Response to ISRP and RME Group Comments and Questions

Projects 35010: An Interactive Biodiversity Information System for the Columbia River Basin

Comment Summary
By funding this proposal, you will be supporting a basin-wide data management system containing hierarchical fish and wildlife habitat and spatial information, which will also meet the intent of RPA 180 and 198. Designed to work with and complement other existing programs' fish data, such as EDT, IBIS will emphasize wildlife and resident fish relationships to each other, their habitats and salmon. Further, the National Biological Information Infrastructure (NBII) has agreed to collaborate with NHI and support the training for metadata development so that digital databases and spatial information throughout the Columbia River Basin can be described and cataloged. Next, we offer to work with the Regional Monitoring and Evaluation team or the process that is established to guide protocols and methods (like that suggested in Project 35033) to acquire and deliver spatial data for the entire Columbia River Basin. Our response to the RME group's concerns explains how we will meet the RPA 181 objectives. Additionally, as noted by the ISRP in their final comment, our proposal is one of the few to address wildlife in the systemwide solicitation and will provide needed wildlife and resident fish data for subbasin and basin planning, which would address RPA 154. Also, the data sets that are being discussed are the only ones we are aware of that would allow fish and wildlife interactions to be determined as well as offer several key components to assist in addressing cumulative impacts, which are required by several federal mandates and legislation.

The initial proposed budget has been modified to accommodate the purchasing of basin-wide Landsat ETM+ imagery for $40,000 and the development of finer resolution imagery/aerial photography for a pilot project area of about 500 sq. km for $25,000. Additionally, we propose to work with the Regional Monitoring and Evaluation team to determine the pilot area. We also suggest the acquisition of 1:24,000 USGS 7.5' topographic maps in a Digital Raster Graphic (DRG) format to serve as the base map for registering the Landsat data and all other projects' spatial data. The cost for the DRGs is $11,000. Finally, we estimate the labor and equipment needed to develop and serve these data sets for the first year to be $120,000. This cost is higher than our original proposed estimate, so we have rescheduled some items in the IBIS development schedule to keep the first year's budget from increasing more than the cost of the imagery ($76,000). Subsequent years budgets will remain similar and we will coordinate with the Regional Monitoring and Evaluation team to prioritize the work between bringing IBIS and these additional spatial data on-line.

NHI is committed to the development of biological and spatial information that transcend all state and ownership boundaries in the Pacific Northwest and Columbia River Basin. NHI is willing and able to enter into the necessary agreements to complete, maintain and make this project a success. Our responses to each question asked by either the ISRP or REM group follow.

The project is costly, leading to the question of whether it would produce information of

sufficient value to the region to justify its expense. The proponents should address the question of demand for the improved databases. How extensively used is the present version and what are its primary uses? If this project is not funded what will happen to plans for improving this information system?

IBIS is an enhanced and expanded version of the Wildlife-Habitat Relationships in Oregon and Washington project that collected and developed information over a 5-year period involving over 600 people with the support of 34 organizations. The project built upon the existing data information that existed within both states at that time. To do this, there was a series of multi-agency teams that oversaw the development of different components of the information. The cost to collect, compile, synthesis, and report the wildlife information for the Oregon and Washington project was about $1.6 million. But prior to establishing the Wildlife-Habitat Relationships project other costs by each state were incurred. For example, Oregon Department of Fish and Wildlife (ODFW) made an investment of $1million over a 7-year period into the Oregon Species Information System (OSIS). OSIS began in 1989, and collected and cataloged wildlife habitat and location information in a consistent way. The OSIS program followed the US Fish and Wildlife Service Multi-States model develop at Virginia Tech. Finally, the National Biodiversity Gap Analysis program was also operating in all states within the Columbia River Basin and much of the current mapping products built off of these data sets to some degree. It was typical for the GAP project to spend between $250,000 to $300,000 per state to acquire these data. Hence, IBIS capitalized on these individual state efforts and financial investments, and either collected, developed and/or compiled these informational data sets into a regional perspective. We would estimate that IBIS's total development costs to range from $4 to $5 million (not including the research projects that are cited as references or supporting information). Thus, we believe that the proposed and revised budgets are modest when compared to the total financial investment in acquiring the information by the 7 states.

Regarding the comment on sufficient value, currently the Northwest Power Planning Council's subbasin planning process has identified IBIS as a key data set. Further, the National Biological Information Infrastructure had identified IBIS as one of their key data sets for the Pacific Northwest. As previously stated, 600 people were involved in the process that was supported by 34 organizations; there is no other informational data set like IBIS in the Northwest. This coupled with the delivery of spatial information at hierarchical levels should make IBIS a valued asset to resource researcher, managers, and planners.

As stated in objective 2 of our proposal, IBIS would focus on fish habitat information for anadromous, resident and marine species. By doing so, IBIS will become a fish and wildlife information system where there is common terminology, fields, definitions, and formats that would have a combined data sets exceeding 150,00 records. Additionally, linkages have already been developed to help identify fish and wildlife interactions, as well as identify over 150 management activities. This later theme would allow potential impacts to key environmental correlates (KECs) to be assessed and translate those into which species may be affected. Other information that will be available on the IBIS Internet site include (but not limited too):

- Wildlife species list with federal and state listed or candidate sensitive species, both aquatic and terrestrial identified
- Present status (and trends) of wildlife populations

- Wildlife-habitat occurrences
- Wildlife-habitat relationships
- Resident fish and wildlife species range maps in the Columbia River Basin developed at the watershed level
- Wildlife associated with riparian, wetland, and rivers/stream habitats
- Salmon-wildlife relationships
- Fish-Habitat Relationships matrices for andaromous, freshwater and marine fish
- Wildlife-habitat maps and GIS data for Columbia River Basin's 62 sub-basins
- On-line interactive query capability of the entire fish and wildlife habitat relationships information data sets
- Incorporate spatial digital data catalog by subbasin - includes 7.5 minute quads, orthophotos, aerial photos, and Landsat imagery
- On-line digitizing to locate and track projects

When NHI sent in this proposal on June 3, 2002 our website showed slightly over 16,000 unique visits. With the submittal of our response we now show over 18,500 unique visits that have perused and/or acquired data. This would translate to about 1,000 unique visits per month. The breakdown by organization acquiring information as reported shows: federal/state/local – 29%, education – 26%, private – 18%, general public – 11%, non-profit – 10%, and tribes – 6%. Please keep in mind that we have just developed a prototype site to demonstrate a proof of a concept. The amount of data that is represented in IBIS at this stage is less than 15% of the total information that we have available. Thus, the response to the minimum amount of data that has been posted so far seems to suggest that there is an interest to peruse and use it. The specific examples that I am aware of include: 1) helping to characterize historic and current conditions in a subbasin, 2) expanding the data and approach to the Columbia River Basin in British Columbia, 3) helping to identify the loss of wildlife habitats, 4) assisting with the development of conservation strategies, 5) evaluating the impacts to species and habitats, 6) capturing maps for reports, 7) using GIS data sets in numerous state, federal and university projects, 8) supporting NWPPC's Multi-species Framework for the Columbia River Basin – integrating fish, wildlife and ecological functions, 9) defining what wildlife-habitats are and what they consist of, and 10) mapping wildlife-habitat types for the entire Columbia River Basin for a current and historic perspective.

Finally, if the project is not funded then continued development obviously would be significantly curtailed. NHI in conjunction with Washington Department of Fish and Wildlife started this project, and both organizations have raised nearly a combined 2 million dollars. We have had no earmarked funds, and the project is now in its 7th year. We have a critical mass of information that can benefit many organizations, researchers, and individuals, and there is no other information source like it within the Pacific Northwest. There is a very strong likelihood that without some consistent funding, NHI will be unable to maintain IBIS.

Additionally, more detail is needed on the products that would be delivered by this project. It is unclear whether there will be sufficient detail in the output to satisfy many users. The sponsors should provide explicit examples of the major types of outputs. For example, what do the terms in figure 3 mean and what will be the explicit information for the basis of Figure 3?

The current descriptions are too general. Maps alone would be of limited use in subbasin planning. Will the detailed 5th HUC-level data on which maps were based be accessible through the program? Will the results be available to users for free or will they have to buy a book and CD?

All data and results developed through this project will be made publicly available, at no cost to the end-users, via the IBIS Internet site (http://nwhi.org/ibis). A free user registration will be required to download data and to use most of the analysis tools. This registration will help NHI monitor and evaluate the site's usage and performance. End users with slow Internet connections may desire to have the larger data sets, such as satellite images, written to CD-ROM and mailed to them. NHI will accommodate these users but will charge a nominal fee to cover writing and mailing the CD-ROMs.

The types of data and tools available on IBIS can be divided into three main categories: 1) GIS data and imagery, 2) relational database queries with links to pre-made maps, and GIS data subsets, and 3) interactive mapping applications that combine GIS and relational data on the fly allowing users to create custom maps and statistics. First, raw GIS data and imagery will be available for GIS users and image analysts. These data will include those basin-wide data used to drive IBIS's analysis tools such as the NWPPC subbasins, HUCs and Ecoprovinces; NHI's current and historic wildlife-habitat grids of the Columbia River Basin; and 5^{th} order HUCs used to create species range maps. Basin-wide GIS data derived from IBIS, such as the species range maps, will also be available for download. Additionally, satellite imagery and possibly aerial photography will be included pending approval and funding for acquiring these data.

The second type of data served by IBIS is that made available through interactive database query tools. Users will be able to query the extensive species-habitat relationship data (see Figure 3) in a variety of ways. For example, they will be able to generate species occurrence lists by county or subbasin, habitat occurrence lists for species, or combinatory queries such as "which birds breed in the Columbia Gorge subbasin and are strongly associated with Westside Riparian Wetlands?" Users will also be able to see which wildlife species are associated with salmon and their relationship types, and they will be able to query how a selected management activity affects certain species. Additionally, pre-made maps, GIS data and statistical summaries will be created for each of the 62 Columbia River Basin subbasins based on IBIS data and NHI's Wildlife-Habitat maps. These are just a few examples of the numerous queries that will be possible when the full IBIS database is restructured and online. Please refer to Figure 3 and Appendix A for a description of the species-habitat relationship data currently in IBIS.

The third type of data that will be made available on IBIS will be presented in interactive mapping applications developed using ESRI's ArcIMS. These applications will combine the IBIS relational database with GIS data sets providing users with more dynamic spatial query capabilities than provided by the other query tools. Users will be able to create custom maps of their desired area by selecting and querying the IBIS relational database and a variety of IBIS GIS layers. For example, a user will be able to create a species rangemap for a subbasin that also displays the current wildlife-habitat types occurring in the subbasin. The user would then be able to generate statistics such as the amount of each habitat occurring within the species potential range within that subbasin and how that species is associated with each of those habitat types. Again, these are just a few examples of the numerous queries that will be available.

Development of all query capabilities will be guided by user feedback and input from the major supporters of IBIS. Additional data and GIS layers will be added to IBIS as driven by this feedback. NHI plans to develop of web services in collaboration with other BPA funded projects to facilitate data sharing. Web services are system independent applications that allow approved remote servers to query an organizations web server in predetermined ways for select data sets. This effectively allows multiple public, private, non-profit and government organizations to work together and serve each other's data in different applications while allowing each group to maintain its own data. Therefore, the development of web services would allow external projects such as NMFS and EDT to incorporate IBIS data into their fish-centric applications and IBIS to include some of NMFS's and EDT's fish data into IBIS applications.

