PART I - ADMINISTRATIVE

Section 1. General administrative information

Title of project

Evaluate Songbird Use Of Riparian Areas During Fall Migration

BPA project number: 20014
Contract renewal date (mm/yyyy): ☐ **Multiple actions?**

Business name of agency, institution or organization requesting funding
Department of Biological Sciences, University of Idaho

Business acronym (if appropriate)

Proposal contact person or principal investigator:

Name	Dr. Patricia Heglund
Mailing Address	Department of Biological Sciences, University of Idaho
City, ST Zip	Moscow, ID 83844
Phone	208-885-2665
Fax	208-885-7905
Email address	pheglund@uidaho.edu

NPPC Program Measure Number(s) which this project addresses

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

Other planning document references

Short description
Evaluate songbird use of native (Willow-dominated) and non-native (Russian-olive dominated) riparian areas as fall migration stopover areas in the Mid-Columbia River Basin.

Target species
Neotropical migratory songbirds, and North American migratory songbirds.

Section 2. Sorting and evaluation

Subbasin

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	Songbird surveys at six study sites	survey completed
1998	Insect surveys at six study sites	survey completed
1997	Songbird surveys at six study sites	survey completed
1997	Vegetation surveys at six study sites	survey completed

Objectives and tasks

Obj 1,2,3	Objective	Task a,b,c	Task
1	Survey migratory songbird use of Willow and Russian-olive dominated areas.	a	Conduct mist net operations at each study site two times per week, using single- and double-stacked mist nets.
2	Determine if there is a difference in songbird species richness and relative abundance between vegetation types during fall migration.	a	Evaluate songbird species richness from mist net data, and compare between sites and vegetation types using analysis of variance.
2		b	Evaluate songbird relative abundance from mist net data, and compare between sites and vegetation types using analysis of variance.
3	Survey insects in Willow and Russian-olive dominated areas during the fall season.	a	Conduct insect surveys using sticky traps, sweep nets, and limb beating. Count and measure all insects and identify to order.
4	Determine if there is a difference in insect relative abundance between vegetation types during the fall season.	a	Evaluate insect relative abundance from insect trapping data, and compare between vegetation types using analysis of variance.
4		b	Evaluate ordinal richness of insects from insect trapping data, and compare between sites and vegetation types using analysis of variance.
5	Determine if dominant tree species, vegetation density, or relative food availability (insects) are important to migratory songbirds' use of a stopover area during fall migration.	a	Compare songbird relative abundance and species richness with vegetation measures (dominant tree species and vegetation density) using analysis of variance.
5		b	Compare songbird relative abundance and species richness with insect relative abundance and ordinal richness at each study site, using analysis of variance.
6	Relate the study findings to migratory songbird conservation in the area, and suggest management implications and strategies.	a	

Objective schedules and costs

Obj #	Start date mm/yyyy	End date mm/yyyy	Measureable biological objective(s)	Milestone	FY2000 Cost %
1	8/1999	10/2000			40.00%
2	10/1999	12/2000			.05
3	8/1999	10/1999			30.00%
4	10/1999	12/1999			5.00%
5	10/1999	12/1999			10.00%
6	10/1999	12/1999			10.00%
				Total	100.00%

Schedule constraints

Completion date
2000

Section 5. Budget

FY99 project budget (BPA obligated):

FY2000 budget by line item

Item	Note	% of total	FY2000
Personnel	One graduate research assistantship, five research assistants	%60	19,720
Fringe benefits	1% for research assistantship, 13% for research assistants	%5	1757.20
Supplies, materials, non-expendable property	Mist net and insect survey supplies	%5	1500.00
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	Scientific meetings	%3	1,000.00
Indirect costs	Overhead of 20.7% for University of Idaho, and 3.5% for Dept. of	%19	6383.28

	Biological Sciences		
Subcontractor		%0	
Other	Research assistant tuition and fees	%7	2400.00
TOTAL BPA FY2000 BUDGET REQUEST			$32,760

Cost sharing

Organization	Item or service provided	% total project cost (incl. BPA)	Amount ($)
U.S. Fish and Wildlife Service	Three field vehices	%2	875.00
U.S. Fish and Wildlife Service	Housing for six field workers	%5	1,750
U.S. Fish and Wildlife Service	Publication costs	%3	1,000
		%0	0
Total project cost (including BPA portion)			$36,385

