Section 10. Narrative

Project ID: 200800700

Title: The UCUT Wildlife M&E Program (UWMEP)

A. Abstract and statement of innovation

Monitoring and evaluation (M&E) of management and habitat restoration projects are prerequisites for assessment of project objectives. Recognizing the importance of M&E, the five Upper Columbia United Tribes pooled 2008-2009 monitoring resources to create the UCUT Wildlife Monitoring and Evaluation Program (UWMEP). The objective of this regional habitat and wildlife monitoring program is to determine outcomes of habitat protection and restoration projects in and proximate to the reservations and aboriginal lands of the five Tribes. This request will make this program a standalone project that supports wildlife mitigation projects of all five Tribes and represents collaboration between the Tribes, UCUT staff, and biologists at Eastern Washington University. Evaluation of habitat change and vertebrate (birds, small mammals, and amphibians) response to management or restoration activities is based on comparisons between reference (desired future condition) and mitigation sites. Reference sites are monitored for 3 years to determine patterns of annual variation, whereas mitigation sites are monitored at 5-year intervals. Similarities between reference and mitigation sites will be compared by analytical tools that account for limited sampling. We selected eight habitat types (shrub-steppe, grassland steppe, conifer woodland, mixed conifer, riparian forest, riparian shrub, wetland meadow, and emergent wetland) for monitoring. We have identified two reference sites for six habitat types and are evaluating potential sites for the remaining two habitats. Monitoring of newly-acquired reference sites will commence in 2009. Given the increase in acreage and habitat diversity, protocols developed for the Albeni Falls M&E Plan will be evaluated for sampling adequacy. Benefits of a regional monitoring system include (1) consistent monitoring across all tribal ownerships, (2) incorporation of web-based and field-computer data entry systems to ensure data quality and reduce costs, (3) data storage in an existing Microsoft SQL Server 2008 database that initially will allow retrieval of both raw data and data summaries from a secure website and a more flexible query system at a later date, (4) improved evaluation of mitigation efforts, and (5) greater regional communication and understanding of both wildlife distributional changes and effectiveness of different management or restoration activities.

B. Problem statement: technical and/or scientific background

Project background

The five members of the Upper Columbia United Tribes (UCUT) have been conducting wildlife mitigation projects both together (i.e., Kalispel, Kootenai, Coeur d'Alene Tribes under the Albeni Falls Work Group) and singly (e.g., Colville Confederated Tribes and Spokane Tribe of

Indians). These projects seek to mitigate habitat and wildlife losses resulting from the construction of the Grand Coulee, Chief Joseph, and Albeni Falls dams. Much of this effort has been for land acquisition, but management activities to protect (e.g., fencing, control of grazing) and to restore habitat (e.g., weed control, planting of native vegetation) have also been initiated. As management and restoration activities increase in importance, monitoring and evaluation (henceforth M&E) become critical to measure their effectiveness. This requirement was recognized early on by the Albeni Falls Work Group (2001), which developed protocols for monitoring vegetation structure and composition and populations of terrestrial vertebrates (i.e., birds, small mammals, and amphibians). Evaluation was directed at comparing mitigation sites with reference areas that represent a future desired condition for a habitat type. Application of these protocols has been limited to the Kalispel (2002-2006) and Coeur d'Alene Tribes (2006).

In a whitepaper to the Columbia Basin Fish and Wildlife Authority, Pope (2007) discussed some of the issues with M&E: "Wildlife managers continue to receive little support or incentive from BPA to develop or implement monitoring for wildlife on mitigation properties. For example, in contrast to fish projects in 2007, BPA refused to fund most M&E work elements associated with wildlife projects in the Columbia Basin. There is also little direction or support from the Northwest Power and Conservation Council (NPCC) or BPA for the wildlife managers to participate in regional monitoring programs (e.g. State Conservation Strategies). The NPCC has not established protocols for monitoring or a functional region-wide database for entering wildlife data collected from monitoring programs. Neither the NPCC nor BPA have provided directions on what to monitor or why. HEP [Habitat Evaluation Procedures] remains the only region-wide assessment process for wildlife projects and the primary focus of BPA in-lieu of more relevant monitoring or assessment programs."

When funding for M&E was restored in 2008, the five Tribes agreed to develop a regional M&E program (UCUT Monitoring and Evaluation Program [UWMEP]) by pooling most of their M&E funds. The rationale was that a consistent monitoring program across all tribal ownerships would allow better evaluation of the effects of management actions and decisions. By creating a central data depository, data and research products can be more easily shared across tribal jurisdictions.

Regional monitoring and evaluation

Development of a program for regional monitoring has challenges as a result of the large geographical scale, the varied habitats (Tables 1, Appendix 1), logistics of fieldwork, development of both an appropriate sampling strategy and appropriate sampling protocols, and construction of a mechanism both for archiving and maintaining data and for making data and data products accessible to managers. In 2008, we began to meet these challenges by working with tribal resource managers to prioritize mitigation properties for monitoring.

Table 1. The number of acres of mitigation lands that are in each of the eight priority habitat types.

	Shrub-steppe	Grassland steppe	Conifer Woodland	Mixed Conifer	Riparian Forest	Riparian Shrub	Wetland Meadow	Emergent Wetland	Tribe Totals
Coeur d' Alene									
Acres	0	0	533	665	781	102	575	30	2685
Percentage	**0%**	**0%**	**20%**	**25%**	**29%**	**4%**	**21%**	**1%**	
Colville									
Acres	21796	13609	2422	12832	230	1051	0	0	51939
Percentage	**42%**	**26%**	**5%**	**25%**	**<1%**	**2%**	**0%**	**0%**	
Kalispel									
Acres	0	0	0	860	193	166	2307	487	4012
Percentage	**0%**	**0%**	**0%**	**21%**	**5%**	**4%**	**58%**	**12%**	
Kootenai									
Acres	0	0	0	112	16	15	95	48	285
Percentage	**0%**	**0%**	**0%**	**39%**	**6%**	**5%**	**33%**	**17%**	
Spokane									
Acres	961	525	728	5308	192	234	0	0	7947
Percentage	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	
Habitat totals	23718	14658	4410	25084	1604	1800	2977	564	74815
	32%	**20%**	**6%**	**34%**	**2%**	**2%**	**4%**	**1%**	

Geographical area and habitats. The five Tribes participating in the M&E program currently have 74,815 acres of mitigation lands (Table 1) in approximately 60 non-contiguous units (Appendix 1). These units are located in seven subbasins of the Pacific Northwest Region (Figs. 1 and 2). Working with wildlife managers from each tribe, eight general habitat types have been selected for monitoring: shrub-steppe, grassland steppe, conifer woodland, mixed conifer, riparian forest, riparian shrub, wetland meadow, and emergent wetland (described in section G). In 2008, we acquired geographical information systems (GIS) data layers for the mitigation lands of each Tribe, which include property boundaries, habitat types, and roads. We acquired digital elevation models for the Colville Confederated Tribes to map slope, and digital orthophotos for all mitigation lands. We visited all of the tribal ownerships in 2008 to better appreciate the management issues for their respective mitigation lands, and to understand the constraints on sampling due to terrain, the road network, and travel distances.

Reference habitats. To evaluate change for mitigation sites, areas that represent a desired future condition are selected as reference sites. These sites are chosen pragmatically as the best

available representative habitats. The addition of four new habitat types required that reference sites be located for shrub-steppe, grassland steppe, conifer woodland, and mixed conifer. Suitable sites for conifer woodland and mixed conifer have been selected at the Turnbull National Wildlife Refuge and Spokane Tribe of Indians. Permission has been granted for sampling to take place over the next three years. Suitable shrub-steppe and grassland steppe exist on federal and state lands have been identified, and final selection and permissioning should be completed in spring 2009.

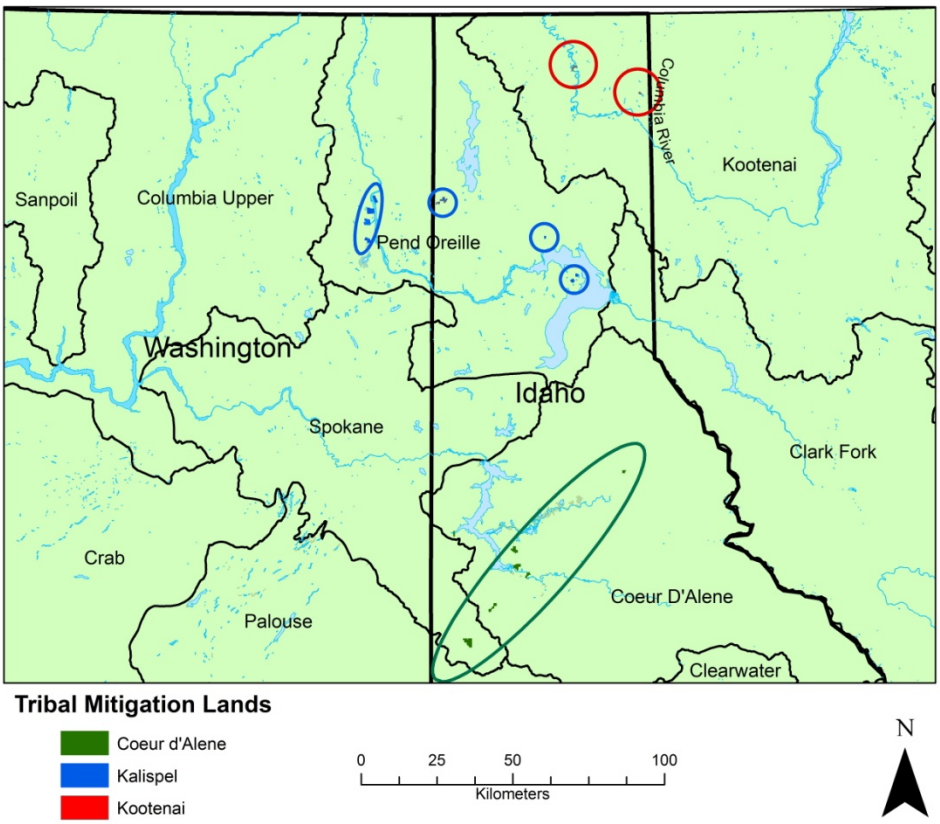

Figure 1. Location of the mitigation lands for the Kalispel, Coeur d'Alene, and Kootenai Tribes.

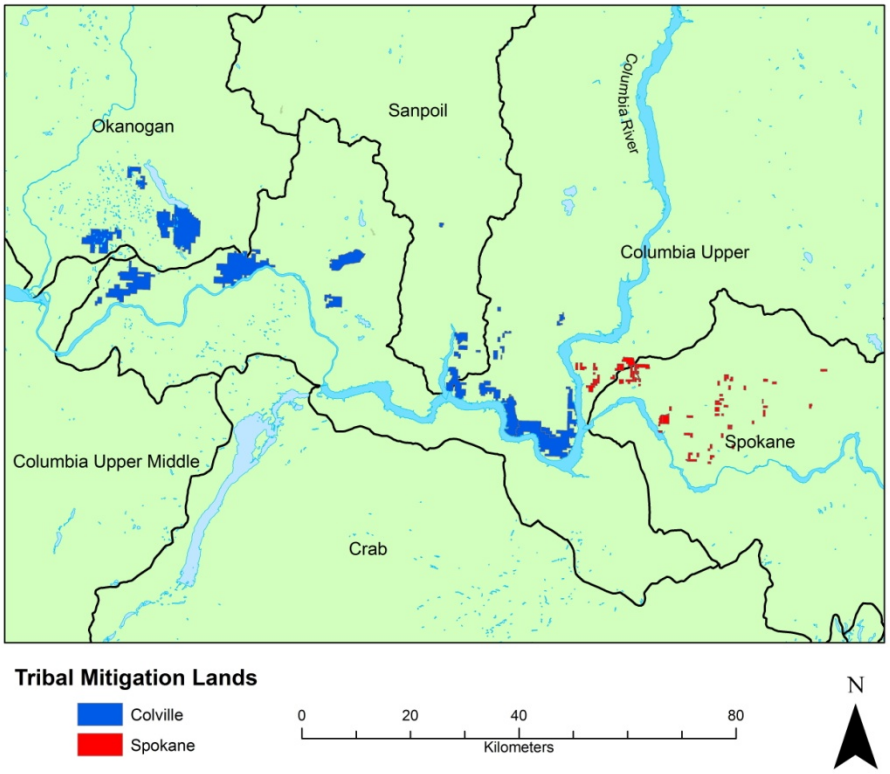

Figure 2. Location of mitigation lands in Washington State for the Colville Confederated Tribes and the Spokane Tribe of Indians.