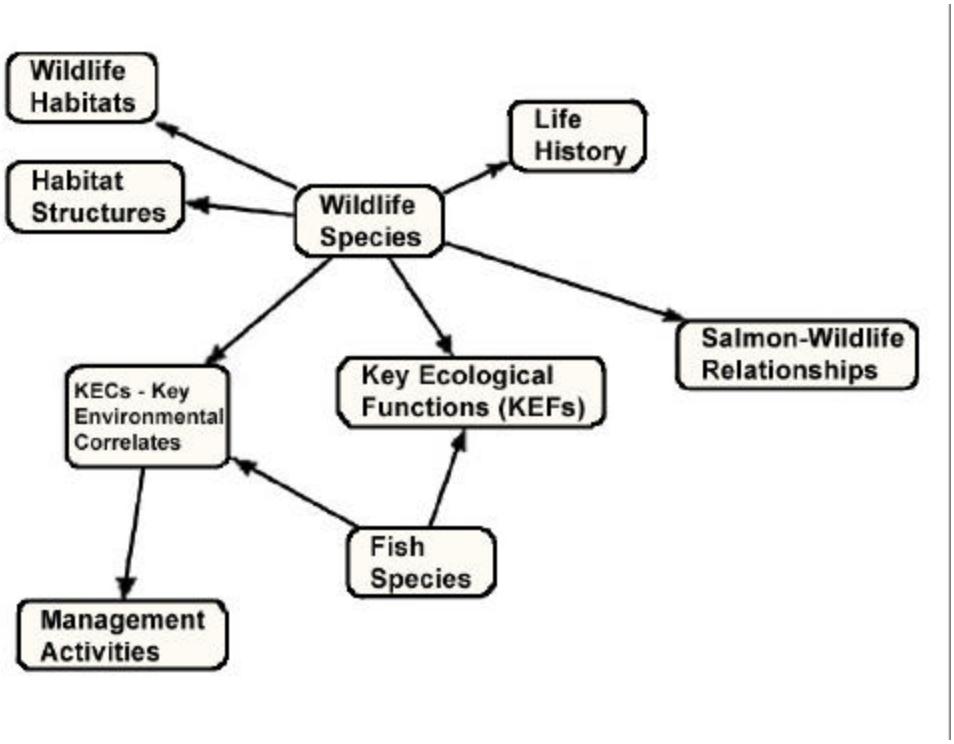

Figure 3. Fish and wildlife species relationships to the 7 data matrices.

The terms in Figure 3 (from original proposal) are the titles of the data matrices, relating to Fish and Wildlife Species, which currently exist in the IBIS database. These were described in more detail in Appendix B in the original proposal and the descriptions are included here again as Appendix A.

Does the project duplicate USFS and BLM efforts? More detail should also be provided about the online peer review and processes for quality control. Is there an M&E plan for checking the accuracy and precision of the database?

No, this project does not duplicate USFS and/or BLM efforts. But to the contrary, both of these agencies were involved with the development of IBIS information. Both agencies contributed funding and in-kind support to complete the Oregon and Washington project and had their senior staff involved with the different multi-agency teams that directed the process.

Regarding online peer review, previously we have developed setups that would allow for on-line capture new or review data by our peers (*Wildlife Habitats and Species Associations in Oregon and Washington – Building a Common Understanding for Management, Progress Report #4* Trevithick and O'Neil. 1999. 52 pp.), as well as obtain unsolicited feedback on our data. For example, information has been posted at our ftp site in the past that required a specific password or time to enter. Information is displayed in a manner to allow the on-line user to comment on it or to allow them to take the information with them and either e-mailing us comments or sending back the information marked up. Detail descriptions giving explanations of the process and definitions were also written and posted. Conducting this kind of approach allows greater participation and faster turn around time for comment. For comments and updates to IBIS by peers, this information is periodically gathered and reviewed. With the development of this project, we will work with the Monitoring and Evaluation team that is selected to help us identify peers who can conduct or offer these reviews.

Regarding quality control, the data standards for developing and updating IBIS and digital map information will follow existing methods (i.e. complete documentation of data sources used by category by species or in the case of map information the acquiring or developing of metadata) and comply with the National Geographic Data Committee standards. Data that cannot be associated with a source (such as anecdotal data on fish, wildlife or habitat) will not be used. For compiling primary data sets: this kind of data will be field observations and measurements. Quality assurance (QA) is a function of: 1) observer selection and training, 2) documentation and use of standard protocols and data forms, and 3) proofing and validation of data. We will seek to acquire documentation that will allow the QA to be determined. Also, we do validate our predictions where possible. For example, we recently were asked by the Port of Portland to create a species list of the Portland Metro area. The informational data sources used to develop the list prior to tying them to habitat associations was as follows: Species lists for both the historic and current potential were developed by initially querying the county occurrence records for Multnomah, Clackamas or Washington depending where the properties were located. The list of species for each Oregon county was developed by reviewing over 100,000 museum records, reviewing the journals of American Bird, Oregon Bird, and Swok Talk (an older publication that proceeded Oregon Bird), and consulting with the Audubon Society. In addition, a number of other primary sources were used to establish or confirm species occurrences: Csuti et al. (1997 and 2001), Verts and Carraway (1998), Ingles (1965), Hall (1981), Bailey (1936), Lord 1902, Gabrielson and Jewett 1940, Jewett et al. 1953, Chapman and Feldhamer 1982, Nussbaum et al. 1983, Contreras 1997, Gilligan et al. (1994), ODFW (1994), Puchy and Marshall (1993), and Brueggeman (1992). Supplemental information also came from Alexander (1996). Species nomenclature follows Collins et al. (1990), Leonard et al. (1993), and Storm and Leonard (1995) for amphibians and reptiles; American Ornithologists' Union (1998) for birds; and Verts and Carraway (1998), Wilson and Reeder (1993), Jones et al. (1992), Hall (1981), and Frost and Timm (1992) for mammals. We then used a 5-year breeding bird atlas (Adamus, 2001) to compare our bird results against. We found less than a 2% omission rate and a 15%

commission rate. In the past, we have also incorporated point locations, sightings, and survey counts as a means to help validate information being disseminated.

Lastly, we have partnered with the National Biological Information Infrastructure (NBII) to help the region develop metadata for the Columbia River Basin projects. Specifically, NBII proposes to conduct 12 metadata training workshops for each of the Columbia River Basin provinces to ensure that metadata creators are familiar with basic concepts related to creating standardized metadata as well as an opportunity to create metadata through hands-on exercises. Each participant brings a dataset to the workshop and prepares metadata to be served on the Clearinghouse. Workshop format and length can be determined by each province to meet their needs. We will also work with the regional Monitoring and Evaluation team to pick the best location where the metadata can reside locally.

NBII metadata workshops use the Federal Geographic Data Committee (FGDC) Biological Data Profile standard, which incorporates all elements of the FGDC Content Standard for Digital Geospatial Metadata and adds elements that specifically describe biological data. These elements include taxonomy, methodology, and analytical tools. The NBII uses Intergraph's SMMS metadata creation tool for NBII workshops, but other tools may be arranged.

NBII metadata workshops normally cover seven topics. Here are summaries of each:

Metadata and Clearinghouse Concepts: Covers basic information about metadata and clearinghouses, how they are used, and their benefits. Also introduces the NBII Biological Metadata Profile and the FGDC Metadata Standard.
NBII/FGDC Metadata Structure: Introduces the 10 sections of the NBII/FGDC metadata standard; templates; elements and hierarchical structure; domain information; and mandatory, mandatory if applicable, and optional elements.
Metadata Tool Operation: This topic familiarizes attendees with a metadata creation tool, which participants will use to create their metadata file. Tool options include SMMS, TKME, and others.
NBII/FGDC Metadata Content: Provides an in-depth look at each section of the NBII/FGDC metadata standard using sample data sets and entering metadata information into SMMS.
Parsing Operation: Describes how to run parsing tools, read the files, correct omissions and other errors, and generate output files for serving on the Internet or Clearinghouse.
Clearinghouse Use: Describes the NBII Clearinghouse and the National Spatial Data Infrastructure Clearinghouse. Participants gain insights on serving, locating, and retrieving Clearinghouse metadata records.
Metadata Development, Consistency and Implementation: In the workshop's concluding unit, participants refine and strengthen their newly acquired skills. Case study approach provides key concepts that help ensure the quality of an organization's metadata. Metadata creation program implementation discussions conclude the workshop.

NBII has created this broad, collaborative program to provide increased access to data and information on the nation's biological resources. The NBII links diverse, high-quality biological databases, information products, and analytical tools maintained by NBII partners and other contributors in government agencies, academic institutions, non-government organizations, and

private industry. NBII partners and collaborators also work on new standards, tools, and technologies that make it easier to find, integrate, and apply biological resources information. Resource managers, scientists, educators, and the general public use the NBII to answer a wide range of questions related to the management, use, or conservation of this nation's biological resources.

Through the NBII Clearinghouse (http://mercury.ornl.gov/nbii/) , Internet users can search through a wide assortment of standardized descriptions, or metadata, of biological databases and information products to identify those that meet their requirements. These metadata concisely convey such things as subject matter; how, when, where, and by whom the data were collected; how to access the database or information product; and person(s) to contact for more information. For the most effective searching and retrieval of information from the NBII Clearinghouse, the metadata must be created according to established guidelines.

Since 1995, the NBII has hosted an active and successful NBII/FGDC metadata training program with more than 60 classroom and 15 conference based workshops with more than 900 attendees from a variety of organizations. Participants represent the federal agencies, state and local governments, academic and research institutions, the private sector, and several Canadian federal and provincial government agencies. The NBII currently has a cadre of NBII metadata trainers who provide workshops in a variety of formats: briefings, half-day, one-day, and two-day.

The project applicant needs to identify which data fields are to be emphasized/actually used, and how this prioritization relates to the estuary/basin. This proposal identifies a specific data management structure. The structure needs to be reviewed to determine how the project fits with current conversations on data base management, including the ongoing StreamNet project, EDT, and with work that LCREP has been coordinating.

The information developed for the marine and estuaries was determined in concert with marine specialists who were brought together in a peer panel process. The data structure was also developed collaboratively in a multi-agency process over the past 7 years. The data fields that would be used are those that are found in Appendix A, but specifically they will correspond to Matrix 1 - Wildlife-Habitat Types #26 to #32 and Matrix 3 – Habitat Elements (Key Environmental Correlates) Section 5.0. As for IBIS's data structure to link with other agencies, recently the California Department of Fish and Game did a revision to their *Marine and Estuarine Habitats of the California Wildlife Habitat Relationship System* and found IBIS's habitat information correlated well (Kevin Shaffer, July 2002, pp.52). Lastly, IBIS was the wildlife counterpart to EDT in the development of the Multi-species Framework Approach in the Columbia River Basin that integrated fish, wildlife and ecological functions. IBIS addressed interactions between fish and wildlife.

Managers of natural resources in the Columbia Basin have been discussing the need to incorporate fish and wildlife habitat components into a common format for evaluation or assessment. We address this need by using the habitat elements (or Key Environmental Correlates [KECs]) as a basis to integrate our depiction of fish and wildlife habitat components. The process of combining fish habitat attributes into the list of wildlife KECs has been started for Chinook salmon, bull trout and other fish species. Fisheries ecologists identified 74 KECs used

by various life history stages. This effort demonstrates the feasibility of bringing fish and wildlife habitat information together.

