PART I - ADMINISTRATIVE

Section 1. General administrative information

Title of project

Characterize And Assess The John Day Watershed Using Landsat Tm Imagery

BPA project number: 20015
Contract renewal date (mm/yyyy): ☐ **Multiple actions?**

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

Business acronym (if appropriate) NHI

Proposal contact person or principal investigator:

Name	Chris Kiilsgaard
Mailing Address	P.O. Box 805
City, ST Zip	Corvallis, OR 97339-0855
Phone	541-929-6330
Fax	
Email address	chris@nwhi.org

NPPC Program Measure Number(s) which this project addresses
ISRP V-C.3.1, V-C.4.1, and V-C.5.1

FWS/NMFS Biological Opinion Number(s) which this project addresses

Other planning document references
ISRP

Short description
Characterizing and assessing landscapes within watersheds will allow for better planning of habitat enhancement and mitigation projects. Also, linking landscapes with wildlife habitats enhances a system approach and strengthens the design of a project.

Target species
All native wildlife species that occur within the John Day watershed with a specific emphasis on those associated or linked (directly or indirectly) to salmon.

Section 2. Sorting and evaluation

Subbasin
Lower Mid-Columbia/John Day

Evaluation Process Sort

CBFWA caucus	Special evaluation process	ISRP project type
Mark one or more caucus	If your project fits either of these processes, mark one or both	Mark one or more categories
☐ Anadromous fish ☐ Resident fish ☒ Wildlife	☒ Multi-year (milestone-based evaluation) ☒ Watershed project evaluation	☒ Watershed councils/model watersheds ☐ Information dissemination ☐ Operation & maintenance ☐ New construction ☒ Research & monitoring ☒ Implementation & management ☐ Wildlife habitat acquisitions

Section 3. Relationships to other Bonneville projects

Umbrella / sub-proposal relationships. List umbrella project first.

Project #	Project title/description

Other dependent or critically-related projects

Project #	Project title/description	Nature of relationship

Section 4. Objectives, tasks and schedules

Past accomplishments

Year	Accomplishment	Met biological objectives?
1998	Phase 1 - developed regional wildlife habitats and structural conditions for forest, shrub/grasslands, and agriculture	yes

1998	Completed a statewide vegetation map with a 250 acre minimum mapping unit	yes
1998	Completed the Willamette Valley map with about a 2 acre minimum mapping unit	yes
1999	Publish the findings in Wildlife Habitats and Species Associations in Oregon and Washington with OSU Press	yes

Objectives and tasks

Obj 1,2,3	Objective	Task a,b,c	Task
1	*Note: Each Objective has Tasks 1-3 associated with it. Task 4 would require work each year. Map wildlife habitats within the North and Middle Forks of the John Day to Kimberley, Oregon at the local level [10 acre minimum mapping unit]	1	Develop and classify spectral groups that would most closely represent wildlife habitats as determined in Phase 1. Also see Methods in Section 8.f for more detail.
2	Map wildlife habitats within the South Fork and Main John Day to Kimberely, Oregon	2	Develop and classify spectral groups that would most closely represent structural conditions as determined in Phase 1. Also see Methods in Section 8.f for more detail.
3	Map wildlife habitats associated with the Main John Day from Kimberley, Oregon to the Columbia River	3	Validate mapping classifications via field visits. Also see Methods in Section 8.f for more detail.
		4	Verify species/habitat relationships that were determined in Phase 1. Also see Methods in Section 8.f for more detail.

Objective schedules and costs

Obj #	Start date mm/yyyy	End date mm/yyyy	Measureable biological objective(s)	Milestone	FY2000 Cost %
1	10/1999	9/2000	characterize and assess watershed	X	33.33%
2	10/2000	9/2001	characterize and assess watershed	X	33.33%
3	10/2001	9/2002	characterize and assess watershed	X	33.33%

				Total	99.99%

Schedule constraints
None know at this time

Completion date
September 30, 2002

Section 5. Budget

FY99 project budget (BPA obligated):

FY2000 budget by line item

Item	Note	% of total	FY2000
Personnel	Support for 5 staff (or equivalent of 3.3 FTE	%54	116,984
Fringe benefits	rate 30% OPB	%23	50,136
Supplies, materials, non-expendable property	software licenses, imagery, and field supplies	%2	4,100
Operations & maintenance		%0	
Capital acquisitions or improvements (e.g. land, buildings, major equip.)		%0	
NEPA costs		%0	
Construction-related support		%0	
PIT tags	# of tags:	%0	
Travel	rate .30/mile and a maximum of $65.00 per diem/day	%3	6,780
Indirect costs	rate 21%	%17	37,380
Subcontractor	Oregon State Univ. for 2nd and 3rd years	%0	
Other		%0	
TOTAL BPA FY2000 BUDGET REQUEST			$215,380