Sampling strategy. The Albeni Falls Work Group (2001) used a stratified-random sampling design to determine the location of monitoring sample points. The protocol required that a permanent grid with spacing of 200 m be established on each mitigation property using Universal Transverse Mercator (UTM) coordinates. Grid points were sequentially numbered and represented potential monitoring sample points on mitigation areas that could be randomly selected by use of a random numbers generator. The 200-m spacing is equal to the preferred sample point separation for breeding bird point-count stations (Huff et al. 2000), and yields one potential sample point for every 4 ha of habitat. Closer grid-point spacing decreases the probability that data from adjacent sample points are independent and increases the risk of double counting birds when using variable-radius point-count sampling techniques in particular. The Kalispel Tribe of Indians sampled approximately 10% of the points on their mitigation properties. We have applied a 200-m grid to the mitigation properties for all five Tribes. Because of the large increase in mitigation properties to be monitored, we determined quite quickly that it would not be possible to sample at a level of 10% of all mitigation properties. We began devising some simple rules to reduce the number of points and to make sampling logistically feasible: sampling points had to be >300 m apart, slopes <20%, and points within 1 mile of an access road. This exercise begs the question, however, of the number of points necessary for assessing change for a particular management or restoration strategy. Habitats that are structurally simple and have fewer species may need relatively few points, whereas those that are more complex and

species rich may need more. In 2009, we plan to address this question by doing preliminary sampling for habitats that have not been examined previously (e.g., shrub-steppe).

Monitoring. The monitoring protocols developed for the Albeni Falls Work Group (2001) were designed to provide a cost-effective means of assessing vegetational change and wildlife (i.e., birds, small mammals, and amphibians) response to management activities. The primary habitats monitored were riparian forest, riparian shrub, wetland meadow, and emergent wetland. These habitats have relatively simple vegetation structure and consistent species distribution in comparison with the four additional habitats (i.e., shrub-steppe, grassland steppe, conifer woodland, mixed conifer) to be sampled because of the broader geographical area. Because some habitats are likely to have a patchier distribution of plant species (e.g., shrub-steppe, conifer woodland), we are examining the adequacy of the vegetation sampling protocols. In 2008, we experimented with longer transects to increase both sample size and area sampled, and with different plot frame sizes. These studies were conducted only for conifer woodland. Similar studies will be conducted for the additional new habitat types commencing in 2009 (e.g., shrub-steppe, grassland steppe).

Data acquisition, storage, retrieval, and analysis. Data collected during monitoring on Kalispel Tribal lands during 2002-2006 have been converted from Microsoft Access files to Microsoft SQL Server 2008. This database system has several advantages: (1) the database can reside on a web server to allow access from any location, (2) backup of the entire database is straightforward, (3) there are many options for querying and manipulating data, (4) data tables can be easily accessed with statistical software (e.g., SAS), and (5) new geographical data types are now available for use with geographical information systems (ArcGIS). In 2008, we began modifying the structure of data tables to incorporate the additional Tribes and mitigation areas. An initial website will be online in March 2009, which will provide access to both raw data and selected data summaries by tribal wildlife managers.

Evaluation. Although the five UCUT Tribes are all conducting mitigation activities to restore native habitats, there is a diversity of habitats and starting points of habitat conditions as well as different levels of and approaches to these restoration projects. Consequently, attainment of specific goals will be specific to each Tribe’s project. Nonetheless, the proposed region-wide approach to monitoring provides several advantages.

First, this approach enables evaluation of habitat change and wildlife response to that change on this larger scale. The data compiled will allow description of both the relative abundance and species diversity of vertebrates, and the structure and composition of the vegetation. Specific additions or losses of species that might be indicative of changes in restored lands can also be determined. Another approach considers overall similarity in the composition of species assemblages between reference and mitigation areas. Temporal comparisons of reference sites can also indicate annual variation in occurrence of species. Recent probabilistic models for estimating compositional similarity incorporate relative abundance and consideration of shared

species that might not be detected during sampling (Chao et al. 2005). These models are particularly appropriate for assessment monitoring which cannot be exhaustive. For example, over the course of four field seasons at Kalispel Tribe study sites, a total of 125 bird species were recorded after >15,000 individual observations. Of these species, 26 were observed <10 times, whereas the most common species was observed 1,244 times. Application of Chao's modified Jaccard similarity index to these data for reference sites showed consistent between year similarities averaging 84% (± 8% SD). Comparisons of mitigation sites to their matched reference sites produced mean similarities of 63% (± 14% SD, range = 33-93%). These data suggest that significant changes at mitigation points may be detected over time by comparing compositional similarity with reference points, but also by temporal comparisons at multi-year intervals.

A key component of the proposed region-wide approach will be a coordinated and accessible data management system. Sampling data and related products will be stored in a common database and be made available to managers via a web interface. With respect to evaluation, this coordination allows successes and failures of different mitigation approaches to be shared and used to adaptively manage individual projects. This will also reduce potential duplications of effort.

C. Rationale and significance to regional programs

The Basin-level goal of the 2000 Fish and Wildlife Program is to fully mitigate for construction and inundation losses, operational losses, or secondary losses from hydropower activities. The Basin-level objectives for wildlife are to (1) develop and implement habitat acquisition and enhancement projects to fully mitigate for identified losses and (2) monitor and evaluate habitat and species responses to mitigation actions (Northwest Power Planning Council 2000). Wildlife mitigation projects are being conducted by the five UCUT Tribes in seven subbasins: Upper Columbia, Sanpoil, Spokane, Coeur d'Alene, Pend Oreille, Kootenai, and Okanogan. The individual subbasin plans all articulate the need for monitoring and evaluation to determine that management or restoration activities achieve their intended objectives for wildlife (Table 3).

The development of a combined monitoring program for the five UCUT Tribes recognized the need to implement a consistent program for evaluating the effects of mitigation actions and management decisions. By subcontracting to Eastern Washington University, monitoring and evaluation of results will be conducted independently. Better quality control for acquired data can be achieved by training technicians to collect data following established protocols and using techniques that ensure data quality. The subcontractors for this project have been evaluating new analytical tools for assessing change in animal assemblages that help to offset limited sampling. Incorporation of new analytical approaches can be assessed and implemented across projects more readily. Evaluation of the effectiveness of management or restoration activities will be unbiased.

This wildlife monitoring program is designed to provide managers with information on population and community trends that can be used in an adaptive management context. A key component of this M&E approach will be a coordinated and accessible data management system. Sampling data and related products will be stored in a common database and be made available to managers via a web interface. This information will be used to adaptively evaluate both management practices for each project and techniques used to restore, enhance, or manage each area and habitat type. The goal is for greater regional communication and understanding of both wildlife distributional changes and effectiveness of different management or restoration activities. Both successes and failures in restoration can provide managers with more cost-effective approaches.

Table 3. Objectives articulated in each of the seven subbasin plans for monitoring and evaluation related activities.

Subbasin	Objectives	Section	Page	Citation
Upper Columbia	**Objective 1A11:** M&E on wildlife lands to determine benefits of enhancements. **Strategy b**: Monitor wildlife population response to habitat enhancement activities	35. Research, monitoring and evaluation plan	8	Northwest Power and Conservation Council (2004f)
Sanpoil	**Subbasin Objective 2B2: Strategy d:** Monitor shrub-steppe habitat. **Subbasin Objective 2B4: Strategy d:** Monitor upland forest habitat.	43. Research, monitoring and evaluation plan	9	Northwest Power and Conservation Council (2004g)
Pend Oreille	**Objective 2B.1:** Fully mitigate for all FERC hydropower terrestrial resources effects within the Pend Oreille Subbasin in-kind and in-place when possible. Complete all mitigation requirements consistent with approved and active guidelines, agreements, and applicable federal (FERC) licenses. **Strategy c:** Implement management plans and conduct implementation and effectiveness monitoring to ensure that objectives are being met.	19. Research, monitoring and evaluation plan	15 - 16	Northwest Power and Conservation Council (2004d)

Table 3. Continued.

Subbasin	Objectives	Section	Page	Citation
Spokane	**Objective 1A11:** Evaluate effectiveness of mitigation by monitoring and evaluating species and habitat responses to mitigation actions.	27. Research, monitoring and evaluation plan	6	Northwest Power and Conservation Council (2004e)
Coeur d'Alene	Conduct inventory to determine current distribution and population status of species/guild.	11. Research, monitoring and evaluation plan	11-16	Northwest Power and Conservation Council (2004c)
Kootenai	The need to monitor terrestrial vertebrates and habitat structure and composition to assess management activities is discussed in the plan.	10.3 Research, Monitoring and Evaluation (RM&E) Program		Northwest Power and Conservation Council (2004b)
Okanogan	This plan recognizes three important habitats: conifer woodland (Ponderosa pine), shrub-steppe, and riparian wetland. Biological objectives address the question of whether managing for particular focal species provides sufficient conditions ("an umbrella") for other habitat obligates.	1.4 Management Plan	87-90	Northwest Power and Conservation Council (2004a)

Section D. Relationship to Other Projects

This proposed project will provide monitoring and evaluation for the wildlife mitigation projects of the five Member Tribes as outlined below.

Kalispel Tribe of Indians (KT)

The KT is implementing *Albeni Falls Wildlife Mitigation – Kalispel Tribe O, M & E project* (1992-061-02). This project manages approximately 4,230 acres to maintain and enhance habitats to partially meet the Habitat Unit losses at Albeni Falls Dam. Habitat types for all target species associated with the Albeni Falls losses are found with the lands managed under this project. This project and its predecessor have been implemented by the Tribe since 1992. At the conclusion of fiscal year 2009, BPA has received a total of 4,259 baseline protection HU credits and 643 enhancement HUs for this project. When completely enhanced, the lands managed under this project are expected to contribute at least 9,500 HUs to the Albeni Falls wildlife mitigation ledger.

Coeur d'Alene Tribe (CDAT)

The Coeur d'Alene Tribe is implementing several programs related to Albeni Falls Wildlife Mitigation (199206102). The *Lake Creek Land Acquisition* (199004401), which historically managed the Windy Bay property, was subsumed into the Albeni Falls project in 2007 to save financial resources. The CDAT is implementing the *Hangman Restoration Project* (200103300) that purchased and manages about 1,300 acres in the Hangman Creek watershed, which are credited against Albeni Falls construction and inundation losses. In addition, the CDAT is implementing BPA project #199004400: *Implement Fisheries Enhancement Opportunities*. This is an ongoing project designed to address the highest priority objective in the Coeur d'Alene subbasin: protect and restore remaining stocks of native resident westslope cutthroat trout to ensure their continued existence in the basin and provide harvestable surpluses of naturally producing adfluvial adult fish from Lake Coeur d'Alene and Benewah, Lake, Evans and Alder creeks. This project works in concert with the Albeni Falls Wildlife Mitigation Project by utilizing opportunities to restore critical habitats on mitigation lands in target watersheds.