Outyear costs

	FY2001	FY02	FY03	FY04
Total budget				

Section 6. References

Watershed?	Reference
☐	Borell, A. E. 1976. Russian-olive for wildlife and other conservation uses. U. S. Dept. of Agric. Leaflet 517. 8 pp.
☐	Brown, C. R. 1990. Avian use of native and exotic riparian habitats on the Snake River, Idaho. Thesis, Department of Fishery and Wildlife Biology, Colorado State University.
☐	Duberstein, C. A., R. D. Sayler, and C. A. Brandt. 1996. Habitat selection by spring migrant passerines in riparian zones of south-central Washington. Unpublished.
☐	Ennor, H. R. 1991. Birds of the Tri-Cities and Vicinity. Lower Columbia Basin Audubon Society, Richland, WA.
☐	Geupel, G. R., D. Hardesty, and G. Ballard. Nov. 1993. Status and distribution of the landbird avifauna along riparian corridors of the Sacramento River NWR: results of the 1993 field season. A report of the Point Reyes Bird Observatory.
☐	Johnson, R.R., L.T. Haight and J.S. Smithson. 1977. Endangered species vs. endangered habitats. Pp.68-79 in R.R. Johnson and D.A. Jones, tech. coords. Importance, preservation and management of riparian habitat. USDA For Serv. Gen. Tech. Rep. RM-43.

☐	Karr, J. R. 1981. Surveying birds with mist nets. Pp. 62-67 in Estimating numbers of terrestrial birds (C.J. Ralph and J.M. Scott, eds.). Studies in Avian Biology 6.
☐	Keast, A. and E. S. Morton (eds.). 1980. Migrants in the Neotropics: ecology, behavior, distribution, and conservation. Smithsonian Institution, Washington, D. C.
☐	Kennedy, P. C., and L. F. Wilson. 1969. Major insect pests in North Dakota shelterbelts: abundance and distribution by climate and host age. U.S. Forest Service Res. Pap. RM (47).
☐	Knopf, F.L. 1985. Significance of riparian vegetation to breeding birds…. Pp. 105-111 in R.R. Johnson, C.D. Ziedell, D.R. Patton, P.S. Folliott and R.H. Hamre, tech. coords. Riparian ecosystems. USDA For. Ser. Gen. Tech. Rep. RM-120.
☐	Knopf, F.L. and T. E. Olson. 1984. Naturalization of Russian-olive: implications to Rocky Mountain wildlife. Wildlife Society Bulletin 12: 289-298.
☐	Knopf, F. L., R. R. Johnson, T. Rich, F. B. Samson, and R. C. Szaro. 1988. Conservation of riparian ecosystems in the United States. Wilson Bulletin 100(2): 272-284.
☐	Kreuper, D.J. 1993. Effects of land use practices on Western Riparian Ecosystems. Pp. 321-330 in Finch, D.M. and P.W. Stangel, eds. Status and Management of Neotropical Migratory Songbirds; 1992 September 21-25; Estes Park, CO. Gen. Tech. Rep. RM-229.
☐	MacArthur, R. H. and A. T. MacArthur. 1974. On the use of mist nets for population studies of birds. Proc. Natl. Acad. Sci. USA 71:3230-3233.
☐	Martin, T. E. and J. R. Karr. 1986. Patch utilization by migrating birds: resource oriented? Ornis Scandinavica 17: 165-174.
☐	Moore, F. R. and W. Yong. 1991. Evidence of food-based competition among passerine migrants during stopover. Behavioral Ecology and Sociobiology 28: 85-90.
☐	Nelson, E., S. Hudson, and K. Moroney. 1997. Migrating and resident songbirds in riparian habitats of the Umatilla National Wildlife Refuge. Unpublished report.
☐	Olson, T. E. and F. L. Knopf. 1986. Naturalization of Russian-olive in the western United States. Western Journal of Applied Forestry 1(3): 65-69.
☐	Ott, R. L. 1993. An Introduction to Statistical Methods and Data Analysis. Wadsworth, Inc., Belmont, CA.
☐	Ralph, C. J. 1981. Age ratios and their possible use in determining autumn routes of passerine migrants. Wilson Bulletin 93: 164-188.
☐	Ralph, C. J., G. R. Geupel, P. Pyle, T. E. Martin, and D. F. DeSante. 1993. Handbook of field methods for monitoring landbirds. Gen. Tech. Rep. PSW-GTR-144. Albany, CA: Pacific Southwest Research Station, Forest Service, U.S. Dept. of Agriculture.
☐	Rappole, J. H. and D. W. Warner. 1976. Relationship between behavior, physiology, and weather in avian transients at a migration stopover site. Oecologia 26: 193-212.