Cost sharing

Organization	Item or service provided	% total project cost (incl. BPA)	Amount ($)
Northwest Habitat Institute	computer equipment, some imagery	%6	15,000

Fish and Wildlife Information Exchange	technical support	%4	10,000
		%0	
		%0	
		Total project cost (including BPA portion)	$240,380

Outyear costs

	FY2001	FY02	FY03	FY04
Total budget	$258,000	$261,000		

Section 6. References

Watershed?	Reference
☐	Bruner, H., and T.A. O'Neil. Assessing Vegetation Mapping Accuracy for the Willamette Valley, Oregon. Oregon Department of Fish and Wildlife, Pittman-Robinson Report (under grant 87-R from U.S.FW Service, Federal Aid Program). Corvallis, OR.
☐	Johnson, D.H., and T.A. O'Neil. in press. Wildlife Habitats and Species Associations in Oregon and Washington - Building a Common Understanding. Oregon State University Press. Corvallis, OR.
☐	O'Neil, T.A., R.J. Steidl, W.D. Edge, and B. Csuti. 1995. Using Wildlife Communities to Improve Vegetation Classification for Conserving Biodiversity. In Conservation Biology, 9(6):1482-1491.
☐	Puchy, C., and D. Marshall. 1993. Oregon Wildlife Diversity Plan. Oregon Department of Fish and Wildlife. Portland, OR. pp. 413.
☐	Risenhoover, K.L., H.B. Underwood, W. Yan, and J.L. Cooke. 1997. A spatially-explicit modeling environ. for evaluting deer manage. strategies. Pages 366-379 in: (W.J. McShea eds.) Science of overabundance: deer ecology . Smithsonian, Washington, D.C.
☐	U.S, Fish and Wildlife Service . 1981. Habitat Suitability Index Models. Div. of Ecological Service, EMS 103. Department of Interior, Washington, D.C. pp. 176.
☐	U.S. Fish and Wildlife Service. 1980. Habitat Evaluation Procedures. Div. of Ecological Services, EMS 102. Department of Interior, Washington, D.C. pp. 143.

PART II - NARRATIVE

Section 7. Abstract

The Independent Scientific Review Panel (ISRP) that critiqued the Columbia River Basin Fish and Wildlife program suggested that the successful design and implementation of wildlife habitat restoration and mitigation projects must begin with putting these actions in context with the existing landscapes. To do so will allow watershed assessments findings to guide fish and wildlife goals and objectives. Furthermore having the ability to predict species associations, map wildlife habitats and wildlife species distributions, would allow for a more comprehensive assessment of individual watersheds, and increase success with conservation actions and strategies. Hence, our proposal builds on the information produced by a previous effort [Phase1 of the project from 1995 to1998], and proposes initiating Phase II which will focus on (1) mapping wildlife habitats at a refined resolution (10 acre minimum mapping unit) and incorporating vegetative as well as structural conditions, (2) validating the mapping effort, (3) evaluating the ability of the wildlife habitats and structural conditions identified through cluster analysis to predict species occurrence, (4) assessing conservation planning by constructing spatially explicit models using classified habitat maps and John Day Basin species data, and (5) using the information to enhance and modify conservation planning for the John Day Basin in Oregon.

Section 8. Project description

a. Technical and/or scientific background

In the Pacific Northwest, there is a great demand for the development and dissemination of data-rich and verifiable information that links landscapes with current vegetation and structural conditions and also can identify wildlife associated with them. For the past three years, the Northwest Habitat Institute (NHI) in collaboration with Oregon State University and the Oregon and Washington Departments of Fish and Wildlife (ODFW and WDFW, respectively) have been working to build public and private partnerships to address this demand. The project developed through this effort is entitled *Wildlife Habitats and Species Associations in Oregon and Washington: Building a Common Understanding for Management.* Phase 1 of this project is scheduled to be completed in August 1999. Currently, 31 partners ranging from private timber associations to federal and state agencies and tribes actively support the project and have participated in the development of information documenting the relationships between wildlife species and habitats for the two-state region of Oregon and Washington. The budget for Phase 1 of the project is approximately 1.5 million dollars; $900,000 were contributed by project partners, and $600,000 have been received through in-kind support. In addition to the support received through the 31 project partners, the efforts of the project have been endorsed at both the regional and national levels of the United States Forest Service (Attachment 1).

