (DBH), water permanence and fluctuation, and tree species type.

In summary, multiple HEP model species i.e., three species in this example, are required to evaluate all habitat variables of concern within the riparian forest cover type. The habitat unit numbers for each HEP model species are then added (stacked) to establish the total number of habitat units (±) for this cover type. This concept is the basis of habitat unit "stacking" used in development of the hydro facility loss assessments and HU gains associated with related mitigation/compensation projects.

Habitat Unit Stacking

Background

In an ideal situation, proper application of HEP principles (USFWS 1980, 1980a) require that wildlife managers mitigate/compensate for the same cover types ("in kind") as stated in hydro facility loss assessments and use identical HEP species models/stacking as those employed to determine the losses. This "ideal" situation, however, rarely occurs. Instead, wildlife managers purchase compensation lands that include dissimilar cover types and/or sub-cover types of those lost e.g., a riverine wetland was lost, but an isolated "bog" wetland was acquired to mitigate for the lost riverine wetland.

This raises several key questions that must be addressed. First and foremost, "are loss assessment HEP model species applicable to the dissimilar or sub-cover types"? If not, "what

HEP model species should be used to evaluate dissimilar or sub-cover types"? Lastly, "how will the stacking issue be addressed relative to dissimilar or sub cover types"?

Discussion

Within the main-stem Columbia River, the Willamette, and Albeni Falls mitigation areas, habitat unit stacking issues are largely associated with the Willamette River Basin and Albeni Falls mitigation project areas. Present habitat unit stacking practices and concerns for the three mitigation areas are discussed below.

Main-stem Columbia River

In practice, most wildlife managers that credit mitigation/compensation projects against main-stem Columbia River Dams followed the habitat unit stacking described in the credited hydro facility loss assessment. In cases of dissimilar cover types, managers generally agreed to stack the same number of species as applied in the associated loss assessment. The number of HEP model species to "stack" was determined by substituting the dissimilar cover type for a loss assessment cover type. For example, if the riparian forest cover type was evaluated with three HEP species in a given loss assessment, and the wildlife area manager substituted a dissimilar cover type for the riparian forest cover type, then three appropriate HEP species models were used to evaluate the dissimilar cover type.

Sub-cover types of extant loss assessment cover types were generally dealt with in a similar manner. HEP model species were substituted in place of less suitable loss assessment models as required. HU stacking was identical to what was described within the appropriate loss assessment.

Findings

Little habitat unit "stacking" controversy currently exists within the main-stem Columbia River mitigation arena. There are several reasons for this including:

1. General willingness of wildlife area managers to follow the previously described "stacking" protocols.
2. Concise loss assessment cover type/species matrices (Grand Coulee Dam is questionable).
3. Wildlife managers have the appropriate "tools" i.e., HEP models, etc. at their disposal.

Willamette

Willamette habitat unit stacking issues are three fold.

1. In general, HSI species models were not used to determine habitat unit losses. Species "checklists" coupled with "expert opinion" guided HSI determination and associated HU losses. The result is totally subjective assessments (I am not suggesting that the results

were or are erroneous; I am pointing out that subjective assessments are extremely difficult to replicate even in a best case scenario).
2. On the ground transects were not conducted. Therefore, solid data does not exist to support baseline habitat suitability indices conclusions/ratings.
3. The number of species "stacked" per cover type was the most reported in a BPA hydro facility loss assessment. As many as 13+ species were reported for some cover types.

Findings

Project managers have expressed considerable interest in completing HEP analyses on Willamette River Basin mitigation projects. At present, however, this group simply does not have the tools necessary to replicate the baseline HEP analyses. Considerable time and funds would be required to construct HEP models for the Willamette. Data resulting and HU values from the new HEP models would not be directly comparable to original baseline HEP results even for like species. In addition, state and federal agencies, NGOs, and interested public have made it clear that they do not support the HEP approach in the Willamette Valley (M. Pope, pers. comm.).

Perhaps the largest obstacle that managers have to overcome is that wildlife species and especially cover types currently considered high priority are almost totally dissimilar to what was included in the Willamette Basin loss assessments. Therefore, relative value indices (RVIs), or some other method would be needed to bridge the gap and/or create a "cross walk" between loss assessment and mitigation project cover types and evaluation species.

I believe the solution is relatively simple. The most timely, cost effective approach to crediting Willamette River Basin projects, assuming credible habitat variable data is important, is to use the Northwest Habitat Institute's new and innovative Combined Habitat Assessment Protocols (CHAP) tool. If habitat variable data verification is not important, then a political resolution could be applied such as an "acre for acre" approach.

Albeni Falls

Albeni Falls is the most problematic area relative to HU stacking and crediting issues. The primary reasons are:

1. There isn't an Albeni Falls loss assessment cover type/species matrix to guide mitigation efforts. Therefore, wildlife managers do not credit or stack HUs in a consistent manner.
2. Wildlife managers resist deviating from using only species identified in the Albeni Falls loss assessment to credit mitigation projects.
3. Lack of resolve among some wildlife managers and BPA to address the loss assessment cover type/species matrix issue.

Findings

Loss assessment cover type/species matrices provide the basic framework that guides HEP planning efforts. Without resolution of the cover type/species matrix matter, planning and executing adequate, equitable, and consistent HEP analyses will continue to be difficult for any entity to accomplish in the Albeni Falls project area. Likewise, the ability to resolve other habitat unit/species stacking or related crediting questions hinge on addressing the cover type/ species matrix concern.