With this data set, managers will be able to evaluate management strategies using a common set of variables for fish and wildlife. While this is seemingly a small step forward, it allows managers to determine how proposed land management activities, under a specific planning alternative, can affect the KECs listed in and thereby influence both salmon and wildlife associated with those elements. We demonstrated this assessment in the Multi-species Framework approach by querying databases listing management activities associated with a given management activities or alternative strategy. We then listed KECs influenced by those management activities, and then we identified which species of fish and wildlife are associated with those KECs. Once knowing which species are involved, the key ecological functions (KEFs) for fish and wildlife can be jointly assessed. In this way, ecosystem functional diversity and functional redundancy can be described for all vertebrate species in the basin in a common assessment

Despite claims of developing materials to support monitoring; it is not clear how the proposal will actually meet goal 180 by developing or integrating with a monitoring program and ground truthing data.

To respond to this question, we reference the Future Needs: Priorities for the Mainstem and Systemwide report. The report cites several actions that need immediately implementation, they are: 1) quantify and characterize landscape, riparian and stream habitat conditions, and 2) develop a basin-wide status monitoring program to address: lack of population data for non-anadromous species and habitat data across the basin. And, one activity where immediate implementation is desired 1) ground-truth and update fish distribution and habitat databases.

IBIS currently contains historic and current landscape characterizations at the landscape scale where riparian and wetlands can be identified. NHI has made 7 proposals in the Province Reviews to refine the wildlife-habitat characterizations to a more refined level of resolution. Nevertheless, with this proposal we would buy and serve Landsat data that could be used to update our current data sets and also purchase some finer resolution imagery at a 1:12,000 scale. The Regional Monitoring and Evaluation Team could help determine what area(s) to acquire for this finer resolution.

IBIS's habitat information was developed around a hierarchical approach. That is the coarse level of information is the wildlife-habitat type, the next level of information is the structural conditions, and the finer level of resolution is the habitat elements or key environmental correlates. Therefore, the hierarchical order allows information to be depicted and displayed at various scales. Additionally, in time, IBIS could include field point and survey information for species that is obtained from primary investigations or monitoring efforts. To review, the hierarchical information would be stored, nested and georeferenced for habitat maps, species locations, and spatial data sets (like Landsat imagery to 7.5 minute quads). The finer resolution data sets can serve as base data layers for a monitoring and evaluation program.

As for Groundtruthing range maps and habitat information, IBIS has the ability to produce both of these data sets that can be verified from fieldwork, surveys or monitoring activities. Currently, IBIS has developed 27 fish and 137 wildlife range maps that have been developed at the 5th HUC level. Thus field verification can occur at the watershed level. Habitat information is currently available at the 4th HUC level, so it could be verified at the subbasin level. As more refined information becomes available, it would be cataloged and georeferenced for inclusion into the hierarchical storage and retrieval system that IBIS will maintain. Groundtruthing of these and other data sets would be done in collaboration with the Regional Monitoring and Evaluation team.

This proposal appears to be to develop imagery technology rather than to provide the imagery. The main problem with providing digital imagery is not the technology for delivery, rather, it is the very high cost of acquiring the imagery. Since there is no budget request in this proposal for actually acquiring spatial data layers, and it could take years to acquire "all the Columbia spatial data layers", there is no guarantee of delivery of the spatial data from this proposal. It would make more sense to adopt the technology for spatial data provision when there is also a budget for acquisition of data layers.

And under Feasibility of Work - ***It is also unclear that there is funding for obtaining actual digital imagery.***

RPA 181 – Future Needs: Priorities for Mainstem/Systemwide identifies and ranks to "Fund purchase of aerial and satellite imagery data throughout the basin before 3 yr implementation check in 2003" as immediate implementation is needed or needed at the highest priority. Therefore, in the original proposal NHI assumed that BPA was already planning to purchase imagery. This response will include a revised budget to include the acquisition of Landsat Enhanced Thematic Mapper data and USGS 1:24,000 Digital Raster Graphic (DRG) maps for the entire U.S. Columbia River Basin.

RPA 181 also ranks to "Acquire and digitize aerial or satellite imagery of the entire Columbia River Basin once every 3 to 5 years for Tier 1 Ecosystem Assessment" as highly desirable. The decision of which types of satellite imagery and/or aerial photography to acquire should be made jointly by all interested public and governmental agencies. However, for Tier 1 assessment, Landsat Enhanced Thematic Mapper Plus (ETM+) imagery appears a likely choice. It is currently among the most affordable remotely sensed digital imagery product that provides sufficient spatial and spectral resolution for a variety of Tier 1 and Tier 2 analyses, and it will likely remain affordable to acquire in 3 to 5 year increments as stated in RPA 181. Landsat ETM+ provides six 30-meter multispectral bands (including visible, near infrared and short-wave infrared), one 60-meter thermal infrared band and one 15-meter panchromatic band that make it suitable for a variety of mapping and image analysis techniques. Additionally, Landsat has a 25-year history with comparable archived data that is available for change detection analysis if desired at a later date. To provide coverage of the entire Columbia River Basin, approximately 50 scenes at a maximum of $800 per scene (georegistered, and radiometric and terrain corrected) would be necessary for a total cost of approximately $40,000. This amount would include only the acquisition cost and not the cost to deliver the information in a seamless format.

Therefore, the proposed budget has been updated to reflect the acquisition of a current set of Landsat ETM+ scenes for the entire U.S. Columbia River basin. Users may desire acquisition of additional, higher-resolution imagery for Tier 2 and Tier 3 analysis. The decisions of which data sets to acquire, again, should be made jointly by all interested public and governmental agencies so that cost and resolution can be balanced. IKONOS satellite data offered by Space Imaging may be of great interest to users at the Tier 2 and 3 levels as it approaches aerial photography resolutions. However, it is much more expensive than Landsat imagery. For example, the minimum cost of IKONOS is currently $\$7/km^2$ for panchromatic or Multispectral imagery. Therefore it would cost $\$7/km^2 * 145{,}673 km^2 = \$1{,}019{,}711$ minimum to acquire coverage of the U.S. Columbia River Basin for either 1-meter black and white or 4-meter multispectral data. Additionally, the accuracy of this $7 data is estimated only at 50 meters. Purchasing the same data georegistered and corrected to 10 meter accuracy (or 1:12,000) currently costs $48.30 per sq km for B&W and Multispectral bands packaged together which means it would cost over $7 million for complete coverage of the U. S. Columbia River Basin. Despite its high cost, IKONOS data is still comparable to acquiring and georegistering digital aerial photography. As focus shifts to Tier 2 and especially Tier 3 projects, it may be desirable to incrementally acquire this or similar high-resolution imagery starting with high-interest regions within the Columbia River Basin. The updated budget includes $25,000 for the acquisition of such high-resolution imagery for a pilot project area of about 500 sq. km as mentioned in Project 35033.

NHI's initial proposal did emphasize delivery of spatial digital data over acquisition. While agreeing that the high cost of such imagery is a major obstacle to overcome, NHI maintains that efficient data organization and delivery is a greater problem. If interested public and governmental agencies agree that Landsat ETM+ is suitable for Tier 1 projects, then data acquisition of one basin-wide key data set can be achieved for $40,000. However, this data set would be over 25 gigabytes (50 scenes at 500+ megabytes each) and delivering it to end users will not be a trivial task. NHI envisions developing an Internet based delivery system where users can select individual Landsat bands by subbasin. This method will allow smaller data downloads and incorporate an efficient mosaic and tiling system of the Landsat imagery. Users with slow Internet connections or those desiring the non-mosaiced full scenes will be able to order the data on CD-ROM for a nominal fee (~$10-$20 per scene) to cover the cost of writing and mailing the CD-ROMS.

The Landsat data will also have to be projected to an agreed upon projection and registered to a selected base map. These steps will ensure that any data created from the Landsat Scenes will co-register with data developed in other funded projects. Additionally, these steps result in a new value-added product that typically fulfills requirements permitting the redistribution of the data. NHI suggests the acquisition of 1:24,000 USGS 7.5' topographic maps in a Digital Raster Graphic (DRG) format to serve as the base map for registering the Landsat data and all other projects' spatial data. This suggestion should be reviewed by all interested agencies to ensure that a base at 1:24,000 will meet the needs of all anticipated Tier 1 through 3 projects. Acquisition of the DRGs is estimated to cost $11,000 for the entire Columbia River Basin and is reflected in the updated budget. The DRGs will be served in the same manner as the Landsat data. Approximately 11,000 DRGs comprise the Columbia River Basin, and the estimated disk space to store these data is approximately 100 gigabytes.

Therefore, to serve two key data sets, one time period of Landsat ETM+ and 1:24,000 USGS DRGs, a system must store, manage, and distribute a minimum of 125 gigabytes of data. More than likely, the actual amount of data will be several times that number, approaching 500 gigabytes, to allow for multiple data distribution formats (e.g., full scenes and subsets, and multiple file formats such as GEOTIFF, raw binary, etc.) as determined by interested groups. Additionally, these data will first need to be imported, re-projected to a standard basin-wide projection such as the ICBEMP Albers and then co-registered to each other, a process that will require GIS and Image analysts a significant amount of processing time and an estimated 250 gigabytes of additional temporary disk space to perform efficiently. Finally, the GIS and Image analysts will have to work with Internet and database programmers to develop the actual image tiling and Internet delivery system. This system will eventually require multiple servers and large Internet bandwidth as subsequent data sets are added and usage increases. Thus, preparing and serving these large basin-wide data sets are not trivial tasks. NHI offered a similar concept in our 2001 Innovative Proposal # 22015 - *Develop a Spatially-based Internet Portal that Integrates Distributed Northwest Fish, Wildlife, and Plant Data for On-Line Mapping, Query, and Analysis*. That proposal was reviewed by the ISRP favorably except at that time it was viewed as premature.

Finally, NHI would like to reemphasize that in addition to serving these large GIS data sets to GIS users, this proposal will develop interactive mapping applications that integrate these data sets with other data for non-GIS experts. For example, an Internet user will be able to locate a precise site of interest by using subbasin boundaries followed by the USGS topographic maps. After clicking the selected site on the topographic DRG, the user may submit queries to the IBIS relational database for that specific site. The user would also be able to display and print a composite of select bands of the Landsat ETM+ data for the queried region. Additionally, NHI will work with other funded agencies to develop web services allowing these other agencies to incorporate these immense spatial data sets into their mapping applications without having to host these data on their servers.

This claim the proposal will fulfill the needs for a regional information system is not supportable by information within the proposal since the needs are currently being identified by SAIC. Furthermore the report by Coutant et.al identified many problems that concern information management per se rather than nominal collection and delivery of a subset of data. Since the claim of performance for this proposal is narrow it cannot reasonably claim to solve the problems identified by Coutant et.al. There appears to be potential for overlap with other data collection institutions: for example the plan to include marine fish habitat data into IBIS appears to overlap, at least in part, with the current recording of data by the PSMFC.

Regarding the needs question that IBIS could not meet regional needs because they are currently being identified by SAIC. What the RME group should be aware of is that this is not the first needs assessment that has been done in the region. The first one that NHI staff was involved with was held in April 1990 on the Oregon State University campus; the Forest Service has held at least 2 that involved NHI staff; and as part of the development of IBIS, a survey was conducted (not unlike the one being currently be done by SAIC) to determine the informational

needs that should be addressed. Though we do not know what SAIC will recommend, NHI has participated in their survey and have met and talked with SAIC staff on several occasions. NHI believes that the needs identified by our process in 1996 that guided the development of IBIS are still appropriate today, and we will plan future IBIS development along the guidelines provided by SAIC when they are available.