The cumulation of the first phase of the project will result in a book published in late 1999 by Oregon State University Press. The book will be used primarily by natural resource managers, landowners, and watershed councils. The data sets developed through the project will be included with the book on a CD-ROM, and also will be

available through an interactive World Wide Web site. For a synopsis of Phase 1 of this project, please refer to Attachment 2.

To maximize the utility of the information developed in Phase 1 of the project for use by natural resource managers, land planners (city, county, and state), landowners, watershed councils, and the public, it is necessary to develop and increase our ability to predict wildlife species associations and map wildlife habitats and wildlife species distributions. Therefore, we are proposing to initiate Phase 2 of the project which will enhance and build on the information developed in Phase 1. The focus of Phase 2 will be to develop high-quality verifiable data at a scale that can be used by natural resource managers and land-use planners to address questions at local, basin, and regional levels. Specifically, we are proposing to build on the efforts described above by (1) mapping wildlife habitats in forest, range, and agriculture landscapes within the John Day Basin of Oregon, (2) validating the accuracy of the mapping effort, (3) validating the wildlife habitats and species association relationships, (4) developing a spatially explicit model using the remotely sensed data, and (5) enhancing and modifying the conservation planning for the John Day Basin. The John Day Basin was chosen as the study site for this project because the region's rich diversity of wildlife habitats and species. Equally important is the contribution this study will make to the information base needed to conserve the biodiversity of this spectacular and important area.

b. Rationale and significance to Regional Programs

The work outlined in this proposal would begin to address how watersheds can be characterized and assessed in a consistent and more comprehensive manner. Additionally, this project would address the ISRP concerns regarding watershed assessment (ISRP V-C.3.1); it contains a scientific research component (ISRP V-C.5.1); and it is an innovative project (ISRP V-C.4.1). Finally, the process and procedures could be used for all watersheds throughout the Columbia River Basin

c. Relationships to other projects

The project's approach and methodology could be applied to other watersheds throughout the Columbia River Basin to allow for consistent assessments.

d. Project history (for ongoing projects)

Not Applicable

e. Proposal objectives

Objective 1. Map wildlife habitats within the South Fork and Main John Day to Kimberely, Oregon [10 acre minimum mapping unit]

Objective 2. Map wildlife habitats within the North and Middle Forks of the John Day to Kimberley, Oregon at the local level [10 acre minimum mapping unit]

Objective 3. Map wildlife habitats associated with the Main John Day from Kimberley, Oregon to the Columbia River [10 acre minimum mapping unit]

f. Methods

Task 1. *Determining Habitat Structure Classification*s

In Phase 1 of the project, we used cluster analysis to identify wildlife habitats for Oregon and Washington (Attachment 3). The premise of cluster analysis is that wildlife species having similar associations with vegetation types will be grouped to form wildlife habitats (O'Neil et al., 1995). Hence, several vegetation types could and did make up one wildlife habitat type. Details of this approach can be found in Johnson and O'Neil (in press), and a list of the 119 vegetation alliances that were used in the analysis can be found in Attachment 4. Similarly, structural conditions for forests, range lands, and agricultural areas were identified in Phase 1 of the project (Attachment 5), and the relationships between these structural conditions and each of the 738 wildlife species occurring in Oregon and Washington were established. We will conduct a cluster analysis on these structural conditions to group wildlife species based on similarity in respect to their associations with structural conditions of the landscape. We will then conduct field tests to see which structural classes can be identified and mapped and to what degree of accuracy. The field trails will be conducted using a 10 acre minimum mapping unit and will follow an approach similar to that used by Bruner and O'Neil (1998) to determine accuracy. The structural types that can be determined in the field trials at 70% or greater accuracy will be included in the classification that will be used to map the John Day Basin.

Task 2. Developing and Verifying the LANDSAT Map

The mappable structural conditions identified in Task 1 will be used in conjunction with the wildlife habitat types (Attachment 3) to develop the mapping classification. A step by step approach will be followed to process, classify, and label the imagery. The first phase of work envisioned will be the initial image processing. Upon delivery of the TM imagery each scene will undergo a series of imagery previews for radiometric quality and subsequent processing tasks. Specific tasks in this image processing phase include:

Writing each image to tape. Imagery will be written to an 8 mm backup tape with copies stored off site.