☐	Rappole, J. H., E. S. Morton, T. E. Lovejoy and J. L. Ruos. 1983. Nearctic avian migrants in the Neotropics. U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C.
☐	Remsen, J. V., Jr., and D. A. Good. 1996. Misuse of data from mist-net captures to assess relative abundance in bird populations. The Auk 113(2): 381-398.
☐	Robbins, C. S., J. R. Sauer, R. S. Greenberg, and S. Droege. 1989. Population declines in North American birds that migrate to the tropics. Proc. Natl. Acad. Sci. USA 86: 7658-7662.
☐	Skagen, S. K., C. P. Melcher, W. H. Howe, and F. L. Knopf. Oct. 1996. Comparative use of riparian corridors and oases by migrating birds in southeast Arizona. A report of the Biological Resources Division, USGS.
☐	Southwood, T. R. E. 1966. Pp. 145-146 and 223-242. Ecological Methods. John Wiley and Sons, Inc., New York.
☐	Taylor, D.M., D.F. DeSante, G.R. Geupel, and K. Houghton. 1994. Autumn populations of landbirds along central coastal California 1976-1986. Journal of Field Ornithology 65(2): 169-185.
☐	Weisbrod, A. R., C. J. Burnett, J. G. Turner, and D. W. Warner. 1993. Migrating birds at a stopover site in the Saint Croix River valley. Wilson Bulletin 105(2): 265-284.
☐	Wilson, L. F. 1962. Forest insects and diseases in the Northern Great Plains - a survey. Lake States Forest Experiment Station, U.S. Department of Agriculture, Station Paper No. 101.
☐	Winker, K., D. W. Warner, and A. R. Weisbrod. 1992. Migration of woodland birds at a fragmented inland stopover site. Wilson Bulletin 104(4): 580-598.
☐	

PART II - NARRATIVE

Section 7. Abstract

In the western United States, critical declines in songbirds and other wildlife are due in part to the alteration of riparian habitat in semi-arid regions. Although less than 1% of the arid west is covered by riparian vegetation, riparian areas support more species of songbirds than the surrounding uplands. Riparian ecosystems in the arid west have historically been altered by the construction of dams, agricultural conversions, and invading exotic vegetation. Russian-olive (*Elaeagnus angustifolia*) is an exotic and invasive woody plant, and areas along the Columbia and Snake Rivers support extensive and often monotypic Russian-olive stands. We propose to continue a research and monitoring project to evaluate migratory songbird use of native and non-native vegetation in riparian areas along the Mid-Columbia River during fall migration. Insect and migratory songbird surveys will be conducted at six study sites using mist nets, and sticky traps, sweep nets, and limb beating. Songbird species richness and relative

abundance, insect relative abundance, and vegetation measurements (taken in previous years) will be examined to determine why certain migratory songbird species may be using one vegetation type over another as fall migration stopover sites. This fourth and final year of data collection is important for determining the conservation value of native or non-native riparian vegetation to migratory landbirds along the Mid-Columbia River during fall migration. This study will culminate in a Master's thesis in May of 2000, and submission of at least one scientific paper to a peer-reviewed journal.

Section 8. Project description

a. Technical and/or scientific background

Some populations of migratory songbirds that breed in North America have been declining in recent years, especially birds that winter in Central or South America (neotropical migratory songbirds) (Keast and Morton 1980, Rappole et al. 1983, Robbins et al. 1989). In the western United States, critical declines of songbirds and other wildlife are due, in part, to the alteration of riparian habitat in semi-arid regions (Knopf et al. 1988, Kreuper 1992). Although less than 1% of the arid West is covered by riparian vegetation, riparian areas support more species of songbirds than the surrounding uplands during both the breeding (Knopf 1985, Knopf et al. 1988, Johnson et al. 1977) and migration seasons (Stevens et al. 1977, Knopf et al. 1988).

Riparian ecosystems in the west often exist naturally as narrow belts of vegetation along streams and rivers, and often occur in steppe, shrub-steppe, and desert regions. Native riparian vegetation has historically been altered by the construction of dams, agricultural conversions, grazing, development, and invading exotic vegetation (Knopf et al. 1988, Kreuper 1992). Russian-olive (*Elaeagnus angustifolia*) is an exotic woody plant that has quickly expanded its range throughout the west since the early 1900's (Borell 1976), and sometimes displaces native trees and shrubs such as Willow (*Salix spp*.) and Cottonwood (*Populus spp*.) (Olson and Knopf 1986). Areas along the Columbia and Snake Rivers in Washington, Oregon, and Idaho support extensive and often monotypic Russian-olive stands.