Wildlife managers target and acquire priority habitats; however, most land acquisitions include non-target cover types because landowners simply refuse to sell only the target areas. Therefore, wildlife managers are "stuck" with cover types that are not identified in the Albeni Falls loss assessment (Martin et al. 1988).

Conducting HEP surveys on these dissimilar cover types is problematic relative to both HEP model species selection and HU stacking perspectives for the following reasons.

1. Wildlife managers are reluctant to replace loss assessment species models with HEP species models that are more applicable to the dissimilar cover types. As a result HEP species models have been applied to cover types that are not appropriate for some HEP models.
2. Without a species/cover type matrix, there is no guidance on how to stack HEP species models for dissimilar cover types.

The net result appears to be lower than expected credited habitat units for Albeni Falls mitigation projects.

I am not suggesting that HEP analyses cannot be conducted on Albeni Falls mitigation projects. I assume, however, that eventually a reconciliation of habitat unit and model selection issues will occur. The question will then be, "how do the compounded, confounding factors get resolved that is equitable to all parties"?

Crediting Ratios

Crediting ratios in this paper refers to the ratio between loss or gain acres and loss or gain habitat units. Habitat unit losses/acres were obtained from data found in the Albeni Falls Wildlife Protection, Mitigation, and Enhancement Plan (Martin et al. 1988), the Bonneville, McNary, The Dalles, and John Day loss assessment (Rasmussen and Wright 1990), the Chief Joseph Dam loss assessment (Berger and Keuhn 1992), and Grand Coulee Dam loss assessment (Howerton et al. 1986). Habitat unit/acre gain data from mitigation projects credited against Albeni Falls, Grand Coulee, Chief Joseph, McNary, The Dalles, John Day, and Bonneville Dams was obtained from BPA's on-line Pisces program.

Discussion

Loss and gain habitat unit per acre ratios for upper and lower Columbia River Dams and Albeni Falls Dam are illustrated in Table 1. Chief Joseph Dam gain ratios are skewed because identical acres were combined in some instances for both Grand Coulee and Chief Joseph Dams in the Pisces data. As a result, Chief Joseph ratio data will not be considered at this juncture.

The habitat unit to acre ratios for the lower Columbia River dams was derived by combining HU/acre data. This was necessary due to how gain data was presented in the Pisces data base; however, individual loss HU/acre ratios for McNary, The Dalles, John Day, and Bonneville Dams are also included in Table 1.

Table 17 Hydro facility loss/gain ratios

Project	Losses			Gains		
	Acres	**HUs**	**HU/Acre Ratio**	**Acres**	**HUs**	**HU/Acre Ratio**
Grand Coulee	70,000	111,785	1.6:1	98,323	92,628	0.94:1
Chief Joseph[32]	8,822	8,833	1:1	19,820	567	0.02:1
Lower Four[33]	58,544	74,752	1.27:1	67,682	68,176	1:1
Albeni Falls	6,617	28,658	4.33:1	10,688	8,687	0.81:1
McNary	15,502	23,544	1.5:1			
The Dalles	9,138	2,330	0.25:1			
John Day	27,455	36,560	1.33:1			
Bonneville	6,449	12,318	1.9:1			

[32] Gain acres and ratio are not accurate in Table 1 because projects were credited to both Chief Joseph and Grand Coulee Dams in the Pisces data.
[33] Data was combined for the lower four Columbia River dams because of the manner in which it was reported in the Pisces data base.

At present, there is a 42% difference between loss and gain habitat unit to acre ratios at Grand Coulee Dam; 22% difference for McNary, The Dalles, John Day, and Bonneville Dams combined; and 82% difference at Albeni falls (I expect the Grand Coulee Dam loss/gain ratio difference to go from 42% to approximately 20% once Pisces is updated with WDFW's 2007 HEP results).

When compared to Columbia River Dams, Albeni Falls loss and gain habitat unit to acre ratios are out of sync. It has been documented in loss assessment HEP results that impacted habitat quality was not "optimum" in most cases. Similarly, habitat quality associated with mitigation projects also varied. As a result, it can be presumed that loss and gain habitat unit to acre ratios should be similar if the same number of HEP model species used to determine the losses were used to determine the gains.

Therefore, based on conclusions drawn from data presented in Table 1 and from loss assessment documents, I conclude the reason Albeni Falls loss and gain habitat unit to acre ratios are out of sync with those associated with Lower Columbia River Dams is due most likely to not using the same number of HEP model species to credit mitigation projects as were used to determine the losses (lack of a species/cover type matrix).

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[i] Follow-up HEP surveys were planned at 5 and 10 year intervals depending on cover type. Requests for follow-up HEP surveys came from BPA COTRs and project sponsors or were sent electronically to the RHT through Pisces. As time progressed, the number of follow-up HEP surveys needed in a given year overwhelmed the RHT's ability to accomplish them. The RHT's primary priority was to complete baseline HEP surveys on new mitigation parcels followed by completing follow-up HEP surveys with whatever time remained of the field season, which generally extended from late May through early September each year. With limited field season time, the RHT largely ignored Pisces generated follow-up HEP survey requests in favor of those requested by project sponsors and BPA COTRs. As a result, follow-up HEP surveys were conducted/distributed randomly across the Columbia Basin Region, but not equally.