Radiometric quality preview. This will provide analysts a preliminary determination of the extent and location of transmission errors and the impact of atmospheric conditions, especially clouds, haze, and smoke from slash burning has upon scene quality. If there are substantial areas of degraded scene quality the NHI has

access to an extensive library of aerial photography and airborne videography which can be substituted as the interpretive base for classification purposes.

Partitioning imagery into ecoregional similarity. Previous mapping efforts by the NHI have demonstrated that whenever classification takes place over a large land area (such as a TM scene), the problem of signature extension severely compromises classification effort. Ecoregional partitioning reduces spectral complexity displayed in a full TM scene, and groups vegetation types into more probable associations.

Construct derivative bands. A normalized difference vegetation index (NDVI) and the first three principal component bands of a Tasseled Cap Transformation algorithm will be incorporated with TM bands 1-5 and 7 to form a 10 band image. This image will be the basis of all subsequent spectral analysis.

Conversion of TM imagery to TIFF format files. A three band (bands 3, 4 and 5) image will be subset from the 10 band image and converted to a TIFF which then can be downloaded to a lap top computer for field reconnaissance purposes.

Conversion of vector format ancillary data. Coverage's which assist the analyst during field verification, especially the road and stream networks will be converted to a DXF format and brought into the lap top computer to display over the TIFF images.

After the steps outlined above are completed, the image will be classified and then field verified. These processes are described briefly below.

Unsupervised classification of the 96-97 scene ecoregion. Initial classification procedures start with a sufficiently large number of spectral clusters (generally between 100-150), to form mutually exclusive spectral signatures. These signatures are then run through a maximum likelihood classifier to produce the initial spectral cluster map.

Preliminary assignment of spectral class to vegetation class. Linking spectral clusters to information classes is first done through an on-screen examination of the clusters overlaid on the image. In many cases the information class is spectrally distinct enough that cluster labeling is very straight forward. However, there will always be a number of spectral clusters that are indeterminable at this stage, as well as, information classes that do not readily lend themselves to an identification (like palustrine forest). Which is the reason for the iterative process to determine spectral/information class relationships.

Field verification of spectral-vegetative condition. This process involves recording vegetation identity at known points within the image. Basically this entails linking our GPS unit to the TIFF version of the TM scene through Field Notes software and recording field training sites. A database will be developed for each

ecoregion using the Field Notes software that includes XY coordinates, the land cover class, and environmental variables that may be useful to the analyst in future processing iterations. The database will be brought into ARC/INFO as a point location file and displayed over the various thematic classifications. Other ancillary data, especially the National Wetlands Inventory and stream network data will be available as vector files displayed over the TIFF to assist in cover type identification.

Refinement-reclassification of spectral class to vegetative condition. This step begins the process of windowing the scene into identifiable and unidentifiable, or problem spectral classes. Once the analyst is confident of the relationship between spectral cluster and CCAP land cover class that class is masked out of succeeding classification iterations. Once the problem spectral classes are identified, separate classifications are performed where a class will be broken into many spectral classes and, if possible, those classes are related to probable land cover types and masked out. Further refinement of spectral cluster/land cover type can be accomplished through the use of ancillary data as logical operators . For example, often deep shadows in mountainous terrain are confused with water signatures. By using a digital elevation model the analyst can overlay that spectral class on all slopes less than 1 % and quickly ascertain differenciate steep slopes from open water.

Field verification of problem spectral-vegetation classes. If the analyst cannot confidently relate spectral cluster to land cover class, another field visit will be necessary to establish the spectral cluster identity.

Editing the refined coverage. As a last step in the classification phase the analyst will hand edit those areas which are too obscure to classify by conventional image processing techniques. Typically, these are the cloud, cloud shadow, or smoke obscured areas. The NHI has access to an extensive collection of recent aerial videography made available by ODFW for classification within the obscured regions.

Accuracy assessment of 1997 scenes. Accuracy assessment will follow the approach identified by Bruner and O'Neil (1998). This methodology will be reviewed in collaboration with other project partners and modified if necessary. However, we do envision a stratified random design, weighted by a per-class basis, with the minimum number of sample points to achieve a 70% accuracy by class standard.