Our claim of performance is to deliver an interactive biodiversity system that will highlight fish and wildlife habitat information and spatial data for the entire Columbia River Basin. What we propose is no small task and we certainly do not believe it to be narrow in scope or performance. We did contact Chris Jordan who was the contact for the RME Group on July 29, 2002 and asked to work with the data management group that reviewed our proposal. One reason for making this contact was to clarify this question. Unfortunately, Chris forwarded our request to the Data Management Team but we were never contacted, hence, we are uncertain as to the concern that the RME Group had our proposal as it relates to the Coutant et al. report [Review of Databases Funded through the Columbia River Basin Fish and Wildlife Program, ISRP 2000-3]. Finally, the principals who have been developing the fish and wildlife information all have natural resource degrees and have worked with information technology and their applications to fish and wildlife, including developing CD-ROMs and Internet applications, for more than 15 years.

The proposal requires a new DBMS design which results in a custom stand alone solution for just a subset of regional data. The project currently lacks tabular database management; proposed project will develop interactive databases.

The continued development of IBIS will not result in just a "custom stand alone solution for just a subset of regional data." On the contrary, IBIS will become an efficient Columbia River Basin-wide wildlife-habitat data delivery system capable of interfacing with the other key databases and modeling efforts identified in the Columbia River Basin, such as EDT and NMFS fish data, through common data fields including Species ID, Habitat Type and Key Ecological Functions. IBIS will not duplicate efforts that have and are occurring in the fish programs. Instead NHI will work with those projects to provide them with the currently missing resident fish and wildlife habitat components.

IBIS is not a spreadsheet of field observations but a peer-reviewed collection of fish and wildlife-habitat attributes and attribute relationships. The information on attribute relationships is especially important as it provides a vehicle for analyzing not just the characteristics of a location or species but also the implications of change in those attributes; opening up new opportunities for linking management decisions with wildlife and habitat impacts. However, this information is currently contained in multiple databases, making it difficult to perform the type of complex queries required to leverage the full power of the data and relationships. This proposal will reorganize the existing data into a cohesive, well-structured relational database with appropriate consideration given to the type of data being stored. The challenges certainly exceed those of storing field collected data observations as one has to consider varying types of relationship, such as direct, indirect, and hierarchical, and the variation of these relationships over space when considering an area as large as the Columbia River Basin.

Clearly identifying how the proposed system is distinct and different from the proposal by StreamNet to provide data collection for stream habitat data users would strengthen the proposal.

IBIS is unique and no other data set currently contains the same information. For example, there are over 300 terms appropriate for fish and wildlife that have been defined in panel reviews. So initially IBIS presents a consistent set of terms with their definitions in common formats for querying. The combined data records that address the 7 data matrices in Appendix A number over 150,000, and IBIS list its sources that are either references or based on an expert panel process. IBIS reviewed over 10,000 references and currently cites over 2,300 references; this is just for the wildlife portion. IBIS also incorporates wildlife-habitat mapping that is primarily derived from Landsat imagery and disseminates this information at the subbasin level in a number of formats for GIS and reports. Again, we are unaware of a similar project that serves and supports these types of data. Additionally, NHI is proposing to support and serve base spatial information including Landsat ETM+ imagery and digital USGS 7.5 minute quads for the entire Columbia River Basin. Finally, IBIS serves GIS data sets that NHI has developed over the years. However, IBIS has only posted on the Internet less than 15% of the information that NHI has available. Nonetheless, the information that is posted on the Internet is accessible at no cost to the users.

On the other hand, Streamnet only addresses anadromous fish and population counts that are associated with them. The anadromous fish ranges that they have are built at the 4th HUC level and the fish population counts are tied to streams and stream reaches. IBIS does not contain any anadromous fish population information.

Detailing the proposed advance query capabilities and decision support tools, and delineating cost effectiveness of off the shelf query tools versus custom query tools would also strengthen this proposal.

Several examples of advance query capabilities that IBIS will feature have been given throughout this response. All of the wildlife-habitat information contained in the relational database will be available to the end user (See Figure 3 and Appendix A for details) through Internet queries. NHI will rely on user feedback to modify the Internet query capabilities to satisfy users' needs. The updated IBIS DBMS will also be combined with GIS datasets allowing users to perform spatial queries and online mapping. As examples, a user may just want to generate a list of potential species occurring in their subbasin or maybe create a species range map for three adjacent subbasins or may want to explore how certain management activities may affect identified species within a given radius of their project site based on the habitat types that currently occur there. IBIS will be able to answer these questions and many others.

Comparing the cost effectiveness of off the shelf tools versus custom query tools is not an issue at this point. Once the DBMS is updated, all Internet delivery queries to it will be based on SQL (Structured Query Language) statements passed to the database by ASP or ASP.NET code. Implementing these techniques are straightforward since NHI has capable programmers on staff who have already developed algorithms that can be readily modified and extended for any database query. Purchasing off the shelf query tools for relational database queries would require

similar modification by the programmers to design and implement the desired queries and possibly more time to successfully integrate these packages with NHI's current Internet server technologies. If at some point NHI needs to provide an Internet service that requires extensive algorithm development, it will definitely look at off the shelf solutions. For example, we intend to combine ESRI's ArcIMS (Internet Map Server) with our ASP algorithms to drive our spatial query and mapping applications. However, NHI purchases these software tools out of its overhead budget and is not requesting direct funding for software purchases. Finally, end users and other Columbia River Basin data projects need not worry about the software that NHI uses to implement IBIS as all its Internet applications will be created to work with the major modern web browsers, and by definition, the web services created to share our data with other funded organizations' applications will be system and software independent. That is the beauty of using the Internet and web services for data delivery.

Finally the proposal needs to directly address RME information system design needs and in particular address RME needs with respect to anadromous fish.

Again, because we were unable to have a conversation with the RME Group's Data Management Team (because there was no response to our inquiry), we cannot adequately address this question. We would like to know specifically the system design needs that have been identified including those that would address anadromous fish. The principal components of IBIS are its fish and wildlife habitat relationship and spatial information. Habitat relationship information will be expanded for fish and wildlife species that occur in the entire Columbia River Basin. Delivery of spatial information will be done at various scales and cover the entire Columbia River Basin. Site-specific information will be incorporated into IBIS in collaboration with the Regional Monitoring and Evaluation team so that it would meet the greatest needs for the majority of the users.

Appendix A –Current Data Fields for Fish and Wildlife-Habitat Relationships

Matrix 1: Wildlife Habitats

The Species-Habitat Project has identified 32 broad scale wildlife habitats in Oregon and Washington. Species are listed under each habitat with codes describing their activity (feed, reproduce, both, other); association (closely associated, associated, present); and confidence level of expert panelists (1-3). The habitats are as follows:

1 Westside Lowlands Conifer-Deciduous Forest

2 Westside Oak and Dry Douglas-fir Forest and Woodlands

3 Southwest Oregon Mixed Conifer-Deciduous Forest

4 Montane Mixed Conifer Forest

5 Eastside (Interior) Mixed Conifer Forest

6 Lodgepole Pine Forest and Woodlands

7 Ponderosa Pine and Eastside Oak Forests and Woodlands

8 Upland Aspen Forest

9	Subalpine Parkland
10	Alpine Grasslands and Shrublands
11	Westside Grasslands
12	Ceonothus-Manzanita Shrublands
13	Western Juniper and Mountain Mahogany Woodlands
14	Eastside (Interior) Canyon Shrublands
15	Eastside (Interior) Grasslands
16	Shrub-steppe
17	Dwarf shrub-steppe
18	Desert Playa and Salt Scrub Shrublands
19	Agriculture and Pastures
20	Urban
21	Lakes, Ponds, Reservoirs, and Rivers
22	Herbaceous Wetlands
23	Westside Riparian-Wetlands
24	Montane Coniferous Wetlands
25	Eastside (Interior) Riparian-Wetlands
26	Coastal Dunes and Beaches
27	Coastal Headlands and Islets
28	Bays and Estuaries
29	Inland Marine Deeper Waters
30	Marine Nearshore
31	Marine Shelf
32	Oceanic

Matrix 2: Structural Conditions (Habitat Structures)

The Species-Habitat Project has developed structural condition or land cover/land use classification systems for the following wildlife habitats: 1) forests; 2) non-forest shrublands and grasslands; 3) urban habitat; and 4) agriculture. Species are listed under each structural condition with codes describing their activity (feed, reproduce, both, other); association (closely associated, associated, present); confidence level of expert panelists (1-3), and a notation in some cases if they need a specific habitat element in order to breed in that structural condition. The classification systems are as follows:

Forest/Woodland

- Grass/Forb - Open
- Grass/Forb - Closed
- Shrub/Seedling - Open
- Shrub/Seedling - Closed
- Sapling/Pole - Open
- Sapling/Pole - Moderate
- Sapling/Pole - Closed
- Small Tree - Single Story - Open
- Small Tree - Single Story - Moderate
- Small Tree - Single Story - Closed
- Medium Tree - Single Story - Open
- Medium Tree - Single Story - Moderate
- Medium Tree - Single Story - Closed
- Large Tree - Single Story - Open
- Large Tree - Single Story - Moderate
- Large Tree - Single Story - Closed
- Small Tree - Multi-story - Open
- Small Tree - Multi-story - Moderate
- SmallTree - Multi-story - Closed
- Medium Tree - Multi-story -Open
- Medium Tree - Multi-story -Moderate
- Medium Tree - Multi-story -Closed
- Large Tree - Multi-story - Open
- Large Tree - Multi-story - Moderate
- Large Tree - Multi-story - Closed
- Giant Tree - Multi-story

Urban

- High Density
- Medium Density
- Low Density

Non-forest Shrublands and Grasslands

- Grass/Forb- Open
- Grass/Forb- Closed
- Low Shrub - Open Shrub Overstory - Seedling/Young
- Low Shrub - Open Shrub Overstory - Mature
- Low Shrub - Open Shrub Overstory - Old
- Low Shrub - Closed Shrub Overstory - Seedling/Young
- Low Shrub - Closed Shrub Overstory - Mature
- Low Shrub - Closed Shrub Overstory - Old
- Medium Shrub - Open Shrub Overstory - Seedling/Young
- Medium Shrub - Open Shrub Overstory - Mature
- Medium Shrub - Open Shrub Overstory - Old
- Medium Shrub - Closed Shrub Overstory -Seedling/Young
- Medium Shrub - Closed Shrub Overstory - Mature
- Medium Shrub - Closed Shrub Overstory - Old
- Tall Shrub - Open Shrub Overstory - Seedling/Young
- Tall Shrub - Open Shrub Overstory - Mature
- Tall Shrub - Open Shrub Overstory - Old
- Tall Shrub - Closed Shrub Overstory - Seedling/Young
- Tall Shrub - Closed Shrub Overstory - Mature
- Tall Shrub - Closed Shrub Overstory - Old

Agriculture

- Cultivated Cropland
- Improved Pasture
- Unimproved Pasture
- Modified Grasslands
- Orchards/Vineyards/Nurseries

Matrix 3: Habitat Elements (Key Environmental Correlates)

Species are listed under various habitat elements as appropriate but without codes on activity, association etc. It is implied that the association is high if an element is tied to a species.