Kootenai Tribe of Idaho (KTOI)

Since 1998, the Kootenai Tribe of Idaho has been a Work Group member of the Albeni Falls Wildlife Mitigation Project (199206105) and has protected 211 acres (185.38 HUs) in Boundary County, Idaho. The Trout Creek Peninsula project encompasses 112 acres (70 HUs) of floodplain/riparian habitats along 14,000 ft of Kootenai River riparian habitats. Management activities include passive and active pocket wetland and riparian reestablishment. The Perkins Lake property encompasses 98.64 acres (115.38 HUs) in the Curley Creek drainage near Moyie Springs, Idaho. Curley Creek has been identified by numerous groups (e.g., TNC, IDFG

Conservation Data Center) as an important wetland complex with existing populations of endemic, threatened, endangered and sensitive wetland plant communities. The Tribe, to evaluate changes in the wildlife habitat areas being restored, is coordinating monitoring procedures, methodologies and survey work under the UWMEP project. UWMEP has been working with the Albeni Falls Work Group to implement the monitoring and evaluation work associated with the Albeni Falls Monitoring and Evaluation Plan methodologies.

Spokane Tribe of Indians (STOI)

The Spokane Tribe Wildlife Mitigation Project (formerly the Blue Creek Winter Range) was developed in 1991 to begin mitigation for Grand Coulee Dam construction and inundation wildlife losses on the Spokane Indian Reservation. The Spokane Indian Reservation was determined to have suffered losses totaling 6699 Habitat Units. The Spokane Tribe initial land acquisitions occurred in 1991-1998 with a total of 1863.5 acres of land being acquired within Blue Creek, Fox Creek, McCoy Lake Watershed, and Wellpinit Mt. Wildlife Mitigation Areas. During the 2000, Provincial Rolling Review the project was approved for a total of $4.5 million for FY01-03. In FY04, the Tribe finally began to purchase land for wildlife mitigation. As of January 9, 2006, the Tribe has acquired a total of 3,777.51 acres (1914.01 acres in FY04-06) of land on and adjacent to the Reservation that are being incorporated into the Spokane Tribe of Indians Wildlife Mitigation Operation and Maintenance Project (199800300). The project was approved for additional land acquisitions for the 2007-2009 review period. The Tribe acquired 3,936.93 acres in 2007, which brought the total land base to 8,407.57 acres. These lands will be monitored as part of the UWMEP project, which started in 2008.

Colville Confederated Tribes (CCT)

The Colville Confederated Tribes Wildlife Mitigation Project is an ongoing project (also known as Hellsgate Big Game Winter Range Wildlife Mitigation Project). The original Hellsgate project was initiated in 1992 with land purchases within the bounds of the CCT Hellsgate Wildlife Game Reserve, but at present the project manages 57,418 acres throughout the CCT Reservation and three Sub-basins within the Inter-mountain Province (IMP). The CCT Wildlife Mitigation Project is proposed as the only Colville Tribal wildlife project to address mitigation for habitat losses resulting from construction and inundation of Chief Joseph and Grand Coulee Dams. The CCT Wildlife Mitigation Project protects credited Habitat Units (HUs) and manages core habitat areas for the biological requirements of managed wildlife species identified in the loss assessments. The majority of the lands managed by the Wildlife Mitigation Project are located on or near the Columbia River (Rufus Woods Lake and Lake Roosevelt) and surrounded by Tribal land. To date, we have acquired a total of 34,597 habitat units (HUs) towards a total of 35,819 HUs destroyed during hydropower development (U.S. Department of Energy 1986, 1992).

The central goal of the CCT Wildlife Mitigation Project is to protect, restore and enhance enough land to compensate for hydropower losses and manage those habitats for the life of the hydropower projects in a manner that will provide abundant and high quality habitats for native wildlife species. Wildlife management in these areas will focus on providing the habitat for desired, native species as well as Washington State Threatened and/or Endangered species, Species of Concern, and species that are important for traditional cultural and/or subsistence use. This project is similar in scope and nature to other projects in the IMP and will continue to protect, restore, and enhance lands acquired for mitigation until fully mitigated. Full mitigation will only occur when the habitats lost due to hydropower development on the Columbia River are regained through acquisition and restoration/enhancements efforts on remaining lands adjacent to the losses that contain existing habitat values that have potential to increase through management and protection. Results will be evaluated by UWMEP to show gains towards established goals and objectives.

E. Project History (for ongoing projects)

In 2008, the Upper Columbia United Tribes (UCUT) established the UCUT Wildlife Monitoring and Evaluation Program (UWMEP; 200800700) to initiate a coordinated regional approach to M&E. In support of the program, the five Tribes pooled 5% of their individual contract resources in the 2008 fiscal year for a total $148,250. This program is closely linked to work completed between 2001 and 2006 by the Kalispel Tribe as part of Albeni Falls Dam Mitigation.

In 2001, the Albeni Falls Interagency Work Group developed the *Monitoring and Evaluation Plan for the Albeni Falls Wildlife Mitigation Project* (Albeni Falls Interagency Work Group 2001). This wildlife monitoring program was designed to provide managers with information on population and community trends that can be used in an adaptive management context. In 2001, the Kalispel Tribe contracted with Eastern Washington University to implement wildlife monitoring on tribal lands. The objectives were to: 1) determine baseline conditions; 2) assess the degree of annual variation in species composition; 3) evaluate changes due to on-the-ground restoration activities; 4) create and maintain a database; and, 5) direct its management efforts. Evaluation of habitat change and vertebrate response to management or restoration activities was based on comparisons between reference (desired future condition) and mitigation sites. Reference sites were monitored for 3 years to determine patterns of annual variation, whereas mitigation sites were monitored at 3-year intervals to detect change. Randomly selected mitigation sites were distributed across the Kalispel Tribe’s wildlife mitigation lands with sample sizes proportional to acreage of each habitat type. Data from the mitigation sites were compared against the appropriate reference sites to describe each habitat types' similarity to the reference site. Once restoration or passive management is complete and habitat types show strong similarity to the reference condition, the active portion of mitigation will be considered complete and the actions a success.

With the establishment of a regional approach to M&E through UWMEP, the monitoring template of the Albeni Falls project had to be evaluated in light of the expansion into more habitat types and greater acreage than found on Kalispel lands. During 2008, the foundation for this expanded M&E program to move forward was accomplished by addressing the tasks identified in Table 4.

Table 4. Accomplishments for the 2008-2009 project year.

2008	Because of the need for a consistent wildlife M&E, the 5 UCUT Tribes pooled 5% of their contracts to initiate a regional approach to M&E based on the Albeni Falls Plan (previously reviewed and endorsed by the ISRP). See UCUT reports/attachments in PISCES.
2008	Coordinated a subcontract with Eastern Washington University (EWU) for the implementation of the wildlife M&E.
2008	Completed draft UCUT Wildlife M&E Plan based on the Albeni Falls model to include changes to the sample site selection criteria and revisitation schedules.
2008	Established 6 new reference sites: 4 conifer woodland sites under a scientific research permit at the Turnbull National Wildlife Refuge and 2 mixed conifer sites at the Spokane Tribe of Indians reservation lands.
2008	Explored potential shrub-steppe and grassland steppe reference sites at various locations and land ownerships/management across greater eastern WA and north ID (e.g., tribal, Nature Conservancy, BLM lands).
2008	Evaluated sampling and data collection methods. For example 1) two vegetation plot designs were compared at two sample sizes; 2) the efficiency of using hand held computers versus paper forms for data collection and entry was compared.
2008	Coordinated site visits to management areas on reservation lands of each of the UCUT's Member Tribes and meetings with EWU Subcontractor, federal agency staff, and with the Wildlife Managers from the UCUT Member Tribes.
2008	Completed field identification of frequently occurring native forbs and grasses from all relevant habitat cover types through the use of keying in the field and the EWU herbarium reference.
2008	Created master plant list for relevant habitat types based on field identification and literature searches. Prepared condensed keys for tadpoles, salamanders, and common fish limited to the UCUT M&E region.
2008	Conducted literature searches for information related to restoration, reference sites, and local vertebrate communities.
2008	Prepared field protocols for bird, amphibian, small mammal, and vegetation sampling.
2008	Compiled land use data, digital elevation models (DEMs), orthophotos by county, and hydrological data related to each of the Member Tribes to aid in selection of mitigation sample points.
2008	Created a detailed narrative of the UCUT M&E Wildlife Program's 8 prioritized habitat types.
2008	Corrected, sorted, and organized the Kalispel Tribe’s Albeni Falls data (2002-2006) into a centralized database. Note: this includes all breeding bird, amphibian, small mammal, and vegetation data.
2009	Establishing a web-based query system to provide access to the Kalispel Tribe’s Albeni Falls Mitigation Project data (2002-2006), UWMEP Data (2008), as well as all future data related to this project
2009	Annual progress and PISCES status reports to be submitted at the end of the project fiscal year.

F. Proposal biological/physical objectives, work elements, methods, and metrics

Objectives

The primary objective of this project is the development of an M&E program that can inform managers of the five Tribes about the effects of their activities on wildlife mitigation lands. A consistent monitoring program across all tribal ownerships will allow better evaluation of the effects of management actions and decisions.

To achieve this, we need to:

Develop an M&E plan that can provide data for evaluation of management activities. The Albeni Falls Wildlife M&E Plan provides a model for sampling protocols. The inclusion of new habitat types and sampling over a broader geographical area, however, requires assessment of sampling approaches, particularly for vegetation structure and composition. This will require examination of the variability of distribution, abundance, and structure of vegetation for new habitats that may be more complex or where plants are more patchily distributed. Furthermore, a modified approach for selection of mitigation sites to be surveyed is required.

Obtain data on reference sites that reflect a future desired condition. Our approach to assessing habitat change and wildlife response is to compare mitigation sites to areas that reflect a desired future condition (reference sites). Such comparisons require that annual variation in reference sites be determined. Sampling will be conducted for small mammals, breeding birds, amphibians, and vegetation to describe reference conditions for each of the 8 priority habitats over 3 years.

Create a database system that makes data and research products easily shared across tribal jurisdictions. A key component of this M&E approach will be a coordinated and accessible data management system. Sampling data and related products will be stored in a common database and be made available to managers via a web interface. By creating a central data depository, data and research products can be more easily shared across tribal jurisdictions.

Work Elements

Work elements 118, 119, 132, 165, and 185: These do not directly address a biological objective, but are support work elements that are needed to complete the overall project or are reporting requirements. These elements will be performed for each contract year.

(119) Work Element: Manage and Administer Project
Work Element Title: General Administration of Project
Description: Manage the project and subcontract, including oversight with the 5 participating Tribes and EWU. Review, approve, and administer the project's SOW, budgets, and contracts. Coordinate/manage all project personnel and equipment, and all associated invoicing with EWU and the BPA

Methods: Conduct activities as necessary.

(118) Work Element: Coordination
Work Element Title: General Project Coordination
Description: Coordinate activities with and between the UCUT's Member Tribes, federal agency staff, and Eastern Washington University (EWU) subcontractor. This will include scheduling and preparing agendas for regular meetings, preparing updates/progress reports, overseeing overall program function including budgetary responsibilities and completion of project tasks.
Methods: Conduct activities as necessary.