Task 3. *Validating Species - Habitat Relationships*

The mapping will enable us to predict the potential distribution of each wildlife species in the John Day Basin and the habitats used by those species. These predictions need to be validated or verified to determine their accuracy and to maximize their usefulness. For the past seven years, the NHI, in conjunction with the Oregon Department of Fish and Wildlife and the Fish and Wildlife Information Exchange program at Virginia Tech. have

been collecting, compiling, and reviewing museum data. Data has been acquired from more than 35 museums and over 100,000 records have been reviewed. Information from this effort has been distilled into county records by date. By coupling this database with the wildlife habitat classification developed through this project, we will be able to predict species associated with different habitats and the potential distribution of the wildlife species. Specifically, we will use the museum data to identify which wildlife species were present in each county in our study area. We will then cross-reference this list with a list of species known to occur within the John Day Basin (Puchy and Marshall 1993) tp establish a list of wildlife species for each county. Then, we will develop a map of potential distribution for each species by linking occurrence information (county and ecoregion), elevational constraints, and habitat and structural information.

It is difficult to evaluate species-habitat relationship information; therefore rather than evaluating the information directly, we will evaluate the predictive capabilities of our approach using several methods, including those outlined below.

Using point-locations for verification. Because we used county information rather than point locations to predict the potential species associated with different habitats and the potential distribution of the wildlife species, we will be able to use the point locations from observations reported by state and federal agencies as well as the museum point locations to evaluate the predictive ability of our information. The NHI is working to created a database that contains point locations for the museum records as well as observational data reported by state and federal agencies. We will query these agencies to update this information, and then utilize this information to evaluate the predictive capabilities of the species-habitat information. In addition, due to the rich diversity of wildlife species, forestry interests, and the high-profile status of the John Day Basin, several projects have been and currently are conducting field work in the region and collecting species and habitat information. We will compile field data collected by state and federal agencies and local experts, as well as the diverse research groups active in the region (e.g. Oregon State University, Eastern Oregon University, the U.S. Forest Service's Pacific Northwest Research Station, and the U.S.G.S. - Biological Resources Division and create a database identifying wildlife species occurrence, locational information, and habitat type. This database will be used to evaluate the predictive capabilities of our information.

Peer review of distribution maps. Maps of potential distribution of each wildlife species will be sent out to local experts for peer review, providing us with qualitative information about the predictive capabilities of our information.

Field Verification. For habitat classifications that have few wildlife species associated with them or are not abundant or well represented, we will conduct field work to verify the species-habitat information and predictive capabilities of the information. All transects and point locations will be georeferenced using a global positioning system (GPS).

Task 4. *Developing Individual Spatially Explicit Models (to occur in year 2 and 3)*

Using a representative group of wildlife species, a potential habitat model will be developed that will be formatted according to standards used to develop Wildlife Habitats and Species Associations (WHSA) effort (Johnson and O'Neil, in press) and a review of the Habitat Suitability Index (HSI) models of the U.S. Fish and Wildlife Service (USFWS, 1981). The HSI models are an outgrowth of the Habitat Evaluation Procedures (USFWS, 1980). The HSI formats emphasize the quantitative relationships between environmental variables and habitat suitability. WHSA and HSI models focus on spatially explicit habitat data, which include vegetation type, stand age, percent cover, vertical and horizontal structure, patch size, patch configuration, landscape use, disturbance, elevation, aspect, soil, special features and other spatially explicit factors. Behavioral data with spatial implications are also incorporated into each model. Additionally, each wildlife species selected to be modeled would be associated with at least one of the major vegetative communities found in the John Day Basin.

Each individual spatially explicit model would be generated by adapting an ungulate management simulator model that was developed by Risenhoover et al. (1997) in conjunction with the Oregon Department of Fish and Wildlife. A multi-species model will be explored and this work would be done in collaboration with the Environmental Protection Agency 's Corvallis Research Laboratory and Oregon State University Department of Fisheries and Wildlife. This model will incorporate information developed in (1) Phase I of the project for wildlife habitats and species associations, (2) a review of the HSI, and (3) Tasks 1 and 2 of this proposal. All models will be reviewed by appropriate peer wildlife specialists. The models may vary in level of precision due in part to varying availability of life history and habitat-related information. For each wildlife species, the potential habitat map generated from this effort will delineate the estimated possible habitat for that species.

Models are especially useful for identifying gaps in our knowledge, assessing the relative importance of system components, and modelling parameters affecting the outcome in management or conservation scenarios. As a precursor to management or land-use action, model predictions may be used to evaluate the tradeoffs associated with a planned activity. Therefore, the spatially explicit model(s) will be valuable tools for land managers, conservation planners, and biologists.