1 Habitat Elements (positive relationships only)
- 1.1 Forest/woodland Vegetative Elements or Substrates
  - 1.1.1 Down Wood (Includes Coarse Woody Debris, rootwads)
    - 1.1.1.1 Decay Class
      - 1.1.1.1.1 Hard
      - 1.1.1.1.2 Moderate
      - 1.1.1.1.3 Soft
    - 1.1.1.2 Down Wood in Riparian Areas
    - 1.1.1.3 Down Wood in Upland Areas
  - 1.1.2 Litter
  - 1.1.3 Duff
  - 1.1.4 Shrub Layer
    - 1.1.4.1 Shrub Size
    - 1.1.4.2 Shrub Canopy Closure
    - 1.1.4.3 Shrub Canopy Layers
  - 1.1.5 Moss
  - 1.1.6 Flowers
  - 1.1.7 Lichens
  - 1.1.8 Forbs (Grass)
  - 1.1.9 Cactus
  - 1.1.10 Fungi
  - 1.1.11 Roots, Tubers, Underground Plant Parts
  - 1.1.12 Ferns
  - 1.1.13 Herbaceous Layer
  - 1.1.14 Trees
    - 1.1.14.1 Snags (Entire Tree Dead)
      - 1.1.14.1.1 Decay Class
        - 1.1.14.1.1.1 Hard
        - 1.1.14.1.1.2 Moderate
        - 1.1.14.1.1.3 Soft
    - 1.1.14.2 Snag Size
      - 1.1.14.2.1 Seedling <1” Dbh
      - 1.1.14.2.2 Sapling/pole 1-9” Dbh
      - 1.1.14.2.3 Small Tree 10-14” Dbh
      - 1.1.14.2.4 Medium Tree 15-19 Dbh
      - 1.1.14.2.5 Large Tree 20-29 Dbh
      - 1.1.14.2.6 Giant Tree >= 30” Dbh
    - 1.1.14.3 Tree Size
      - 1.1.14.3.1 Seedling <1” Dbh
      - 1.1.14.3.2 Sapling/pole 1-9” Dbh
      - 1.1.14.3.3 Small Tree 10-14” Dbh
      - 1.1.14.3.4 Medium Tree 15-19 Dbh

1.1.14.3.5 Large Tree 20-29 Dbh
1.1.14.3.6 Giant Tree >= 30” Dbh
1.1.14.4 Mistletoe Brooms/Witches’ Brooms/Broomed Trees
1.1.14.5 Dead Parts of Live Tree
1.1.14.6 Hollow Living Trees
1.1.14.7 Tree Cavities (Far Smaller than Hollow Trees)
1.1.14.8 Bark (Includes Crevices/fissures); Loose Exfoliating Bark
1.1.14.9 Live Remnant/legacy Trees
1.1.14.10 Large Live Tree Branches
1.1.14.11 Tree Canopy Layer
1.1.14.11.1 Sub-canopy
1.1.14.11.2 Above canopy
1.1.14.11.3 Tree bole
1.1.14.11.4 Canopy
1.1.15 Fruits/seeds/nuts
1.1.16 Edges
1.2 Shrubland/grassland Vegetative Elements or Substrates
1.2.1 Herbaceous Layer
1.2.2 Fruits/seeds
1.2.3 Moss
1.2.4 Cactus
1.2.5 Flowers
1.2.6 Shrubs
1.2.6.1 Shrub Size (height)
1.2.6.1.1 Small
1.2.6.1.2 Medium
1.2.6.1.3 Large
1.2.6.2 Percent Shrub canopy layer
1.2.6.3 Shrub Canopy Layers
1.2.6.3.1 sub canopy
1.2.6.3.2 above canopy
1.2.7 Fungi
1.2.8 Forbs
1.2.9 Bulbs/tubers
1.2.10 Grasses
1.2.11 Cryptogrammic Crusts
1.2.12 Trees (located in a shrubland/grassland context)
1.2.12.1 Snags
1.2.12.1.1 Decay class
1.2.12.1.1.1 Hard
1.2.12.1.1.2 Moderate
1.2.12.1.1.3 Soft
1.2.12.2 Snag size
1.2.12.2.1 Shrub/seedling
1.2.12.2.2 Sapling/pole
1.2.12.2.3 Small tree

1.2.12.2.4 Medium tree
1.2.12.2.5 Large tree
1.2.12.2.6 Giant tree
1.2.12.3 Tree Size
1.2.12.3.1 Shrub/seedling
1.2.12.3.2 Sapling/pole
1.2.12.3.3 Small tree
1.2.12.3.4 Medium tree
1.2.12.3.5 Large tree
1.2.12.3.6 Giant tree
1.2.13 Edges

2 Ecological Elements
2.1 Exotic Species (specify whether negative or positive relationship in comments)
2.1.1 Plants
2.1.2 Animals
2.1.2.1 predation
2.1.2.2 direct displacement
2.1.2.3 habitat structure change
2.1.2.4 other
2.2 Insect Population Irruptions (specify whether negative or positive relationship in comments)
2.2.1 Mountain Pine Beetle
2.2.2 Spruce Budworm
2.2.3 Gypsy Moth
2.3 Beaver/muskrat Lodges/ponds/dams (positive only)
2.4 Burrows (positive only)

3 Non-vegetative Terrestrial Substrates (positive with a few exceptions as noted)
3.1 Rocks
3.1.1 Gravel
3.1.2 Talus
3.1.3 Talus-like Habitats (Includes Boulders)
3.2 Soils (specify whether negative or positive relationship in comments)
3.2.1 Soil Depth
3.2.2 Soil Temperature
3.2.3 Soil Moisture
3.2.4 Soil Organic Matter
3.2.5 Soil Texture
3.3 Rock Substrates
3.3.1 Avalanche Chute
3.3.2 Cliffs (Includes Lava Tubes)
3.3.3 Caves
3.3.4 Rocky Outcrops and Ridges
3.3.5 Rock Crevices

3.3.6 Barren Ground (includes mineral licks)
3.3.7 Playa (Alkaline, Saline)
3.4 Snow
3.4.1 Snow Depth (specify whether negative or positive relationship in comments)
3.4.2 Glaciers, Snow Field (Permanent Snow/ice)

4 Freshwater Riparian and Aquatic Bodies (positive with a few exceptions as noted)
4.1 Water Characteristics (specify whether negative or positive relationship in comments)
4.1.1 Dissolved Oxygen
4.1.2 Water Depth
4.1.3 Dissolved Solids
4.1.4 Water Ph
4.1.5 Water Temperature
4.1.6 Water Velocity
4.1.7 Water Turbidity
4.1.8 Free Water
4.1.9 Salinity and alkalinity
4.2 Rivers & Streams
4.2.1 Oxbows
4.2.2 Order and Class
4.2.2.1 Intermittent
4.2.2.2 Upper Perennial
4.2.2.3 Lower Perennial
4.2.3 Zone
4.2.3.1 Open Water
4.2.3.2 Submerged/benthic
4.2.3.3 Shoreline
4.2.4 In-stream Substrate
4.2.4.1 Rocks
4.2.4.2 Cobble/gravel
4.2.4.3 Sand/mud
4.2.5 Vegetation
4.2.5.1 Submergent vegetation
4.2.5.2 Emergent vegetation
4.2.5.3 Floating mats
4.2.6 Coarse woody debris in streams and rivers
4.2.7 Pools
4.2.8 Riffles
4.2.9 Runs/glides
4.2.10 Overhanging vegetation
4.2.11 Waterfalls
4.2.12 Banks
4.2.13 Seeps or Springs
4.3 Ephemeral pools

- 4.4 Sand bars
- 4.5 Gravel bars
- 4.6 Lakes/ponds/reservoirs
  - 4.6.1 Zone
    - 4.6.1.1 Open Water
    - 4.6.1.2 Submerged/benthic
    - 4.6.1.3 Splash Zone/periodically Flooded
  - 4.6.2 In-water Substrate
    - 4.6.2.1 Rock
    - 4.6.2.2 Cobble/gravel
    - 4.6.2.3 Sand/mud
  - 4.6.3 Vegetation
    - 4.6.3.1 Submergent Vegetation
    - 4.6.3.2 Emergent Vegetation
    - 4.6.3.3 Floating Mats
  - 4.6.4 Size
    - 4.6.4.1 Ponds (<2ha)
    - 4.6.4.2 Lakes (>=2ha)
- 4.7 Wetlands/marshes/wet Meadows/bogs and Swamps
  - 4.7.1 Riverine Wetlands
  - 4.7.2 Context
    - 4.7.2.1 Forest
    - 4.7.2.2 Non-forest
  - 4.7.3 Size
  - 4.7.4 Marshes
  - 4.7.5 Wet meadows
- 4.8 Islands
- 4.9 Vernal or Seasonal Flooding

5 Marine Systems (positive with a few exceptions as noted)

- 5.1 Zone
  - 5.1.1 Supratidal
  - 5.1.2 Intertidal
  - 5.1.3 Nearshore Subtidal
  - 5.1.4 Pelagic/shelf
- 5.2 Substrates
  - 5.2.1 Bedrock
  - 5.2.2 Boulders
  - 5.2.3 Hardpan
  - 5.2.4 Cobble
  - 5.2.5 Mixed-coarse
  - 5.2.6 Gravel
  - 5.2.7 Sand
  - 5.2.8 Mixed-fine
  - 5.2.9 Mud
  - 5.2.10 Organic

5.3 Energy
- 5.3.1 Protected
- 5.3.2 Semi-protected
- 5.3.3 Partially exposed
- 5.3.4 Exposed

5.4 Vegetation
- 5.4.1 Mixed macro algae
- 5.4.2 Kelp
- 5.4.3 Eelgrass

5.5 Water Depth
- 5.5.1 Surface Layer
  - 5.5.1.1 Tide Rips
  - 5.5.1.2 Surface Microlayer (Neuston)
- 5.5.2 Euphotic
- 5.5.3 Disphotic
- 5.5.4 Demersal/benthic

5.6 Water Temperature

5.7 Salinity

5.8 Forms
- 5.8.1 Beach
- 5.8.2 Off-shore Islands/rocks/sea stacks
- 5.8.3 Marine cliffs (mainland)
- 5.8.4 Delta
- 5.8.5 Dune
- 5.8.6 Lagoon
- 5.8.7 Salt Marsh
- 5.8.8 Reef
- 5.8.9 Tidal flat

5.9 Water Clarity

~~6 Topographic or Physiographic Elements (positive relationships only)~~
- ~~6.1 Elevation~~ (Included as a field in Life History matrix instead)
- ~~6.2 Slope~~
- ~~6.3 Aspect~~

7 Fire as a habitat element

8 Anthropogenic Disturbances & Elements (specify whether negative or positive relationship in comments)
- 8.1 Campgrounds/picnic Areas
- 8.2 Roads
- 8.3 Buildings
- 8.4 Bridges
- 8.5 Diseases Transmitted by Domestic Animals
- 8.6 Animal Harvest or Persecution (Includes poaching, legal harvest, pest control, incidental take in gillnets, etc.)