(185) Work Element: PISCES Status Reports
Work Element Title: Produce PISCES Reports
Description: Prepare 4 quarterly PISCES reports against each identified milestone, indicating whether the milestone is green, yellow, or red.
Methods: Reports will be completed and filed on-line via PISCES within 15 days of the end of the quarter.

(132) Work Element: Produce Annual Report
Work Element Title: Annual Progress Report
Description: Prepare and submit required progress report for the project's contracting period.
Methods: Complete Annual Progress Report and submit electronically to BPA COTR.

(165) Work Element: Produce Environmental Compliance Documentation
Work Element Title: Complete Environmental Compliance Requirements (NEPA).
Description: Acquire appropriate permits for land use and wildlife sampling.
Methods: Complete research and access permit applications and environmental compliance documentation from appropriate land managers/owners.

Work Elements 156, 157, 160, 161, and 162: The following directly support our objective of creating a regional M&E program to evaluate habitat management activities on wildlife mitigation lands of the five UCUT Member Tribes.

(156) Work Element: Develop RM&E Methods and Designs
Work Element Title: Develop RM&E Methods and Designs.
Description: Review and revise the UCUT Wildlife M&E Plan as new data become available. This will include stratified random selection of mitigation sites for each wildlife management parcel. It will also address sampling interval for the various management types (passive or active restoration) and habitat types.
Methods: The UCUT Monitoring and Evaluation Program draws heavily on our experience with the Albeni Falls M&E plan (AFIWG 2001). The extension of the M&E program to a broader geographical area and to new habitat types may require changes in both data collection protocols and the sampling strategy for mitigation lands.

Protocols developed for surveys of breeding birds, small mammals, and amphibians can be applied without modification (described in WE 157). Because the sampling protocols for vegetation were created for relatively less complex habitats (e.g., wetland meadow), we

anticipated that some modifications would be required for sampling in more complex or more patchy habitats (e.g., mixed conifer and shrub-steppe, respectively). We began investigating different sampling levels and approaches for conifer woodland and mixed conifer reference sites in 2008 as discussed in WE 157. This work will be continued for the other habitat types in 2009.

The Albeni Falls Work Group (2001) used a stratified-random sampling design to determine the location of monitoring sample points. The protocol required that a permanent grid with spacing of 200 m be established on each mitigation property using Universal Transverse Mercator (UTM) coordinates. Grid points were sequentially numbered and represented potential monitoring sample points on mitigation areas that could be randomly selected by use of a random numbers generator. The 200-m spacing is equal to the preferred sample point separation for breeding bird point-count stations (Huff et al. 2000), and yields one potential sample point for every 4 ha of habitat. Closer grid-point spacing decreases the probability that data from adjacent sample points are independent and increases the risk of double counting birds when using variable-radius point-count sampling techniques in particular. The Kalispel Tribe of Indians sampled approximately 10% of the points on their mitigation properties. We have applied a 200-m grid to the mitigation properties for all five Tribes. Because of the large increase in mitigation properties to be monitored, we determined quite quickly that it would not be possible to sample at a level of 10% of all mitigation properties. We began devising some simple rules to reduce the number of points and to make sampling logistically feasible: sampling points had to be >300 m apart, slopes <20%, and points within 1 mile of an access road. This exercise begs the question, however, of the number of points necessary for assessing change for a particular management or restoration strategy. Habitats that are structurally simple and have fewer species may need relatively few points, whereas those that are more complex and species rich may need more. In 2009, we plan to address this question by doing preliminary sampling for habitats that have not been examined previously (e.g., shrub-steppe).

Schedule:

2009-2011. Determine necessary sampling effort for new habitat types. This information along with field experience and tribal priorities for monitoring will be used to develop a schedule for sampling of mitigation areas to commence in 2012. A final M&E plan will be available by early 2012.

(157) Work Element: Collect/Generate/Validate Field and Lab Data
Work Element Title: Complete Collect/Generate/Validate Field and Lab Data
Description: Collect data for small mammals, amphibians, breeding birds, and vegetation on at least 2 reference sites for each of the new habitat types. Conduct initial sampling of vegetation on potential mitigation sites to determine necessary levels of sampling for these habitats.
Methods: The methods for monitoring small mammal, breeding bird, and amphibian abundance, and structure and composition of vegetation on reference and mitigation sites will largely follow those developed by wildlife biologists at Eastern Washington University for the Kalispel Tribe and adopted by the Albeni Falls Project Interagency Work Group (2001). As the regional approach to M&E is expanding into more habitat types and greater acreage than found on Kalispel lands, the adequacy of these methods is currently being evaluated. Prior to each year of vertebrate sampling, necessary permits will be obtained and the project will be reviewed by

Eastern Washington University's Institutional Animal Care and Use Committee. Our methods are summarized as follows.

Small mammals. The small mammal community is an important component of biological diversity in most ecosystems. Small mammals act as seed dispersal agents, their burrowing disturbs soil and creates microsites for seedling development, and they provide a prey base for higher trophic level consumers. Monitoring species abundance, community diversity, and trends provides information that can be used to determine the effectiveness of management actions in moving towards conservation goals. Small-mammal populations will be sampled by removal trapping on a 9 by 5 grid centered at each sample point and 12 m spacing. Trapping will be conducted for 3 consecutive nights yielding a total of 270 trap nights per sample point. Data recorded for each specimen will include trap location; date of capture; species; standard body measurements; and upon autopsy, sex and reproductive condition. Skulls will be labeled and cleaned for positive species identification and some specimens will be prepared as study skins.

Breeding birds. Monitoring the health and long-term stability of bird communities can provide an important measure of overall environmental health (Morrison 1986). Birds are good environmental monitors for several reasons: many species can be monitored simultaneously with a single method, methods for monitoring are well understood and standardized, birds occupy all habitat types, and as a community represent several trophic levels and habitat use guilds. Monitoring species abundance, community diversity, and trends provides information that can be used to determine the effectiveness of management actions in moving towards conservation goals. Point counts will be used to monitor breeding birds. Point counts are the most widely used quantitative method used for monitoring land birds and involve an observer recording birds from a single point for a standardized time period (Ralph et al. 1995). Each mitigation or reference point is the center of a point-count station. The focal survey area consists of a 50-m radius circle around each birding station. At each site an 8-minute point count will be conducted between sunrise and 10 AM during the breeding season. Data are recorded in three time periods and all birds observed during this time will be recorded for presence/absence data. All points will be visited a minimum of five times with a minimum of 7 days between counts. To maximize the probability of recording all bird species present on a site regardless of variable arrival and breeding times, surveys are scheduled so that each site is visited at regular intervals throughout the breeding season. Field observers should be highly qualified to detect birds by sight and sound. Fixed-radius plots (where the radius is arbitrarily small) reduce the interspecific difference in detectability by assuming that: a) all the birds within the fixed radius are detectable; b) observers do not actively attract or repel birds; and c) birds do not move into or out of the fix-radius during the counting period. This allows for comparisons of abundance among species. Unlimited radius plots maximize the amount of data collected because they include all detections and are appropriate when the objective is to monitor population changes within a single population (Ralph et al. 1995).

Amphibians. Amphibians are important components of ecosystem biodiversity that are frequently overlooked by fish and wildlife habitat managers. There is growing worldwide concern about perceived and actual declines in populations of amphibians. Permeable skin and a life cycle that involves both aquatic and terrestrial habitats make amphibians especially susceptible to altered conditions they may encounter in their habitat. They can serve as indicators of environmental

health. Local management activities may disproportionately affect amphibians (and reptiles) because of their relatively sedentary lives in contrast to species with greater mobility such as larger mammals and birds. Many wildlife mitigation properties, especially those not yet acquired, have never been intensively surveyed for herpetofauna. We have designed this monitoring program to provide managers with information about what species presently occur on individual projects (the inventory phase) and to provide them with information about the effectiveness of their habitat management practices (monitoring phase) toward benefiting the species assemblages that occur there. Where appropriate, amphibian populations will be monitored by larval trapping using collapsible minnow traps. Transects of 5 traps will be established in open water areas near mitigation or reference points. Traps will be set out for 5 days at each site during early and again in late summer. Salamander or frog larvae are identified, measured for snout-vent length, and examined for larval stage. Water depth will be measured for each capture. Fish will also be identified and counted.

Vegetation. Vegetation provides habitat for wildlife species. The primary issues regarding the conservation and restoration of vegetation and wildlife habitats are plant community composition, structure, and ecosystem function. The goal of vegetation sampling is to collect comparative information on herbaceous vegetation, shrubs, and trees on both reference and mitigation points.

The frequency and percent cover of ground vegetation and substrate features will be measured. Unless precluded by plant condition (e.g., seedling), all plants will be identified to species. For the Kalispel Tribe 2002-2006 dataset, ground vegetation and substrate were measured using a 20 x 50-cm plot placed at the center of each site point and on alternating sides of a 16-m transect radiating in each of the cardinal directions from the site point for a total of 17 plots. Species of herbaceous vegetation and substrate features (e.g., rock, litter) were recorded and assigned to 1 of 6 cover categories (Daubenmire 1959). The height (to nearest cm) of the tallest vegetation rooted in the plot was measured at three points along the midline of the plot frame. In tall marsh vegetation, the plot frame used is 3-sided (open on 1 of the 50-cm sides) to be able to slide the plot into the vegetation rather than placing over the vegetation. Instead of cover class, the number of stems of cattails and bulrushes are recorded.

The primary habitats monitored for the Kalispel Tribe were riparian forest, riparian shrub, wetland meadow, and emergent wetland. These habitats have relatively simple vegetation structure and consistent species distribution in comparison with the four additional habitats (i.e., shrub-steppe, grassland steppe, conifer woodland, mixed conifer) to be sampled because of the broader geographical area. Because some habitats (e.g., shrub-steppe, conifer woodland) are likely to have a patchier distribution of plant species, we will extend our initial evaluation of the adequacy of the vegetation sampling protocols. In 2008, we experimented with longer transects to increase both sample size and area sampled and with a nested-plot design (Smith et al. 1986). These studies were conducted only for conifer woodland. Similar studies will be conducted for the additional new habitat types commencing in 2009 (e.g., shrub-steppe, grassland steppe).

Shrubs will be measured along 2-m wide by 32-m long belt transects. The species and the size (length x width x height) of each shrub will be recorded. Number of trees by species and diameter at breast height (dbh) size class will be recorded within 16 × 16-m plots centered on

each reference or mitigation point in 6 size classes. The number of standing dead trees (i.e., snags) will be recorded by species, size class, and stage of decay.

All data will be entered into the UWMEP database as described in Section 160 and will be analyzed as described in Section 162.

Schedule:

2009-2011. Sampling for vegetation and for small mammals, birds, and amphibians will be conducted on reference sites for new habitat types (i.e., shrub-steppe, grassland steppe, conifer woodland, mixed conifer) to assess annual variation. Vegetation sampling on mitigation sites to determine the level of sampling required.

2012-2016. Because of the large geographical area to be monitored, we anticipate a 5-year cycle for sampling mitigation sites across all tribal ownerships. This will be the first full sampling cycle.

2017-2018. The sampling cycle will restart.

(160) Work Element: Create/Manage/Maintain Database
Work Element Title: Create/Manage/Maintain Database
Description: Input small mammal, bird, amphibian, and vegetative data into a central UCUT Wildlife M&E database. This database will be housed at EWU for the time being and will be used to serve data through a web accessible database.
Methods: Data tables were created for the Kalispel Tribe (Albeni Falls M&E) using Microsoft Access. These data have been ported to Microsoft SQL Server 2008 for UWMEP, and the tables have been modified to incorporate additional information required by the inclusion of additional Tribes and mitigation lands. Vegetation data collected in 2008 for conifer woodland and mixed conifer reference sites have been added.