Few scientific studies have examined wildlife use of Russian-olive areas. One study found that along the Snake River in Idaho, native Willow sites had higher bird species richness and density, and more foraging and nesting guilds, than Russian-olive sites during the breeding season (Brown 1990). Knopf and Olson (1984) found that Russian-olive stands along rivers in Utah, Idaho, and Colorado (the Uintah, Snake, and Big Thomson Rivers, respectively) supported avian communities intermediate in species richness and diversity to native riparian and adjacent shrub-steppe communities. Further studies examining wildlife use of Russian-olive areas are needed, and will be useful to wildlife managers in the region.

In addition to bird surveys, two insect surveys in Russian-olive stands conducted in North and South Dakota in the early 1960's indicated that few insects (in both of these cases, insect pests) were found in these trees (Wilson 1962, Kennedy and Wilson 1969). More recent published information on insect abundance in Russian-olive stands does not exist. Since most migratory songbirds are insectivorous to some degree, an implication

of these findings is that Russian-olive areas may not provide a food source for some songbird species.

The importance of riparian areas to songbirds in the arid west during migratory periods has not been well documented. Duberstein et al. (1996) found that songbirds used any of the limited riparian areas available on the Hanford reservation in Washington, regardless of vegetation type. However, Skagen et al. (1993) and Geupel et al. (1993), who conducted songbird surveys in riparian areas of southeastern Arizona and along the Sacramento River, respectively, concluded that native riparian vegetation is most important to migrating songbirds passing through these areas.

Results from a 1997 fall songbird survey on the Umatilla National Wildlife Refuge in central/eastern Washington and Oregon indicated that a native Willow area supported greater songbird species diversity and relative abundance than a riparian area dominated by Russian-olive (Nelson et al. 1997). This single study led to a more extensive examination of the area: additional study sites were added in Willow and Russian-olive dominated riparian areas. From 1997 on, songbird surveys using mist nets have been conducted twice per week at each site from mid-August to mid-October. Weekly insects surveys using sticky traps, sweep nets, and limb beating were carried out during the 1998 season. Preliminary results indicate a higher relative abundance of neotropical migratory birds and insects in Willow over Russian-olive areas; and a higher relative abundance of North American migratory birds in Russian-olive over Willow areas. Tests of significance have not yet been conducted.

Hundreds of thousands of dollars have been spent by wildlife managers in Washington and Oregon both on planting Russian-olive stands to provide wildlife habitat, and on removing Russian-olive stands to restore areas to native vegetation. The value of this study and others like it is to provide wildlife managers with sound information regarding the importance of both Russian-olive and Willow areas to wildlife, so that they can develop cost-effective management plans that meet their wildlife conservation objectives. An additional year of data collection at all six study sites will result in a strong study on the value of native and non-native riparian areas to wildlife managers in the region. A graduate student (Sherry Hudson) will be crew leader on the proposed study and has conducted all previous songbird surveys on the Umatilla National Wildlife Refuge and environs. Dr. Patricia Heglund, the Principal Investigator for the proposed study, has been the Principal Investigator and graduate advisor since 1997.

b. Rationale and significance to Regional Programs

The Umatilla and Cold Springs National Wildlife Refuges were established as mitigation for the wetland areas lost after the installment of the John Day and McNary Dams. Songbird and other wildlife surveys on this and other public land in the area will provide useful mitigation information for the Northwest Power Planning Council's Fish and Wildlife Program to protect, mitigate, and enhance fish and wildlife on the Columbia River and its tributaries, especially because of serious considerations to draw down the John Day Pool. The drawdown of the John Day Pool will eliminate some of the existing riparian areas (with both native and non-native vegetation), and will open up new areas for the growth of riparian vegetation. Understanding the relative value of native and non-

native riparian vegetation to wildlife will assist wildlife managers in formulating management plans for these areas, and will help to make mitigation decisions.

c. Relationships to other projects

This study may provide important information for wetland improvement, establishment, and management. It is a study being done in collaboration with the Mid-Columbia River National Wildlife Refuges Complex (U.S. Fish and Wildlife Service).

d. Project history (for ongoing projects)

This study is in the fourth and final year of an ongoing effort to examine the use of riparian areas in the Mid-Columbia River Basin by migratory birds in the fall. This has not been a BPA funded project in the past.

e. Proposal objectives

The objectives of this project are to:

1. Survey migratory songbird use of Willow and Russian-olive dominated areas.

2. Determine if there is a difference in songbird species richness (number of species found in an area) and relative abundance (number of birds per sampling effort) between Willow and Russian-olive dominated areas during fall migration.

3. Survey insects (a main food source for neotropical migratory birds) in Willow and Russian-olive dominated areas during the fall season.