8.7 Fences/corrals
8.8 Supplemental Food
8.9 Refuse (includes landfills)
8.10 Supplemental Boxes, Structures and Platforms
8.11 Guzzlers and Waterholes
8.12 Toxic Chemical Use (indicate only documented effects)
- 8.12.1 Herbicides/fungicides
- 8.12.2 Insecticides
- 8.12.3 Pesticides
- 8.12.4 Fertilizers

8.13 Hedgerows/windbreaks
8.14 Sewage Treatment Ponds
8.15 Repellents
- 8.15.1 Chemical (Taste, Smell, Tactile)
- 8.15.2 Disturbance (by noise or visual displays)

8.16 Culverts
8.17 Irrigation Ditches/Canals
8.18 Powerlines/corridors
8.19 Pollution
- 8.19.1 Chemical
- 8.19.2 Sewage
- 8.19.3 Water

8.20 Piers
8.21 Mooring piles, dolphins, buoys
8.22 Bulkheads, Seawalls, Revetment
8.23 Jetties, Groins, Breakwaters
8.24 Water Diversion Structures (Dams, Dikes, Levies)
8.25 Log Boom
8.26 Boats and ships
8.27 Dredge spoil islands
8.28 Hatchery fish and facilities

Matrix 4: Wildlife Species Life History and Occurrence

Taxonomic Field Headings
- Project species ID number
- Kingdom
- Phylum
- Class
- Order
- Family
- Scientific name (1)
- Scientific name (2)
- Common name (1)
- Common name (2)
- Subspecies name(s)
- Taxonomic references

General Status and Occurrence
- Breeding status
- Occurrence status - Oregon
- County occurrence - Oregon
- Occurrence status - Washington
- County occurrence - Washington
- Population status
- Occurrence references

Seasonal Activity and Movements
- Occurrence by month
- Breeding period by month
- Type of seasonal inactivity
- Seasonal inactivity by month
- Type of migration/seasonal movements
- Migration/seasonal movements by month
- Migration/seasonal movements by distance class
- Forms aggregations (includes type of aggregation in comments)
- Distance between natal area and first breeding site (natal philopatry)
- Age at cessation of parental care
- Seasonal activity and movements references

Reproduction and Population Data
- Average Number of offspring per litter or eggs per clutch
- Number of litters/clutches per year
- Average age at first breeding for females
- Average life span in the wild
- Maximum life span in the wild
- Mating system
- Den/nest/pupping/calving location (includes nest/den site fidelity in comments)
- Reproductive/population references

Spatial and Landscape Data
- Home range size class
- Site fidelity to summer range
- Site fidelity to winter range
- Geographic range
- Population distribution
- Landscape use
- Elevation range
- Known constraints to movements
- Spatial/landscape/population references

Diet Information
- Diet
- Foraging location
- Diet references

Body Size Data
- Mass
- Mass references

Matrix 5: Key Ecological Functions

1 Trophic relationships

- 1.1 heterotrophic consumer
  - 1.1.1 primary consumer (herbivore) (also see below under Herbivory)
    - 1.1.1.1 foliovore (leaf-eater)
    - 1.1.1.2 spermivore (seed-eater)
    - 1.1.1.3 browser
    - 1.1.1.4 grazer
    - 1.1.1.5 frugivore (fruit-eater)
    - 1.1.1.6 sap feeder
    - 1.1.1.7 root feeders
    - 1.1.1.8 nectar feeder
    - 1.1.1.9 fungus feeder
    - 1.1.1.10 flower/bud/catkin feeder
    - 1.1.1.11 aquatic herbivore
    - 1.1.1.12 feeds in water on decomposing benthic substrate
    - 1.1.1.13 bark/cambium/bole feeder
  - 1.1.2 secondary consumer (primary predator or primary carnivore)
    - 1.1.2.1 invertebrate eater
      - 1.1.2.1.1 terrestrial invertebrates
      - 1.1.2.1.2 aquatic macroinvertebrates
      - 1.1.2.1.3 freshwater or marine zooplankton
    - 1.1.2.2 vertebrate eater (consumer or predator of herbivorous vertebrates)
      - 1.1.2.2.1 piscivorous
    - 1.1.2.3 ovivorous
  - 1.1.3 tertiary consumer (secondary predator or secondary carnivore)
  - 1.1.4 carrion feeder
  - 1.1.5 cannibalistic
  - 1.1.6 coprophagous (feeds on fecal material)
  - 1.1.7 feeds on human garbage/refuse
    - 1.1.7.1 aquatic (e.g. offal and bycatch of fishing boats)
    - 1.1.7.2 terrestrial (e.g. landfills)
- 1.2 prey relationships
  - 1.2.1 prey for secondary or tertiary consumer (primary or secondary predator)

2 Aids in physical transfer of substances for nutrient cycling (C,N,P, etc.)

3 Organismal relationships

- 3.1 controls or depresses insect population peaks
- 3.2 controls terrestrial vertebrate populations (through predation or displacement)
- 3.3 pollination vector
- 3.4 transportation of viable seeds, spores, plants or animals
  - 3.4.1 disperses fungi
  - 3.4.2 disperses lichens
  - 3.4.3 disperses bryophtes, including mosses
  - 3.4.4 disperses insects and other invertebrates
  - 3.4.5 disperses seeds/fruits (through ingestion or caching)
  - 3.4.6 disperses vascular plants

3.5 creates feeding, roosting, denning, or nesting opportunities for other organisms
- 3.5.1 creates feeding opportunities (other than direct prey relations)
  - 3.5.1.1 creates sapwells in trees
- 3.5.2 creates roosting, denning, or nesting opportunities

3.6 primary creation of structures (possibly used by other organisms)
- 3.6.1 aerial structures
- 3.6.2 ground structures
- 3.6.3 aquatic structures

3.7 user of structures created by other species
- 3.7.1 aerial structures
- 3.7.2 ground structures
- 3.7.3 aquatic structures

3.8 nest parasite
- 3.8.1 interspecies parasite
- 3.8.2 common interspecific host

3.9 primary cavity excavator in snags or live trees

3.10 secondary cavity user

3.11 primary burrow excavator (fossorial or underground burrows)
- 3.11.1 creates large burrows (rabbit-sized or larger)
- 3.11.2 creates small burrows (less than rabbit-sized)

3.12 uses burrows dug by other species (secondary burrow user)

3.13 creates runways (possibly used by other species)

3.14 uses runways created by other species)

3.15 pirates food from other species

3.16 interspecific hybridization

4 Carrier, transmitter, or reservoir of vertebrate diseases

4.1 diseases that affect humans

4.2 diseases that affect domestic animals

4.3 diseases that affect other wildlife species

5 Soil relationships

5.1 physically affects (improves) soil structure, aeration (typically by digging)

5.2 physically affects (degrades) soil structure, aeration (typically by trampling)

6 Wood structure relationships (either living or dead wood)

6.1 physically fragments down wood

6.2 physically fragments standing wood

7 Water relationships

7.1 impounds water by creating diversions or dams

7.2 creates ponds or wetlands through wallowing

8 Vegetation structure and composition relationships

8.1 creates standing dead trees (snags)

8.2 herbivory on trees or shrubs that may alter vegetation structure and composition (browsers)

8.3 herbivory on grasses or forbs that may alter vegetation structure and composition (grazers)

Matrix 6: Land Use and Management Activities

Under each activity is a list of habitat elements that may be affected either positively or negatively by the activity. Habitat elements are then tied to species.

I. FIRE MANAGEMENT

- A. Suppressing wildfire
- B. Low to moderate intensity burns
- C. High intensity burns
- D. Fire (in general)

II. **FRESHWATER WETLAND, RIPARIAN, AND AQUATIC RESOURCE MANAGEMENT**

- A. Creating and maintaining impoundments
- B. Controlling water levels (reservoirs < 1000 acres)
- C. Creating/maintaining islands or rafts within impoundments
- D. Draining wetlands, marshes, ponds, lakes
- E. Increasing water supply (flow augmentation)
- F. Decreasing water supply (flow withdrawal)
- G. Burning wetlands to maintain successional stages (*see prescribed fire*)
- H. Restoration of wetlands
- I. Wetland management techniques
- J. Flooding fields and wetlands
- K. Removing riparian vegetation
- L. Livestock grazing of riparian areas (*see livestock management*)
- M. Adding coarse woody debris and boulders to streams and rivers
- N. Removing coarse woody debris from streams and rivers
- O. Restoring/maintaining beaver populations
- P. Retaining riparian buffer strips
- Q. Armoring banks for erosion control (gabion matting, riprap)
- R. Controlling sedimentation by revegetation of banks with grass-sedge-forb mixtures
- S. Controlling water pollution
- T. Disposing/assimilating wastewater
- U. Dredging
- V. Locating/constructing stream crossings (*see roads section*)
- W. Controlling aquatic plants
- X. Channelization

III. **ROAD MANAGEMENT**

- A. Road construction and obliteration
- B. Operational aspects of road maintenance and use
- C. Road closures
- D. Bridges
- E. Roads (in general)

IV. **AGRICULTURAL ACTIVITIES**

- A. Applying fertilizers
- B. Applying pesticides
- C. Applying herbicides
- D. Applying fungicides
- E. Haying/mowing
- F. Maintaining grasses and forbs within orchards, Christmas tree farms, vineyards etc.
- G. Providing/maintaining vegetation along field and ditch margins (hedgerows, fencerows, corridors, and shelterbelts)
- H. Retaining crop residue (over winter)
- I. Implementing farmland conservation programs (conservation reserve programs)

J. Irrigating
K. Altering drainage (ditching, tiling)
L. Decreasing water supply - flow withdrawal (*see aquatic resources*)
M. No-till farming/minimum till farming
N. Clean farming (includes burning, nothing left in fields or along edges)
O. Strip intercropping
P. Conversion of native habitats
Q. Control of vertebrates considered to be agricultural pests (includes use of repellents)
R. Providing artificial nesting sites (*see forest management*)
S. Agriculture (in general)

V. **SHRUBLAND and GRASSLAND MANAGEMENT**
A. Mechanical vegetation management (includes chaining)
B. Burning (*see prescribed burning*)
C. Using herbicides
D. Restoration
E. Conversion of shrubland to native or non-native grassland
F. Livestock grazing (*see livestock management*)
G. Shrubland management (in general)
H. Grassland management (in general)

VI. **LIVESTOCK MANAGEMENT**
A. Livestock grazing (all activities)
B. Conversion of shrubland to native or non-native grassland (*see shrubland/grassland management*)
C. Creating or providing stockponds (or other water sources)
D. Excluding livestock from riparian areas (*see aquatic resources)*

VII. **FENCING**
A. Fencing to control or direct wildlife access (predator exclusion, ungulate damage control, controlling wildlife access to highways)
B. Fencing for protection/restoration of habitat (other than riparian)
C. Fencing to exclude livestock from riparian areas (*see aquatic resources*)

VIII. **MINING ACTIVITIES**
A. Site reclamation (replanting vegetation, water quality management)
B. Surface/strip mining and processing
C. Underground mining and processing
D. Maintaining access to abandoned subsurface mines and tunnels
E. Placer prospecting and mining
F. Mineral exploration
G. Sand/gravel and peat mining
H. Mining (in general)
I. Mining activities involving blasting (no HE's tied to this activity)
J. Oil and gas extraction

IX. **FOREST MANAGEMENT**
A. Harvest Operation Activities:
1. clearcutting
2. shelterwood cuts
3. seed tree cuts
4. group selection
5. selective harvest across all tree sizes
6. selective harvest of specific sizes or conditions or species (varied prescriptions)

B. Silvicultural/Stand Improvement Activities:

1. pre-commercial thinning
2. thinning (to enhance dominant or co-dominant trees, e g., release cutting, forest health, stocking densities)
3. pruning
4. simplifying species composition and/or structure (genetically selecting trees, favoring one or few commercially desired species)
5. type conversion (e.g., changing grassland to trees, or oaks to conifers)
6. prescribed burning for forest health and site prep (*see fire management*)
7. applying insecticides
8. forest management (in general)