In 2008, we tested the use of handheld computers (PDAs) for collection of vegetation data on new reference sites. Data collected on handwritten data sheets were compared to those downloaded from the handhelds. Out of several hundred records, there were only two small discrepancies between the two sets of data. Because these data are time consuming to record by hand and subsequently enter into a computer, we plan to collect all vegetation data using handhelds in subsequent field seasons. Field data for small mammals and amphibians have been collected using field forms, but we will determine the utility of handhelds for these data in 2009. Independent contractors conduct bird sampling, and we have created a website for data entry for their use.

The lead technician has the primary responsibility for ensuring data quality. All species are represented by 4-6 letter codes (e.g., PEMA = ***Pe****romyscus* ***ma****niculatus*) and there are now several hundred codes in use. We have created forms for both handheld and computer data entry that reduce errors by providing dropdown menus for such codes or by limiting the range of responses.

The SQL database resides on a server at EWU and is mirrored at a web-hosting server (discountasp.net).

Schedule:

2009-2018. Data from each year of sampling will be entered and checked in the year of collection.

(162) Work Element: Analyze/Interpret Data
Work Element Title: Analyze/Interpret Data
Description: Complete analysis and interpretation of data from all focal guilds and vegetation for the 8 reference habitat types. These include shrub-steppe, grassland-steppe, conifer woodland, mixed conifer, riparian forest, riparian, wet meadow, and emergent wetland.
Methods: Data obtained under WE157 allow description of both the relative abundance and species diversity of vertebrates, and the structure and composition of the vegetation. Specific additions or losses of species that might be indicative of changes in restored lands can also be determined. Another approach considers overall similarity in the composition of species assemblages between reference and mitigation areas. Temporal comparisons of reference sites can also indicate annual variation in occurrence of species. Recent probabilistic models for estimating compositional similarity incorporate relative abundance and consideration of shared species that might not be detected during sampling (Chao et al. 2005). These models are particularly appropriate for assessment monitoring which cannot be exhaustive. For example, over the course of four field seasons of the Kalispel project, a total of 125 bird species were recorded after >15,000 individual observations. Of these species, 26 were observed <10 times, whereas the most common species was observed 1,244 times. Application of Chao's modified Jaccard similarity index to these data for reference sites showed consistent between year similarities averaging 84% (± 8% SD). Comparisons of permanent sites to their matched reference sites produced mean similarities of 63% (± 14% SD, range = 33-93%). These data suggest that significant changes at mitigation points may be detected over time by comparing compositional similarity with reference points, but also by temporal comparisons at multi-year intervals.

When data become available for reference sites for all eight habitat types, we may find that the similarity of reference sites to themselves (i.e., annual comparisons) may vary across habitats. This level of similarity may then indicate an upper limit for changes that might come about from management or restoration activities. Managers may then determine a threshold for success that may be, for example, 10% less than this upper limit.

Schedule:

2009-2011. Data will be collected for new reference sites and similarity analyses will be initiated by late 2010, and completed by late 2011.

2012-2018. As data are acquired for mitigation sites, analyses of species diversity, species richness, and community similarity will be conducted.

(161) Work Element: Disseminate Raw/Summary Data and Results
Work Element Title: Disseminate Raw/Summary Data and Results
Description: Develop web-based query system to disseminate raw and/or summary data. This is a prototype and will not be completed by the end of the first year. It will be a multi-year development task.
Methods: By uploading the database to a SQL Server webhost, data will be made available to program participants or other approved personnel. An initial website will be online by late March 2009. This website will provide access to both raw data and selected data summaries (e.g., small-mammal species richness), both of which can be downloaded for specific analyses. Some information may be restricted for sensitive species.

Over the next 3 years, we plan to implement an advanced query system that will allow participants to more easily access data of specific interest to them. Additionally, SQL Server 2008 has new data types for georeferencing data. In 4-5 years, we would like to link the data to a geographical information system (e.g., ArcGIS) to allow spatial analysis of species distributions and habitat condition.

The website will also be used for access to data products including reports and reprints produced by UWMEP.

Schedule:

2009. Initial website for simple access and data summaries will be online.

2010-2011. Advanced query system to be implemented to allow managers more flexibility in how they access and manipulate the data.

2012-2013. Integration with geographical information systems to allow spatial analysis of data.

2014-2018. Additional capabilities may be added as required.

Assessment of factors that might limit success of project

As with any long-term monitoring project, there is a possibility that natural events (e.g., fire, flood) might alter habitat conditions. If this occurred on sites prior to completion of the sampling cycle, alternate sampling sites might be required.

G. Monitoring and evaluation

This project will develop a complete M&E program to support the UCUT Member Tribes. A draft monitoring plan will be completed in March 2009. A final monitoring plan will not be available until after completion of reference site sampling. This plan will include a complete time table for future sampling on mitigation sites. In Section F, we describe the data needs required to adapt the Albeni Falls Protocols for vegetation sampling, and to determine the

minimum sampling points required for mitigation sites in different habitats. The protocols for monitoring vertebrates will be the same as used in the Albeni Falls M&E Plan (Albeni Falls Interagency Work Group 2001). In the following, we describe the priority habitats identified by Tribal wildlife biologists for M&E.

Shrub-steppe. This habitat is characterized by a low-moisture gradient and a plant community adapted to arid conditions. Trees are absent from the landscape and instead *Artemisia tridentata* (big sage) or *Artemisia tripartita* (threetip sage) are the dominant species throughout the region. Less common shrubs include *Purshia tridentata* (antelope bitterbrush), *Chrysothamnus viscidiflorus (*rabbit brush), *Atriplex spp.* (winter fat), and *Sarcobatus vermiculatus (*greasewood). Another important feature of shrub-steppe is an understory dominated by bunchgrasses. The most prominent species are *Pseudoroegneria spicata* (bluebunch wheatgrass), *Festuca idahoensis* (Idaho fescue), *Poa secunda* (Sandberg's bluegrass), and *Stipa comata* (needle-and-thread). With the spring rains, a colorful display of annual and perennial wildflowers blooms throughout the shrub-steppe. *Phlox speciosa* (showy phlox), *Lupinus* spp. (lupines), *Ranunculus glaberrimus* (sagebrush buttercup), *Clarkia pulchella* (ragged robin), *Calochortus macrocarpus* (sagebrush mariposa lily), *Zigadenus venenosus* (death camas), *Eriogonum spp.* (buckwheats), and *Lomatium spp.* (desert-parsley) are common. The presence of a cryptogamic crust composed of lichens, mosses, and algae is important to maintaining the integrity of shrub-steppe. This soil layer reduces wind and soil erosion, aids in nitrogen fixation, and protects against the invasion of non-native species such as *Bromus tectorum* (cheatgrass) (Washington Native Plant Society 2008).

Grassland Steppe. Grassland steppe is similar to shrub-steppe except in that *Artemisia spp.* (sagebrush) are either absent or sparsely represented, and bunchgrasses are the dominant vegetation type. This habitat type is found predominately to the east and southeast of shrub-steppe as it transitions into lowland forest in the Columbia Basin region (Crawford and Kagen). Fragmented remnants of grassland steppe are found in the Palouse region of southeastern Washington and adjacent Idaho that has largely been converted to agriculture. Two dominant bunchgrasses are *Pseudoroegneria spicata* (bluebunch wheatgrass) in drier areas and *Festuca idahoensis* (Idaho fescue) in moister ones. Other native perennial grasses can include *Festuca campestris* (rough fescue), *Aristata longiseta* (three-awn), and *Poa secunda* (Sandberg's bluegrass). In places with higher precipitation or where soils have higher moisture holding capacity, perennial and annual broadleaf forbs comprise a significant portion of the landscape (Daubenmire and Daubenmire 1970). Common wildflowers include *Balsamorrhiza sagittata* (arrowhead balsamroot), *Lupinus spp.* (lupines), *Lomatium spp.* (desert-parsley), and *Eriogonum spp.* (buckwheats).

Conifer Woodland. Lowland forests throughout the region are dominated by drought-tolerant *Pinus ponderosa* (ponderosa pine). Historically these forests were adapted to a relatively frequent fire cycle that formed naturally occurring open-canopy woodlands. In modern times,

fire suppression and other management techniques have led to denser stands (O'Connell 2008). Within conifer woodlands, soil type, aspect, and moisture availability will influence vegetation patterns. *Pseudotsuga menziessi* (Douglas fir) can form associations with ponderosa pine in more mesic sites. At drainage sites or riparian areas, *Populus tremuloides* (quaking aspen) will form clonal stands within the broader habitat-type. Under the right conditions, shrubs might be present as part of the understory along with the more typical grasses and forbs. *Symphoricarpos albus* (snowberry) is the most common shrub species, with accounts of *Rosa woodsii* (Wood's rose), *Amelanchier alnifolia* (serviceberry), and *Prunus virginiana* (chokecherry) (Daubenmire 1968). Common grasses include *Calamagrostis rubescens* (pinegrass), *Festuca idahoensis* (Idaho fescue) and *Pseudoroengeria spicatum* (bluebunch wheatgrass), along with *Koeleria cristata* (junegrass) and *Poa spp*. (bluegrasses). At the margins of ponderosa pine, trees are scattered and eventually give way to large expanses of savannah meadow. Here shrubs are scarce and grasses dominate the landscape. A diverse number of perennial and annual forbs also inhabit conifer woodlands and savannah meadow including *Balsamorhiza sagittata* (arrowhead balsamroot), *Dephinium nuttallianum* (Nuttall's larkspur), *Lupinus spp.* (lupines), *Achillea millefolium* (yarrow), *Lithophragma bulbifera* (bulberous fringecap), *Eriogonum heracleoides* (parsnipflower buckwheat), and *Sisyrinchium inflatum* (purple-eyed grass). Outcrops of basalt rock are also a common geologic feature of this habitat type.

Mixed Conifer. At slightly higher elevation, dry ponderosa pine woodlands begin the transition into more mixed conifer forest. Mixed conifer habitats are predominately coniferous forests with some deciduous trees present. Factors such as elevation and moisture availability play an important role in determining community composition (Cooper et al. 1991). *Pseudotsuga menziesii* (Douglas fir) is widely distributed throughout this habitat type and is the dominant tree species at lower elevations. Successional areas within Douglas fir sites may be populated with *Larix laricina* (western larch) and *Pinus contorta* (lodgepole pine). Isolated individuals of ponderosa pine might exist in drier micro-sites, with occurrences of *Abies grandis* (grand fir) and *Acer glabrum* (Rocky mountain maple) in wetter areas. As elevation and moisture availability increase, *Abies grandis* (grand fir) becomes dominant or co-dominant to Douglas fir and forms new associations with *Abies lasiocarpa* (subalpine fir), *Picea engelmanii* (Engelmann's spruce), *Thuja plicata* (western red cedar), and *Pinus monticola* (western white pine). Within the mixed conifer habitat type there is great shrub diversity. The understory may exist in dense thickets with multiple strata to clearings with fewer occurrences. *Phasocarpus malvaceus* (ninebark), *Holodiscus discolor* (oceanspray), *Symphoricarpos albus* (snowberry), *Berberis repens* (creeping oregongrape), *Spiraea betulifolia* (birch-leaf spiraea), *Rosa gynmnocarpa* (baldhip rose), and *Pachistima myrsinites* (mountain boxwood) are all good representatives. Less common is *Ceanothus velutinus (*shiny-leaf ceanothus). A variety of forbs that many act as indicators for this habitat-type include *Thalictrum occidentale* (meadowrue), *Arnica cordifolia* (heart-leaf arnica), *Linnaea borealis* (twinflower), *Smilacina spp*. (false Solomon's seal), *Osmorhiza* chilensis (sweet cicely), *Chimaphila umbellatum* (pipsissiwa), and *Galium spp*. (bedstraw).