Dr. Daniel Edge from Oregon State University will be the lead to accomplish this task.

Task 5. *Information Transfer: Enhancing and Modifying Basin and Watershed Conservation Planning (to occur in year 2 and 3)*

Recently, the greater conservation community has been focusing on the John Day Basin because of the area's rich biodiversity. Recognizing this importance we will work assisting local conservation groups and concerned citizens with developing conservation assessment/plan for the region.

Working with the local entities, including federal and state, will allow us to better define and describe conservation goals, as well as, evaluate alternative land-use scenarios, habitat suitability and connectivity. Additionally, the outcomes from the data developed in Tasks 1-4 will also assist local natural resource planners with their goals and objectives and allow the outputs to be used by an ongoing conservation process.

Our proposal is to take the outputs identified in Tasks 1-4 and enhance conservation assessment/plan for the region. We will also work with the other landuse planners and natural resource managers in the region to make sure they are aware of the ongoing process and invite them to participate. This Task allows the technology and information that is developed in this project to be transferred to concerned groups and citizens to help resolve questions, and hopefully maintain the biodiversity of the region.

Task 6. *Distribution of Products*

Products developed from this effort will include (1) a map (10 acre mmu) of the wildlife habitat types and structural conditions within the John Day Basin, (2) a report that identifies the accuracy of the mapping effort and evaluates the predictive capabilities of the species-habitat relationship information, (3) a spatially explicit model, (4) a refined conservation planning that would address wildlife habitat enhancement and mitigation opportunities for the area, and (5) post information to ours (and BPAs) interactive World Wide Web sites.

The NHI is a educational and scientific non-profit institute dedicated to developing and disseminating high-quality verifyable data. Therefore, all products developed by the NHI, including those developed through this proposal will be posted at an interactive World Wide Web sites and disseminated through additional methods including books, CD-ROMS, maps, and tools that will facilitate the evaluation and conservation of biodiversity. The NHI specializes in developing World Wide Web sites for both data dissemination and data collection/ information development (e.g. the following information development site will be operational through December 1998 *http:\\shp-odfw.peak*). Target audiences for NHI information include natural resource managers, land-use planners (city, county, and state), conservation groups, private organizations and businesses, landowners, watershed councils, and students and educators at all educational levels. For your review, we have included several figures that depict our work which can be found in Attachment 6.

Delivery of products to BPA. Each TM scene will be delivered as a ERDAS Imagine 8.3 IMG format file. Data will be distributed on 8 mm tapes. Currently the NHI is evaluating the purchase of a CD-ROM writer to facilitate data distribution and dissemination. Analog copies of each scene will be plotted and delivered at the time of tape distribution. The NHI can accommodate hard copy requests for maps not exceeding the width limitation of an E sized plotter.

g. Facilities and equipment

The computer equipment that would be available to conduct this proposal is (at a minimum): 1 workstation, 5 PC computers, 1 laptop computer, 1-GPS unit, 1-HP Plotter, scanner, digitizer and tape backup system. No major equipment cost is expected with the direct costs of this proposal.

h. Budget

Because the John Day Basin is a large geographic area, the we propose that the work on this project will be conducted in 3 Phases over 3 years. The three Phases (objectives) are outlined in the proposal. The budget developed for this project for the first year is to support 5 staff who have experience in 1) project management and wildlife ecology, 2) biogeography, 3) GIS analysis, 4) system/database support, and 5) field biology. Phase 1 would assess the South Fork and Main John Day down to Kimberley, Oregon. This way we can allow for some adaptive management in our approach by giving BPA the opportunity to review the information developed to see if modifications are needed before continuing throughout the entire basin. Our overhead rate is very low and reasonable because NHI is a non-profit organization. Additionally, the NHI would also support this project by cost-sharing our computer expenses, as well as, our affiliate's (Fish and Wildlife Information Exchange) willingness to support this project with their technical support. Future budgets and proposals beyond FY 2000 would be developed and submitted to BPA for their consideration, providing they (and other natural resource agencies and watershed councils) approve of our approach and initial findings. Future budget costs would be held as low as possible and we would continue to look for cost-sharing opportunities. Years two and three will include a modelling component, as well as, beginning to work with interested agencies and publics within the Joh Day Basin to facilitate the transfer of our technical information.

Section 9. Key personnel

See Attachment

Section 10. Information/technology transfer

Please see Section 8. F. Tasks 5 and 6.

Congratulations!