C. Site prep/Tree Establishment Activities
1. applying herbicides
2. fertilizing plantations
3. removing slash (includes piling and burning or hauling off for chipping; all slash is removed from site)
4. planting or seeding for reforestation (includes vexar tubing, shade cards, plastic sheeting)
5. tilling prior to planting

D. Habitat Management Activities
1. maintaining mature/old growth
2. grazing livestock
3. retaining medium-sized green trees (11-19" dbh)
4. retaining large green trees (20"+ dbh)
5. retaining trees with defects (cavities, broken tops, heart rot, conks, multiple tops)
6. creating/maintaining edges
7. maintaining mast trees
8. developing/maintaining forest openings (natural meadows, preventing tree encroachment)
9. developing/maintaining brush/slash piles
10. retaining/providing dead/down wood
11. retaining/creating snags
12. retaining riparian buffer strips (*see aquatic activities*)
13. providing artificial nest sites
14. creating/maintaining corridors

E. Incidental Activities:
1. introducing exotic vegetation (elk forage mixes)
2. creating water sources (digging pumper ponds or wildlife ponds)
3. removing hazard trees (OSHA, campgrounds, roadsides)
4. building skid trails and landings
5. controlling vertebrates considered to be forest pests

F. Special Forest Products:
1. firewood cutting
2. harvesting mushrooms
3. bough collection
4. special forest products (in general)

X. **MARINE ACTIVITIES**
A. Marine dredging and filling
B. Harbor, marina, ferry terminal development
C. Residential docks in marine and freshwater
D. Toxic spills (oil or other chemicals)
E. Armoring shorelines (bulkheads/jetties)
F. Developing off-shore (underwater) structures

G. Marine fisheries (food depletion, gear impacts)
H. Aquaculture

XI. **URBAN DEVELOPMENT**
A. Paving
B. Building houses and businesses (loss of habitat)
C. Owning domestic animals (cats or dogs, not livestock)
D. Urban aquatic habitat management (includes development and maintenance of golf course ponds, channeling/ditching waterways etc.)
E. Landscaping and vegetation management
F. Water quality and stormwater management
G. Establishing/maintaining greenways/greenbelts

XII. **RECREATIONAL ACTIVITIES**
A. Trail use and camping (includes using pack animals, mountain biking, hiking etc.)
B. Snowshoeing/snow skiing/sledding
C. Mountain/rock climbing
D. Motorized boating (includes water skiing, jet skiing)
E. Non-motorized boating (includes wind surfing)
F. Swimming
G. Off-road driving (all types of vehicles except snow mobiles)
H. Snowmobiling
I. Aircraft use (includes helicopters) (No HE's tied to this activity)
J. Recreational developments (building campgrounds, marinas, trails, cottages)
K. Fish stocking

XIII. **RIGHT-of-WAY MANAGEMENT**
A. Utility corridors (power transmission lines, oil/gas pipelines)

Matrix 7: Salmon-Wildlife Relationships

For each species, relationships with particular salmon life stages are noted.

Relationships:

0 = Unknown if relationship occurs
1 = Strong, consistent relationship
2 = Occasional relationship
3 = Indirect relationship
4 = No relationship
5 = Rare relationship

Salmon stages:

0 = Not known
1 = Incubation - eggs and alevin
2 = Freshwater rearing - fry, fingerling, and parr
3 = Saltwater - smolts, immature adults, adults
4 = Spawning - freshwater
5 = Carcasses

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Bonneville Power Administration
FY 2003 Provincial Project Review

Mainstem & System-wide Province
Revised Budget 8/23/02

First, read the help documents

Please carefully read the **Proposal Development and Selection Criteria** document, which contains information on the review process, and the **instructions** document, which provides field- and content-related help for the form. If you are missing either document, please visit http://www.cbfwa.org/reviewforms/systemwide/default.htm or call 503-229-0191.

Important notes

- This form is to submit projects or proposals for BPA FY 2003-5 funding for Mainstem & System-wide Province only.
- This document is only available for Word97/Word2000/WordXP. Do not save down to older formats, or use in another word processor such as WordPerfect, even if it supports Word conversions. You will lose the auto-calculations, and won't be able to add or delete table rows. You may also risk not being able to re-open the document.
- Some help text is included as "hidden" comments on the data form, which is displayed by resting the mouse cursor over any yellow text (usually section headings or field names)
- Use these keystroke macros to assist you in the form. If the macros aren't available (nothing happens when you press these keys), then you need to enable macros in Word: In Word97, close the proposal, then open again and choose Enable macros if prompted. In Word2000/XP, close the proposal, choose Tools, Macro, Security, and set the security level to medium. Re-open the proposal and choose Enable macros when prompted.

To	Press
insert rows in tables	Alt-R and you'll be asked whether to insert a row at the current position or add one to the end of the table
delete rows in tables	Alt-D at the row you want to delete
calculate budget totals	Alt-C either periodically, or when you're done with the form
Spellcheck	Alt-S

Steps to complete the form

1) First, read the help documents (get them at http://www.cbfwa.org/reviewforms/systemwide/default.htm)
2) There are two documents to this form:
   a) Part 1 (**blank_sys.doc)** consists of administrative and budgeting information. Your input is restricted to the grey fields.
   b) Part 2 (**narrative.doc)** allows you to describe your project at length, including maps, tables, graphics, etc.
3) Save this as something other than blank_sys.doc. Preferably, use the BPA 9-digit project number, like "198906200.doc" or if your project has no project number, the first few words of the title, like "RestoreFish.doc", and a proposal number will be assigned to you by BPA upon receipt of your proposal.
4) Your cursor is already in the first input field, Title of Project, so start typing

5) Fill in all fields (gray boxes) pressing Tab to advance from one field to the next
6) Press Alt-C when complete to calculate totals
7) Save document, then open **narrative.doc** to begin Part 2.
8) Please print the completed documents. Part 1 prints in landscape (sideways) orientation, Part 2 in portrait (regular).

Save the documents and then **email** your forms and any attachments to fwproposals@bpa.gov. **NOTE: BPA cannot receive e-mails larger than 5 MB.** Or mail paper and diskette(s) to:

Bonneville Power Administration
Attention: Cate Hanan - KEWB-4
FY 2003 Proposals – Mainstem & System-wide Province Review
905 NE 11th Avenue
Portland, OR 97232

9) Monitor the http://www.efw.bpa.gov/cgi-bin/FW/02MainstemSystemwide.cgi.website to verify your project funding request is received and posted correctly.

All projects must be received no later than 5:00pm PST on Monday, June 3, 2002.
No late proposals will be reviewed for FY 2003 funding.

PART 1 of 2. Administration and Budgeting

Section 1 of 10. General administrative information

Title of project
An Interactive Biodiversity Information System for the Columbia River Basin

BPA project number

Business name of agency, institution or organization requesting funding
Northwest Habitat Institute

Business acronym (if appropriate) NHI

Proposal contact person or principal investigator:

Name	Thomas O'Neil
Mailing Address	P.O. Box 855
City, ST Zip	Corvallis, OR 97339-0855
Phone	(541) 753-2199
Fax	(541) &53-2440
Email address	habitat@nwhi.org

Manager of program authorizing this project Thomas O'Neil

Location of the project

Latitude	Longitude	Description
49N	124W	Entire Columbia River Basin
41N	110W	Entire Columbia River Basin

Target species
All resident fish and wildlife species that occur within the Columbia River Basin.

Short description
To complete development of a resident fish and wildlife information system on the Internet to allow users/resource managers to access, query, and retrieve spatial, text, and tabular data. Interactive and decision support tools will also be developed.

RPAs. View guidance on proposal development and selection criteria named mainstem_systemwidecriteria.pdf, available as a link from the main proposal solicitation page. Indicate what, if any, ESA Biological Opinion action(s) will be met by the proposed project. Explain how and to what extent the project meets the ESA requirement.

NMFS and/or FWS Reasonable and Prudent Alternatives (RPA)

RPA Number	Description
152	This project supports a coordinated effort to evaluate and assess offsite habitat enhancement by using and building on existing data management structures, so all agencies will share habitat data, databases, data management and quality assurance information.
154	This project supports the development and updating of subbasin assessments and plans by supplying consistent technical information to subbasin planners
180	This project would develop and implement a basinwide hierarchical spatial, text, and tabular data design to support monitoring programs and allow ground-truthing of regional databases
181	This project would develop the spatial delivery system once the digitial aerial and satellite imagery of the entire Columbia River Basin has been acquired.
198	This project continues to expands upon a common data management system for fish and wildlife and their habitats.

Information transfer The expected outcomes of this project are (check one) ☒ quantitative ☒ qualitative ☒ indirect Data generated by this project are (check one) ☐ primary ☒ derived ☐ indirect Are there restrictions on the use of the data? (check one) ☐ none ☒ non-commercial use only ☐ educational use only ☐ requires prior approval ☐ sensitive ☐ proprietary, no public distribution	Where do the data reside (check one or more)? Private/managed locally: ☐ printed ☐ electronic Public access: Printed at ☐ BPA ☐ Peer-reviewed journal or other Northwest Habitat Institute Internet at ☐ BPA ☐ StreamNet ☐ Fish Passage Center ☐ DART or other web address www.nwhi.org/

In what other ways will information from this project be transferred or used?
Information on the Internet site will be in a format that can be used in reports, publications and presentations. For example, the existing habitat maps can be downloaded for publications as a JPEG of TIFF format or as digitial layers for Arc/Info or Arc/View.

Section 2 of 10. Past accomplishments

Year	Accomplishment
1998	Completed for USGS-Biological Resources Division: GAP Analysis Program a statewide map and data layers of Oregon Vegetation - Landscape Level Cover Types
1998	Completed for Oregon Fish and Wildlife a fine scale map (2 ac. miniimum mapping unit) and GIS data layers of the Willamette Valley
1999	Completed for the Northwest Power Planning Council Wildlife-Habitat Type maps and GIS data layers depicting Current and Historic Conditions of the U.S. portion of the Columbia River Basin
2000	Completed for Washington Dept. of Fish and Wildlife a statewide map and GIS data layers of Washington's Wildlife-Habitat Types
2001	Co-developed and published the Wildlife-Habitats Relationships in Oregon and Washington book and CD-ROM
2001	Co-developed and published the 2nd Edition of the Atlas of Oregon Wildlife
2001	Completed the first International map and GIS data layers that shows the U.S. and Canada Columbia River Basin for Current Wildlife-Habitat Types
2001	Developed and launched a proof of concept of the Interactive Biodiversity Information System (IBIS) on the Internet.
2001	Co-developed the publication Inventory and Monitoring of Salmon Habitat in the Pacific Northwest - Directory and Synthesis of Protocols for Management/Research and Volunteers in Washington, Oregon, Idaho, Montana, and British

Year	Accomplishment
	Columbia
2002	Developed a Annotated Bibliography on Coastal Cutthroat Trout for U.S. Fish and Wildlife Service (an abstract for each paper or publication was written and hard copy acquired) done in conjunction with the Washington Department of Fish and Wildlife
2002	Co-wrote the report on A Multi-Species Framework Approach for the Columbia River Basin for the Northwest Power Planning Council