Riparian Forest. Riparian forests include treed areas adjacent to streams, rivers, and lakes. Depending on elevation and topography, these forests can be dominated by deciduous or coniferous trees. For the UWMEP project, this habitat is defined as being predominantly deciduous. Dominant tree species might include *Populus trichocarpa* (black cottonwood), *Populus tremuloides* (quaking aspen), or *Alnus rubra* (red alder). Other trees that might be present are *Betula spp.* (birch), *Salix spp. (willows),* and *Rhamnus purshiana* (cascara). Riparian forests are often seasonally flooded to varying degrees. As such, water tolerant shrubs such as *Cornus sericea* (red-osier dogwood) and *Spiraea douglasii* (Douglas's spiraea) are often associated with this habitat type. However, it is also possible that vegetation within the forested area will be composed entirely of upland species (Guard 1995). Plants identified with these places include *Dryopteris austriaca* (wood fern), *Lycopus americanus* (skunk cabbage), *Myosotis laxa* (forget-me-not), *Impatiens aurella* (orange impatiens), and *Equisetum spp*. (horsetail).

Riparian Shrub. Riparian shrub habitat is found adjacent to seasonal or permanent water areas. These places are dominated by dense thickets of shrubs with either no trees present or only sparse "open-canopy" cover. Although species composition can vary due to flooding dynamics and soil type, some species are typically associated with this habitat. Taller shrubs might be *Salix spp.* (willows), *Alnus spp*. (alders), and *Crataegus douglassi* (black hawthorn). Smaller shrubs include *Spiraea douglassi* (Douglas's spiraea), *Cornus sericea* (red-osier dogwood), and *Rosa spp*. (rose). If trees are present they are fewer and of less significance, including *Populus trichocarpa* (black cottonwood) and *Populus tremuloides* (quaking aspen). The understory is variable and might include grasses, sedges, and forbs common to either Mixed Conifer or Riparian Forest habitat types depending on local conditions. This habitat type is also inclusive of areas formerly classified as "shrub scrub" in previous ISRP publications.

Wetland Meadow. Wetland Meadow habitat encompasses seasonal floodplain meadows that are wet in springtime but that typically dry by mid-summer. This habitat is dominated by a variety of *Carex spp.* (sedges) and *Juncus spp. (rushes). Eleocharis palustris* (creeping spikerush), *Luzula campestris* (sweep's brush), *and Juncus ensifolius* (swordleaf rush) might also be present. Grasses native to this habitat include *Calamagrostis canadensis* (blue-joint) and *Agrostis spp.* (bent-grass). On disturbed sites that have been grazed by cattle or drained for farmland, non-native pasture grasses such as *Phleum pretense* (timothy), *Alopecurus pratensis* (meadow foxtail), and *Poa pratensis* (Kentucky bluegrass) can become established (O'Connell 2008). Perennial and annual forbs are also well represented and include *Potentilla gracilis* (graceful cinquefoil), *Ranunuclus spp.* (buttercup), *Lupinus polyphyllus* (bigleaf lupine), *Senecio spp*. (groundsel), *Triteleia hyacinthina* (hyacinth brodiaea), *Castilleja spp.* (paintbrush), and *Camassia quamash* (blue camas).

Emergent Wetland. Emergent wetland marshes retain sufficient standing or soil water to support the dominant species *Typha latifolia* (cattail), as well as other obligate and facultative wetland species. The dominant cattails might occur in pure stands or in mosaics with *Scirpus*

tabernaemontani (soft-stem bulrush). Also common are *Sparaganium eurycarpum* (giant bur-reed), *Eleocharis spp.* (spikerush), *Polygonum spp.* (smartweeds), and several types of *Carex spp*. (sedge). Aquatic open water areas in the center of the cattail marsh support a number of floating plants such as *Lemna minor* (common duckweed), *Spirodela polyrhiza* (greater duckweed), and *Nuphar lutea* (yellow pond lily). The introduced grass *Phalaris arundinacea* (reed canary grass) is also widespread. At the margins of emergent wetlands, perennial and annual facultative wetland species can be found among the sedges and rushes. These include *Scutellaria galericulata* (marsh skullcap), *Mentha arvensis* (field mint), *Lysichiton americanus* (water whorehound), and *Stachys rigida* (rigid hedge-nettle).

H. Facilities and equipment

The UCUT organization makes available office space, conference and meeting rooms, computers, printers/copiers, telephones, fax machine, office supplies, and telephone conference line capabilities. Administrative support and executive managerial oversight are provided. The organization also maintains a vehicle that is accessible when needed to occasionally support the project. Eastern Washington University (subcontractor) provides library services, and site licenses for geographical information system (ArcGIS) and statistical analysis (SAS) software. Office and laboratory space are available at the Turnbull Laboratory for Ecological Studies. The herbarium at EWU has representatives of most native and introduced plants in the region. Personal computers and printers are available for data entry, data analysis, mapping, and website development. One Trimble GeoXT GPS unit is available for the project.

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Northwest Power and Conservation Council. 2004f. Section 35. "Research, monitoring and evaluation plan"; In Upper Columbia Subbasin Plan, Intermountain Province Subbasin Plan, Columbia River Basin Fish and Wildlife Program. Portland, OR.

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Ralph, C. J., J. R. Sauer, and S. Droege. 1995. Monitoring bird populations by point counts. U.S.D.A. Forest Service, Pacific Southwest Research Station, Albany, CA.

Smith, S. D., S. C. Bunting, and M. Hironaka. 1986. Sensitivity of frequency plots for detecting vegetation change. Northwest Science 60:279-286

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U.S. Department of Energy. 1992. Wildlife Habitat Impact Assessment Chief Joseph Dam Project Washington. Project Report BPA US DOE.

Washington Native Plant Society. 2008. Plant Assemblages of Shrub-steppe. http://www.wnps.org/ecosystems/shrubsteppe_eco/assemblage.htm. Washington Native Plant Society.

Appendix 1. The number of acres of mitigation lands that are in each of the eight priority habitat types listed by mitigation unit for the five Tribes.

	Shrub-steppe	Grassland steppe	Conifer Woodland	Mixed Conifer	Riparian Forest	Riparian Shrub	Wetland Meadow	Emergent Wetland	Tribe Totals
Coeur d' Alene									
Benewah				183		86	105		374
Goose Haven			87	25			348	14	474
Windy				119		4	6	2	131
Cougar				120	17	10	8	3	158
Hangman			445.7		750.1				1196
Trout				214		1.5	3	0.5	219
Sullivan				2	8		28	9	47
Hepton				2	6		77	1	86
Total Cd'A	0	0	532.7	665	781.1	101.5	575	29.5	2685
	0%	**0%**	**20%**	**25%**	**29%**	**4%**	**21%**	**1%**	**100%**
Colville									
W. Kuehne	2010		594	1052	8	147			3811
H. Kuehne	1404		591	1604	200	116			3915
Berg Bros.	1774	3108	150			73			5105
Berg 20%	727	673	380			20			1800
Nespelem Bend	257					75			332
Redford Canyon	185		30						215
Friedlander				35		25			60
Sand Hills	564			836					1400
Graves	1863	700				167			2730
Tumwater	3600	3059				150			6809
White Lakes	1488	2972				11			4471
Boot Mtn	5114		545			27			5686
Rattlesnake	486.7			8830	21.9	107.2			9446

Appendix 1. Continued

	Shrub-steppe	Grassland steppe	Conifer Woodland	Mixed Conifer	Riparian Forest	Riparian Shrub	Wetland Meadow	Emergent Wetland	Tribe Totals
Colville									
Hinman	170	600							770
Agency Butte		2368				20			2388
CCT Land Near Graves	75					5			80
Covington		129							129
Redthunder	1164			133		38.5			1335
Jacobson	914		132	342		69			1457
Total CCT	21796	13609	2422	12832	229.9	1050.7	0	0	51939
	42%	**26%**	**5%**	**25%**	**<1%**	**2%**	**0%**	**0%**	**100%**
Kalispel									
Flying Goose Ranch				89	78	13	245	134	559
Trimble Creek				54.1	16.7	44.8	714.1	70.2	900
Tacoma Creek				130.5	45.5	38.4	181.5	98	494
Priest River				22	4	29	114	9	178
Sandpoint				417	21	4	61	88	591
Big Meadows				75	25	20	440	50	610
Sand Creek				72	3			5	80
Carney						15	390	27	432
Twigg						1.6	161	5.9	169
Total KTOI	0	0	0	859.6	193.2	165.8	2306.6	487.1	4012
Cover Type as % of Total	**0%**	**0%**	**0%**	**21%**	**5%**	**4%**	**58%**	**12%**	**100%**
Kootenai									
Trout Creek				75	16.3		95.2		186.5
Perkins Lake				36.7		14.5		47.6	98.8
Total KTI	0	0	0	111.7	16.3	14.5	95.2	47.6	285.3
Cover Type as % of Total	**0%**	**0%**	**0%**	**39%**	**6%**	**5%**	**33%**	**17%**	**100%**

Appendix 1. Continued

	Shrub-steppe	Grassland steppe	Conifer Woodland	Mixed Conifer	Riparian Forest	Riparian Shrub	Wetland Meadow	Emergent Wetland	Tribe Totals
Spokane									
Castle 1-4	98.4	11.2	60.5	1032.8	59.8	11.9			1274.6
McCoy 1-3	23.3	3.1		653.1	13.2				692.7
East McCoy	131.5	89.9		360.9	1	42.2			625.5
West McCoy	145	410		654.8		162.6			1372.4
Turtle 1-8				857.7	49.4				907.1
Wellpinit 1-13		9		937.8	11.5				958.3
A184C				10					10
A13B				51.8		5.2			57
T67B				75.5	5.1				80.6
T65C	15.7			17	6.5				39.2
A1052	72.9								72.9
Peaks	250.3			97.6					347.9
A75	42.4			16.2					58.6
T283				84		7.1			91.1
A599				80					80
A314				67.5	7.5				75
A1073_74				182.4	16.6				199
A1074M	1.7			78.5	13.7				93.9
T401A	10.7			19.4		4.5			34.6
T1354		1.3		31	7.4				39.7
Blue Creek	169.4		667						836.4
Total STOI	961.3	524.5	727.5	5308	191.7	233.5	0	0	7946.5
	12%	**7%**	**9%**	**67%**	**2%**	**3%**	**0%**	**0%**	**100%**

Section J. Key Personnel

Name	Organization	Title	FTE	Project Duties
Chase Davis	UCUT	Project Lead	0.15	Coordination, administration, collaboration, communication, budgetary, personnel, and oversight duties as needed.
Steve McConnell	UCUT	Project Coordinator	0.10	Coordination, scientific/technical tasks, and oversight as needed.
James Hallett	EWU	PI Subcontract	0.33	Supervise and train technical staff as necessary; selection of reference and mitigation study sites; finalize monitoring plan; manage database, database tools, and website; data analysis; report writing.
Margaret O'Connell	EWU	Co-PI Subcontract	.04	Assist in the supervision and training of technical staff as necessary; selection of reference and mitigation study sites; assist in the finalization of monitoring plan; assist in data management and analysis; assist in report writing.
Kristi Kimmet	EWU	Lead Technician	0.75	Coordinate and train field crews, oversee data collection and entry, prepare and identify plant and animal specimens, literature research, purchase supplies, assist with report writing, and other duties as required.
Ray Entz	KT	Project Liaison		Assist in the selection of reference and mitigation study sites; provide input to monitoring plan; provide logistic support as needed (e.g., permitting, tribal maps, gate access).
Scott Soults	KTOI	Project Liaison		As above.
Kelly Singer	STOI	Project Liaison		As above.
Cam Heusser	CDAT	Project Liaison		As above.
Richard Whitney	CCT	Project Liaison		As above.
Unidentified	UCUT	Field technicians (3)	1.0	Collect data on terrestrial vertebrates and habitat, enter and check data in database

Chase C. Davis

Education, Certification, and Training:
Master of Urban and Regional Planning, Eastern Washington University, 2005.
B.A., Bachelor of Arts in Geology, Washington and Lee University, 1993.