Section 3 of 10. Relationships to other projects

Project #	Project title/description	Nature of relationship
	Only a few examples are listed here:	
19881084	Streamnet	IBIS's resident fish and wildlife information system would compliment Streamnet's anadromous information system
1525	Establishing Baseline Key Ecological Functions of Fish and Wildlife for Subbasin Planning	Uses and builds upon the 27 fish and 137 wildlife species range maps and the fish-habitat relationships that were developed for this project.
9609400	Washington Department of Fish & Wildlife Habitat Units Acquisition	Could assist with evaluating the restore/enhance 100,000+ acres of wildlife habitat in Washington to mitigate for losses associated with hydroelectric development.
29019	Characterize and Assess Wildlife-Habitat Types and Structural Conditions for Okanogan sub-basin	Assist with the evaluation and subbasin assessment of the Okanogan
24015	Wetland/Riparian Protection, Restoration, Enhancement and Maintenance in the Coeur d'Alene Subbasin	Assist with the value assessement to the wildlife resource
199303501	Enhance Fish, Riparian, and Wildlife Habitat Within the Red River Watershed	Could use IBIS information as part of their holistic approach and adaptive management principles to enhance fish, riparian, and wildlife habitat and water quality within the Red River watershed.
24012	Implement Floodplain Operational Loss Assessment, Protection, Mitigation and Rehabilitation on the Lower Kootenai River Watershed Ecosystem	Assist with the assessment as well as identifying possible linkages with other projects like 24010- Reconnection of Floodplain Slough Habitat to the Kootenai River

Section 4 of 10. Estimated budget for Planning & Design phase

Task-based estimated budget

Objective (1. text, 2. text...)	Task (a. text, b. text...)	Task duration in FYs	Estimated FY 03 cost	Subcon-tractor
1. Incorporating existing information (design and function) into an interactive Internet application	a. Restructure and esign new integration and relationships of existing wildlife-habitat information and spatial data sets	1	19,220	☐
	b. Define formats and create wildlife species range maps	2	18,120	☐
	c. Optimize interfaces by developing the necessary programming and scripts to relate with the appropriate data sets	1	13,600	☐
	d. Evaluate integrity of interfaces and programming through iterative testing	1	2,480	☐
2. Expand current contents (design and function) to include other data sets and other spatial data into an interactive Internet application	a. Design new integration and relationships for initial data set on existing resident and marine fish-habitat relationships and developp and serve spatial data sets	5	39,880	☐
	b. Acquire Landsat Imagery and 7.5 minute quads (DRGs) and IKONOS imagery for Pilot Area		76,000	☐
	d. Define formats and create fish species range maps	2	18,120	☐
	e. Optimize interfaces by developing the necessary programming and scripts to relate with the appropriate data sets	1	9,880	☐
	f. Evaluate integrity of interfaces and programming through iterative testing	1	2,480	☐
3. Develop more robust queries and decision support tools.	a. Define common query patterns and common project tracking and decision needs	4		☐
	b. Develop scripts, programs and	4		☐

Objective (1. text, 2. text...)	Task (a. text, b. text...)	Task duration in FYs	Estimated FY 03 cost	Subcon-tractor
	interfaces			
	c. Evaluate integrity of queries and tools through iterative testing	4		☐
	d. Make presentations and conduct workshops to obtain feedback	4		☐
	e. Finalize queries and tools	4		☐
		Total	$199,780	

Out year objective-based estimated 2004 - 2007 budget

Objective (1. text, 2. text...)	Starting FY	Ending FY	Estimated cost
1. Incorporating existing information (design and function) into an interactive Internet application	2003	2004	102,460
2. Expand current contents to include other data sets (design and function) and other spatial data into an interactive Internet application	2003	2007	228,380
3. Develop more robust queries and decision support tools	2004	2007	361,300

Out year estimated budgets

	FY 2004	FY 2005	FY 2006	FY 2007
Total budget	$137,280	$140,480	$143,760	$146,840

Section 5 of 10. Estimated budget for Construction/Implementation phase

Task-based estimated budget

Objective (1. text, 2. text...)	Task (a. text, b. text...)	Task duration in FYs	Estimated FY 03 cost	Subcon-tractor
1. Incorporating existing information (design and function) into an interactive Internet application	a. Restructure and esign new integration and relationships of existing wildlife-habitat information and spatial data sets	1	28,830	☐
	b. Define formats and create wildlife species range maps	2	22,180	☐

Objective (1. text, 2. text...)	Task (a. text, b. text...)	Task duration in FYs	Estimated FY 03 cost	Subcon-tractor
	c. Optimize interfaces by developing the necessary programming and scripts to relate with the appropriate data sets	2	20,400	☐
	d. Evaluate integrity of interfaces and programming through iterative testing	1	3,720	☐
2. Expand current contents (design and function) to include other data sets and other spatial data into an interactive Internet application	a. Design new integration and relationships for initial data set on existing resident and marine fish-habitat relationships and develop and serve spatial data sets	5	69,820	☐
	b. Define formats and create fish species range maps	2	22,180	☐
	c. Optimize interfaces by developing the necessary programming and scripts to relate with the appropriate data sets	5	14,820	☐
	d. Evaluate integrity of interfaces and programming through iterative testing	1	3,720	☐
3. Develop more robust queries and decision support tools.	a. Define common query patterns and common project tracking and decision needs	4		☐
	b. Develop scripts, programs and interfaces	4		☐
	c. Evaluate integrity of queries and tools through iterative testing	4		☐
	d. Make presentations and conduct workshops to obtain feedback	4		☐
	e. Finalize queries and tools	4		☐
		Total	$185,670	

Out year objective-based estimated 2004 - 2007 budget

Objective (1. text, 2. text...)	Starting FY	Ending FY	Estimated cost
1. Incorporating existing information (design and function) into an interactive Internet application	2003	2004	153,690
2. Expand current contents to include other data sets (design and function) and other spatial data into an interactive Internet application	2003	2007	342,570
3. Develop more robust queries and decision support tools	2004	2007	541,950

Out year estimated budgets for construction/implementation phase

	FY 2004	FY 2005	FY 2006	FY 2007
Total budget	$205,920	$210,720	$215,640	220,260

Section 6 of 10. Estimated budget for Operation & Maintenance phase

Task-based estimated budget

Objective (1. text, 2. text...)	Task (a. text, b. text...)	Task duration in FYs	Estimated FY 03 cost	Subcon-tractor
1. Incorporating existing information (design and function) into an interactive Internet application	e. Convert and integrate data with relational ties	2	14,750	☐
	f. Establish interfaces and interactive modes	2	12,200	☐
	g. Create and update metadata	1	13,500	☐
2. Expand current contents to include other data sets (design and function) and other spatial data into an interactive Internet application	e.. Convert and integrate data with relational ties	5	14,750	☐
	f. Establish interfaces and interactive modes	5	12,200	☐
	g. Create and update metadata	5	13,500	☐
3. Develop more robust queries and decision support tools	g. Conduct interval testing of queries and tools	4		☐

Objective (1. text, 2. text...)	Task (a. text, b. text...)	Task duration in FYs	Estimated FY 03 cost	Subcon-tractor
	h. Write descriptions and "how to use manual"	1		☐
4. Update information system	a. Actively seek and acquire new data sets (including monitoring data) to update information on resident fish and wildlife from all 4 Northwestern States	4		☐
	b. Actively seek and acquire or create new spatial data sets like acquiring the digital aerial and satellite imagery and developing the methodology and process to serve these data	4		☐
5. Operate and maintain information system	a. Maintain Internet Access	5	2,400	☐
	b. Provide Technical Support to Users	5		☐
	c. Provide for System and Information backups and redundancies	5	25,600	☐
		Total	$108,900	

Out year objective-based estimated 2004 - 2007 budget

Objective (1. text, 2. text...)	Starting FY	Ending FY	Estimated cost
1. Incorporating existing information (design and function) into an interactive Internet application	2003	2004	50,450
2. Expand current contents (design and function) to include other data sets and other spatial data into an interactive Internet application	2003	2007	80,450
3. Develop more robust queries and decision support tools	2004	2007	62,500
4. Update information system	2004	2007	651,200
5. Operate and maintain information system	2003	2007	423,400

Out year estimated budgets for operations & maintenance phase

	FY 2004	FY 2005	FY 2006	FY 2007
Total budget	$265,700	$287,000	$297,600	$308,800

Section 7 of 10. Estimated budget for Monitoring & Evaluation phase

Task-based estimated budget

Objective (1. text, 2. text...)	Task (a. text, b. text...)	Task duration in FYs	Estimated FY 03 cost	Subcon-tractor
6. Monitor use and efficiency of the information system	a. Evaluate use of queries, tools, pages, formats	5	5,100	☐
	b. Determine efficiencies of relationships to data versus delivery time to user (includes evaluating other computer programs and delivery software)	5	3,500	☐
	c. Write reports documenting progress, use, and findings	5	6,000	☐
		Total	$14,600	

Out year objective-based estimated 2004 - 2007 budget

Objective (1. text, 2. text...)	Starting FY	Ending FY	Estimated cost
6. Monitor use and efficiency of the information system	2003	2007	80,700

Out year estimated budgets for monitoring & evaluation phase

	FY 2004	FY 2005	FY 2006	FY 2007
Total budget	$15,300	$16,100	$16,900	$17,800

Section 8 of 10. Estimated budget summary

Itemized estimated budget

Item	Note	FY 2003
Personnel	FTE: 5	239,950
Fringe benefits	33% of Personnel expense	79,184
Supplies, materials, non-expendable property	Backup and redundancy system, software, server, T1 line support, liencse renewals	36,860
Travel	8 trips - 2 to each of the 4 states	4,800
Indirect costs	20%	72,156
Capital acquisitions or improvements (e.g. land, buildings, major equip. over $10,000)	Landsat imagery - $40,000; IKONOS imagery - $25,000; and 7.5 minute DRGs - $11,000	76,000
NEPA costs		0
PIT tags @$2.25/ea	# of tags:	0
Subcontractor		0
Other		0
	Total BPA funding request	$508,950

Total estimated budget

Total FY 2003 project cost	$508,950
Amount anticipated from previously committed BPA funds (carryover)	-
Total FY 2003 budget request	$508,950
FY 2003 forecast from FY 2001	
% change from forecast	0.0% increase

Reason for change in estimated budget

Reason for change in scope

Cost sharing

Organization	Item or service provided	Amount ($)	Cash or in-kind?
National Biological Information Infrastructure	Developing metadata - FY 03	85,000	in-kind
Northwest Habitat Institute	General support for IBIS - FY 03	15,000	in-kind
Bureau of Land Management	General support for IBIS - FY 03 tenative	40,000	cash
National Fish and Wildlife Foundation	General support for IBIS - FY 03 tenative	40,000	cash
Northwest Habitat Institute	Development of Proof of Concept	45,000	in-kind
U.S. Fish and Wildlife Service	Development of Proof of Concept	10,000	cash
Bureau of Land Management	Development of Proof of Concept	24,500	cash
Northwest Power Planning Council	Development of Proof of Concept	75,000	cash
	Total cost-share	$334,500	

Out year budget totals

	FY 2004	FY 2005	FY 2006	FY 2007
Planning & design phase	137,280	140,480	143,760	146,840
Construction/impl. phase	205,920	210,720	215,640	220,260
O & M phase	265,700	287,000	297,600	308,800
M & E phase	15,300	16,100	16,900	17,800
Total budget	$624,200	$654,300	$673,900	$693,700

Other budget explanation

Part 1 of 2 complete!

Press Alt-C to calculate totals on the document. If any totals don't match, you'll see a message.
Then save this document, and open "narrative.doc" to begin Part 2, which includes Sections 9-10.