Current Employer and Responsibilities:
The Upper Columbia United Tribes (UCUT), Forests and Fish Program Liaison and Policy Coordinator, September 2006-date. Oversee planning, coordination, communication, collaboration, implementation, funding, budgets, policy, and scientific/research strategies for the Tribes for Clean Water and Endangered Species Acts compliance under a federal HCP for all state and private forest lands in WA St., as well as the associated processes of the Forests and Fish Report, Timber-Fish-Wildlife Agreement, Cooperative Monitoring, Evaluation, and Research Committee, and the Adaptive Management Program. Work entails high level policy and scientific technical communications with the timber industry, federal and state agencies, elected officials, county governments, small forest landowners, staff and elected officials at our Member Tribes, outreach to other Tribes, and to other participating entities. Responsible for other projects and duties as assigned, including providing services to our Member Tribes located in Idaho.

Previous Employment:
Sierra Club, Regional Representative, Spokane, WA, 2000-2006.
United Food and Commercial Workers Union, Regional Representative, Local 1439, Spokane, WA, 1999-2000.
City of Spokane, Neighborhood Planner and Coordinator, Department of Community and Economic Development, 1998-1999.
Sierra Club, Regional Conservation Associate in WA, ID, and MT, 1996-1999.
Cavlogix Corporation, Software Sales and Marketing Coordinator, Seattle, WA, 1997-1998.
Okanogan Highlands Alliance, Regional Representative, Seattle, WA, 1996-1997.
Fund for Public Interest Research and the State Public Interest Research Groups (PIRGs), California, Oregon, and Washington, 1993-1996.

Expertise:
Chase has extensive experience in project management, program/project implementation, strategic planning, communications, coordination, working with diverse constituencies, innovative and collaborative partnership approaches to complex natural resources issues, budgeting and fundraising, politics, outreach to the media, organizational development, and staff management. He possesses a great deal of knowledge with regard to many land use and natural resources management, legal, and technical issues, including habitat, riparian, and fisheries restoration and conservation.

Relevant Technical Publications and Presentations:
Davis, C., 1993, Petrologic and Geochemical Study of the Gabbros and Associated Rocks of the Pikes Peak Batholith, Southern Front Range Rocky Mountains, Colorado: Keck Research Symposium, Vol. 6. Member of a grant funded research team chosen from thirteen private liberal arts schools. Conducted extensive field research and sample preparation. Authored, published, and presented senior thesis at Whitman College, Walla Walla, Washington.

Davis, C., 2005, EWU M.U.R.P. Thesis, Planning for Inland Northwest Wilderness Areas.

Author, contributing author, field researcher, and editorial assistance for numerous Sierra Club Books publications, including for use in programs, publications, and productions for local, regional, and national media outlets.

Steven P. McConnell

Education, Certification, Training:
Ph.D., Forest Ecology and Management, University of Idaho, 2000
M..S., Forest Ecology, Virginia Polytechnic Institute and State University, 1988
B.S. Forest Resources Management, University of Washington, 1982
A.A.S. Fisheries Technology, Peninsula College, 1977

Current Employer and Responsibilities:
Upper Columbia United Tribes, Forest Practices Coordinator, Spokane, Washington. Responsibilities; Represent eastern Washington (Colville Confederated, Kalispel and Spokane) tribes in the Washington States' Forest and Fish Adaptive Management Program. Serve on committees that develop and manage research questions addressing critical questions pertaining to the relationship between forest and fish rules and their effects on water quality and endangered species. Develop and implement research addressing the interaction of rules and riparian forests in eastern Washington. Review the scientific work done within the Adaptive Management Program and provide technical input to tribes on this work

Previous Employment:
Silviculturist**,** Cooperative Monitoring, Evaluation, and Research (CMER), Olympia, Washington. 2005-2006
Silviculturist, Northwest Indian Fisheries Commission, Olympia, Washington, 2000-2005

Expertise:
Dr. McConnell has more than 20 years of experience in forest research focusing especially on understanding the composition and structure of riparian forests in response to both passive and active management. He is an expert with forest growth and yield models and has conducted numerous exploratory analyses of alternative management approaches such as new rules for riparian management or management that could occur under the auspices of "ecosystem management".

Publications and Presentations:
McConnell, S. November, 2007. The DFC Model: a regulatory tool used in riparian forest management in Washington State. Growth Model Users Group, Gifford Pinchot National Forest Headquarters, Vancouver, WA. Available on-line: http://www.growthmodel.org/

McConnell, S. 2007. An overview of the DFC Model and an analysis of westside Type F riparian prescriptions and projected stand basal area per acre. CMER Publication #07-701, Olympia, WA. 46 p, Available on-line: http://www.dnr.wa.gov/BusinessPermits/Topics/FPAdaptiveManagementProgram/Pages/fp_cmer_completed_projects.aspx

McConnell, S. and J. Heimburg. 2007. A field analysis of riparian site attribute data and stand inventory data from approved forest practices applications along westside Type F streams. CMER Publication # TBD, Olympia, WA. 41 p.

McConnell, S. and J. Heimburg. 2007. A review of DFC Model and board manual shortcomings to implementing westside Type F riparian rules. CMER Publication # TBD, Olympia, WA. 49 p.

Benkert, K., Bilby. B. Ehinger, W., Farnum, P. Martin, D. McConnell, S., Peters, R., Quinn, T. Raines, M., Ralph, S. and Schuett-Hames, D. 2002. Monitoring design for the forestry module of the Governor's Salmon Recovery Plan. CMER Program, Olympia, WA. 86 p.

James G. Hallett

Education, Certification, Training:
Ph.D., Zoology, Texas Tech University, 1981
A.M., Biology, Boston University, 1976
A.B., Biology, Boston University, 1972

Current Employer and Responsibilities:
Eastern Washington University; Adjunct Professor of Biology.
Responsibilities: Conduct research on the ecology of terrestrial vertebrates including habitat relationships and methods for monitoring populations. Mentor undergraduate and graduate students in research methods.

Previous Employment:
Associate Scientist and Adjunct Associate Professor, School of Biological Sciences, Washington State University, Pullman, WA, 1991-2005

Expertise:
Dr. Hallett has been conducting field research on terrestrial vertebrates for over 30 years. His research has focused on wildlife-habitat relationships and conservation biology. Major projects have evaluated the importance of landscape structure and configuration on wildlife communities, determined the effectiveness of buffers in riparian areas in maintaining wildlife, and examined patterns of use of legacy and dead trees by wildlife. He has taught classes in population biology, conservation biology, mammalogy, landscape ecology, and multivariate statistics, and trained 12 graduate students. Dr. Hallett has served as a scientific advisor for federal, state, and nongovernment agencies.

Publications and Presentations:
Mech, S. G., and J. G. Hallett. 2001. Evaluating the effectiveness of corridors: a genetic approach. Conservation Biology 15:467-474.

Hallett, J. G., T. Lopez, M. A. O'Connell, and M. A. Borysewicz. 2001. Decay dynamics and avian use of artificially created snags. Northwest Science 75:378-386.

Hallett, J. G., M. A. O'Connell, and C.C. Maguire. 2003. Ecological relationships of terrestrial small mammals in western coniferous forests. Pp 120-156 *In* C. Zabel and R. G. Anthony, editors. Mammal community dynamics: management and conservation in the coniferous forests of western North America. Cambridge University Press.

Anthony, R. G., M. A. O'Connell, M. M. Pollock, and J. G. Hallett. 2003. Associations of mammals with riparian ecosystems in Pacific Northwest forests. Pp. 510-563 *In* C. Zabel and R. G. Anthony, editors. Mammal community dynamics: management and conservation in the coniferous forests of western North America. Cambridge University Press.

Hallett, J. G., M. A. O'Connell, and R.D. Entz. 2007. Use of similarity indices to evaluate responses of wildlife to restoration activities. Ecological Society of America and Society for Restoration Ecology Joint Meeting. San Jose, CA. August 2007.

Margaret A. O'Connell

Education, Certification, Training:
Ph.D., Biology, Zoology, Texas Tech University, 1981
M.S., Zoology, Wildlife Management, Texas Tech University, 1975
B.A., Prescott College, 1973

Current Employer and Responsibilities:
Eastern Washington University, Cheney, WA; Professor, Department of Biology and Co-director of the Turnbull Laboratory of Ecological Studies (TLES). Responsibilities: Teach university classes in Vertebrate Zoology, Wildlife Management, Conservation Biology, Mammalogy, and Ornithology. Advise graduate students in wildlife research. Coordinate teaching and research activities at TLES. Maintain a research program focused on the wildlife and habitats of eastern Washington.

Expertise:
Dr. O'Connell has over 30 years of experience in wildlife research including habitat assessment and population monitoring. In conjunction with Washington State's Timber Fish and Wildlife Program, she has co-directed projects evaluating the importance of landscape structure and configuration on wildlife communities, determining the effectiveness of buffers in riparian areas in maintaining wildlife, and examining patterns of use of legacy and dead trees by wildlife.

Publications:

Anthony, R. G., M. A. O'Connell, M. M. Pollock, and J. G. Hallett. 2003. Associations of mammals with riparian ecosystems in Pacific Northwest forests. Pp. 510-563 In C. Zabel and R. G. Anthony, editors. Mammal community dynamics: management and conservation in the coniferous forests of western North America. Cambridge University Press.

Rancourt, S. A., M. I. Rule, and M. A. O'Connell. 2005. Maternity roost site selection of long-eared myotis, *Myotis evotis*. Journal of Mammalogy 86:77-84.

Bateman, H. A., and M. A. O'Connell. 2006. Effects of prescribed burns on wintering cavity-nesting birds. Northwest Science 80:283-291.

Rancourt, S. A., M. I. Rule, and M. A. O'Connell. 2007. Maternity roost site selection of big brown bats in ponderosa pine forests of the Channeled Scablands of northeastern Washington State, USA. Forest Ecology and Management 248:183-192.

O'Connell, M. A. 2007. Guide to the small mammals of the Columbia Basin Region of Washington State. Bureau of Land Management, Spokane, WA, 147 pp.

Lehmkuhl, J.F., R. D. Peffer, and M.A. O'Connell. 2008. Riparian and upland small mammals on the east slope of the Cascade Range, Washington. Northwest Science 82:94-107.

Kristi L. Kimmet

Education, Certification, Training:

B.S. Biology, Eastern Washington University, 2001
A.A. Liberal Arts, Spokane Community College, 1999

Current Employer and Responsibilities:

Eastern Washington University, Department of Biology, Research Technologist. Cheney, WA 2008 to Present. Performs duties related to wildlife monitoring as part of EWU's collaboration with the Upper Columbia United Tribes. Duties include: leading field crews, reference site selection, vegetation sampling, small mammal/amphibian sampling, plant identification, specimen preparation, website design, data entry, data analysis.

Previous Employers:

Kalispel Tribe of Indians, Department of Natural Resources. Wildlife Field Technician. 2001-2006 Seasonal
Bureau of Land Management, Independent Contract. Specimen Preparation. Jan-Mar 2004
Eastern Washington University, Vertebrate Ecology Lab. Research Assistant. 1999-2001

Expertise:

Ms. Kimmet studied vertebrate zoology, ecology, ornithology, plant taxonomy, and related subjects at Eastern Washington University where she graduated with honors. As a senior, she conducted independent undergraduate research at Turnbull National Wildlife Refuge on mycophagy of small mammals. She has several years experience as a wildlife field technician for the Kalispel Tribe of Indians, and is familiar with all monitoring protocols established by the Albeni Falls Work Group. Ms. Kimmet is skilled in identifying the fauna and flora (native and introduced) of the Columbia Basin.

Publications and Presentations:

Kimmet, K.L, M.A. O'Connell, and S. Schwab. 2001. The effects of fire on mycorrhizal fungi and small mammal mycophagists in ponderosa pine. Northwest Science Annual Meeting. Boise, ID (poster presentation).

Ray D. Entz

Education, Certification and Training:
M.S., Biology, Eastern Washington University, 1995
B.S., Biology/Zoology, Eastern Washington University, 1991

Current Employer and Responsibilities:
Kalispel Tribe of Indians, Director of Wildlife and Terrestrial Resources
Responsibilities: Administration, supervision and management of wildlife program including wildlife projects and personnel for the Natural Resources Department. This includes drafting funding proposals; initiating contracts and coordinating subcontractors; budget tracking; approving supply requisitions; draft correspondence; and assist biologists and technicians in the field when necessary.

Previous Employment:
Wildlife Program Manager, Kalispel Tribe of Indians, Usk, WA, 1997-2008
Assistant Director/Wildlife Biologist, Kalispel Tribe of Indians, Usk, WA, 1993-1997
Research Assistant, Eastern Washington University, Cheney, WA, 1992
Biologist, Eastern Washington University, Cheney, WA, 1991

Expertise:
Mr. Entz has extensive experience in project management, habitat conservation, wetland and riparian restoration, and project/program management. He participated in the Albeni Falls Interagency Work Group from 1992-present and assisted in drafting and approving the Albeni Falls Interagency Work Group Operating Guidelines. Ray has authored several wildlife management plans as well as HEP reports and HEP assessments. Mr. Entz has implemented several wetland and shoreline stabilization designs since 1994. From 1992 to 2009, he has successfully negotiated or assisted in the protection of 18 parcels totaling 4,231 acres of wildlife habitat in eastern Washington and northern Idaho.

Publications and Presentations:
Box Canyon Dam HEP Team. 2000. Habitat Evaluation Procedure (HEP) Assessment Report for Box Canyon Hydroelectric Project FERC No. 2042. FERC, WA D.C.

Entz, Ray. 1995. Nest predation in managed forests of eastern Washington: effects of habitat and location. Eastern Washington University Library, Cheney, WA.

Entz, R., N. Lockwood, and D. Holmes. 2003. Tacoma/Trimble Area Management Plan. Bonneville Power Administration. Portland, OR.

Kalispel Tribe of Indians. 2002. Fish and Wildlife Management Plan. Kalispel Tribe of Indians – Natural Resources Department, Usk, WA.

Merker, C. and R. Entz. 1992. Habitat Evaluation Procedures for the Pend Oreille wetlands wildlife mitigation project –Flying Goose Ranch in Kalispel Tribe of Indians Wildlife mitigation and restoration for Albeni Falls Dam: Flying Goose Ranch Phase I. Bonneville Power Administration. Portland, OR.

Scott M. Soults

Education, Certification, Training:
A.A., Scott Community College, Business Administration, 1985
B.S., University of Montana, Wildlife Biology/Zoology, 1991
Graduate course work, Boise State University, Raptor Biology, 1995 -1997

Current Employer and Responsibilities
Kootenai Tribe of Idaho; Wildlife Manager; 1999 to Present
Responsible for all activities associated with the development, coordination and implementation of wildlife management activities including planning, prioritization of management activities, drafting of policy recommendations, wildlife mitigation activities, budget development and the drafting of annual reports and management plans.

Previous Employment:
USDA Natural Resources Conservation Service; Wildlife Conservationist; Gallatin, Missouri; 1997-1999
Talon Environmental Consultants; Biological Consultant and Owner; Boise, Idaho; 1996-1997
Engineering and Inspection Services, Inc.; Environmental Scientist; Boise, Idaho; 1993-1996

Expertise
Mr. Soults has professional experience in environmental site assessment, conservation management, and wetland delineation. In past positions, Mr. Soults has managed habitats in Pacific Northwest forests, Great Basin high deserts, Midwestern grasslands, and many types of wetlands and riparian areas. He also has a variety of experience including surveying, trapping and handling raptors, upland game birds and mammals, and tagging and transplanting a variety big game.

Publications and Presentations:
Environmental Protection Agency 2004. Kootenai River Valley Wetlands and Riparian Conservation Strategy – Kootenai Tribe of Idaho Fish & Wildlife Department Bonners Ferry ID

Soults, S; Chase, E and P Anders. 2005 Operational Loss Assessment, Protection, Mitigation and Rehabilitation on the Kootenai River Floodplain Ecosystem: Libby Dam. presented at the Fluvial Geomorphology Fish Habitat Symposium Kootenai Tribe of Idaho Fish & Wildlife Dept

Soults, S and E Chase 2005 Channelization and Alteration of the Kootenai River and Floodplain: History and Reclamation. presented at the Fluvial Geomorphology Fish Habitat Symposium Kootenai Tribe of Idaho Fish & Wildlife Dept

Kootenai Tribe of Idaho. 2000. GIS layers, maps and perennial wetland analysis on the Kootenai Subbasin. Kootenai Tribe of Idaho – Fish and Wildlife Department, Bonners Ferry, ID. September 2000.

Kootenai Tribe of Idaho. 1999. Fish and Wildlife Management Plan. Kootenai Tribe of Idaho – Fish and Wildlife Department, Bonners Ferry, ID. April 1999.

Kelly Singer

Education, Certification, Training:

Bachelor of Science, Wildlife Management, Washington State University; May 1995.
WA Pesticide Applicator License; Spokane, WA; February 2004.
Habitat Evaluation Procedures Certification (HEP); Yakima, WA; August 1998.
Fire Guard School; USDA Forest Service; Okanogan, WA; June 1995.

Current Employer and Responsibilities:

Spokane Tribe of Indians, Wildlife Mitigation Project Manager, 2000 to Present
Duties: Manage Spokane Tribe Wildlife Mitigation and Wildlife Mitigation Operation & Maintenance Projects which include: budget development, work plan development, contract spending, supervising staff (up to 5 employees), contract status reports, and Columbia Basin Fish & Wildlife Mitigation Program participation. Habitat Enhancement Activities include: enhancement plan development, funding proposal development, tree & shrub establishment, native grass establishment, water site improvement, forest thinning.

Previous Employment:
Nebraska Game & Parks Commission, Conservation Technician II, 1999 to 2000
Spokane Tribe of Indians, Wildlife Biologist, 1998 to 1999
Nebraska Game & Parks Commission, Conservation Technician I, 1997 to 1998
USDA Forest Service (Colville, WA), Forestry/Biological Science Technician, Apr-Nov 1995 & 1996

Expertise:

Mr. Singer has expertise in the wildlife, habitat, and project management. His emphasis has been on the operations, maintenance, and restoration of coniferous forest, shrub-steppe, riparian, and deciduous hardwood habitat types.

Publications and Presentations:

Singer, Kelly J. 2009. Draft Spokane Tribe Wildlife Mitigation Area Management Plan. Spokane Tribe of Indians Department of Natural Resources, Wellpinit, WA. January 2009.

Cameron Heusser

Education, Certification, Training:

B.S. Wildlife Science, Washington State University, 1996
M.S. Fisheries Resources, University of Idaho, 2001

Introduction to Fluvial Geomorphology Course, USFWS, 2002
Forest Insect and Disease Identification and Management, USFS, 2002
ArcView 8.2 GIS Training, University of Idaho, 2003
Indian Hunting and Fishing Rights, Falmouth Institute, 2003, 2005
Snow Tracking Rare Species, Gardiner, MT, 2007

Current Employer and Responsibilities:

Coeur d'Alene Tribe of Indians, Wildlife Program Manager

Project responsibilities include assisting in the development and implementation of wildlife related research, management, population monitoring and habitat evaluation studies for various wildlife species. Responsibilities also include coordinating the development and implementation of mitigation plans to address the wildlife losses associated with the construction and operation of the Albeni Falls and Post Falls hydrofacilities. Various administrative duties are also required to effectively manage the Wildlife Program, including program planning, budgeting, report writing, and personnel supervision.

Previous Employment:

Wildlife Program Manager, Coeur d'Alene Tribe, Plummer, Idaho. 2003-2009
Fish and Wildlife Biologist, Coeur d'Alene Tribe, Plummer, Idaho. 2001-2003

Expertise:

Mr. Heusser has experience in program management, habitat conservation, wetland and riparian restoration and various wildlife research/monitoring projects.

Richard Whitney

Education, Certification, Training:

A.A.S. in Forestry (1999), A.A.S. in Wildlife Management (1999), A.A.S. in Outdoor Recreation (1999), and an A.A. degree in Liberal Arts (2001), Spokane Community Colleges.
B.S., Wildlife Ecology, Washington State University, 2002.
M.S., Natural Resource Sciences, Washington State University, currently enrolled.
Certified as a pesticide applicator, a scuba diver, in use of ARCGIS, and as a HEP (Habitat Evaluation Procedures) evaluator.

Current Employer:
Colville Confederated Tribes (CCT); Wildlife Biologist II, CCT's Wildlife Mitigation Project, 2003-date. Responsibilities: Monitor and evaluate project lands, including terrestrial animal and vegetative surveys and inventories; develop and implement short and long-term management plans, including scopes of work and budgets, for each of the Wildlife Mitigation Project's properties including burning, grazing, thinning/logging, and planting prescriptions; compile project reports to Bonneville Power Authority; provide GIS mapping support for the Project; investigate and develop land packages for consideration of enrollment into the Mitigation Project; attend related meetings and conferences, including BPA Sub-basin plan technical and oversight committee meetings, Columbia Basin Fish and Wildlife Authority's Wildlife Committee meetings, Upper Columbia United Tribes' technical meetings, and the Colville Business Council meetings as needed.

Previous Employment:
Colville Confederated Tribes Department of Forestry and Department of Fish and Wildlife, various wildlife and timber internships, biological technician jobs, and fisheries staff positions, 1994-2003.

Expertise:
Mr. Whitney has 15 years of academic, technical field research, project management, program implementation, and professional scientific positions that provide expertise in multiple natural resources disciplines including fisheries, forestry, wildlife, and associated habitat planning, data collection, inventorying/surveying, producing maps, land management, monitoring, assessments/evaluation, planting prescriptions, and restoration.

Publications and Presentations:
Whitney, R. 2003-2008. Hellsgate Big Game Winter Range Wildlife Mitigation Project annual reports.
Whitney, R., 2003. Restore Habitat for Sharp-tailed Grouse project annual report 2003.
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