4. Determine if there is a difference in insect relative abundance (potential food source for neotropical migratory landbirds) between Willow and Russian-olive dominated areas during the fall season.

5. Determine if dominant tree species, vegetation density, or relative food availability are important to migratory songbird use of a stopover site during fall migration.

6. Relate the findings of this study to migratory songbird conservation in the area, and suggest management implications and strategies for wildlife managers in the area.

The study's null hypotheses are that there is no significant difference in songbird relative and species richness, or insect relative abundance, between the Willow and Russian-olive dominated areas. I will fail to reject the null hypothesis if there is no significant difference in songbird relative abundance, for all species combined and for each species, between these two vegetation types; if there is no significant difference in songbird species diversity between vegetation types; and if there is no significant

difference in insect relative abundance between vegetation types. Another reason we would fail to reject the null hypothesis is that riparian habitat in the study area is so limited that birds use all riparian areas indiscriminantly. Also, if vegetation structure in each of the study sites is similar and birds use different shrub/tree species based on structure alone, we will fail to reject the null hypothesis.

f. Methods

Study area

This study will be conducted in riparian areas of the Mid-Columbia River Basin between Arlington and Hermiston, Oregon. This area of Washington and Oregon is very dry, with 17-20 cm of rain annually. Historically this area was dominated by shrub-steppe habitat, with typically narrow (less than 30 meters) riparian strips along waterways. It is now primarily agricultural, with isolated pockets of shrub-steppe upland and narrow, isolated patches of riparian vegetation along the Columba River and adjacent sloughs, creeks and rivers, and reservoirs. The John Day and McNary dams are hydropower-generating structures in the study area, and were constructed in 1968 and 1955, respectively. Water levels in the proposed study area fluctuate seasonally and are controlled by the Army Corps of Engineers and the Bureau of Reclamation.

Six study sites have been chosen in two riparian vegetation types: three in areas dominated by Willow (*Salix spp*.) and three in areas dominated by Russian-olive (*Elaeagnus angustifolia*). One Willow and one Russian-olive site were chosen from the three largest riparian patches available in the area, and each of these patches contain both vegetation types. These three areas are: a) Willow Creek Wildlife Area (119° 55' lat., 45° 48' long.) in Oregon; b) Cold Springs National Wildlife Refuge (119° 10' lat., 45° 50' long.) in Oregon; and c) the McCormack (119° 35' lat., 45° 55' long.) and Paterson (119° 35' lat., 45° 56' long.) Units of the Umatilla National Wildlife Refuge, in Oregon and Washington, respectively. This setup allows for the greatest similarity between sites in each area, in terms of topography, proximity to water and water type (river or reservoir), and adjacent upland habitat. The Willow and Russian-olive sites in each area are located at least one kilometer apart, to increase the probability of independence between sites, and each of the three areas are at least 30 kilometers apart. All six study sites are similar in size (5-10 hectares), less than 100 meters in elevation, and within one kilometer of water (river or reservoir). Although the two dominant vegetation types sometimes occur mixed together, a majority of the woody vegetation at each of the six study sites consists of Willow or Russian-olive, with at least 75% of the woody vegetation within a 25 meter radius of each mist net comprised of that site's indicative species. All sites were chosen for similarity in plant structure and height. All adjacent uplands are dominated by agriculture/farms and shrub-steppe habitat.

Vegetation was described and vegetation measurements were taken at each site in previous years (fall of 1997 and 1998). At each site, measurements included: percent cover of tree, shrub, ground, litter, and water categories in 25 meter radius circles around each mist net center point, and at four randomly chosen points; identification of dominant tree, shrub, and herb species; placement of trees (woody plants over 5 meters) in height

and dbh classes; placement of shrubs (woody plants up to 5 meters, and all Russian-olive and Willow) in height classes; and shrub stem counts.

Observer training

All research assistants will have previous training in bird identification and bird banding skills. At the beginning of each season, assistants will spend one week in training which will include animal care and use protocol, bird identification by sight and sound, standardization of captive bird measurements, insect collection and identification methods, and sound field data collection techiques. Training will be provided by Sherry Hudson, a University of Idaho Masters degree candidate. Ms. Hudson will also be the crew leader (and participant) during the field season. Ms. Hudson has successfully completed Animal Care and Use training from the University of Idaho, and this project has received approval from the University's Animal Care and Use Committee.

Bird surveys

An array of nine single-stacked and two double-stacked mist nets have been established at each of the six study sites, so that all nets can be checked within 20-30 minutes. Mist net and banding procedures will follow those described by Ralph et al. (1993). In summary, nets will be opened starting at 15 minutes after local sunrise and operated for six hours thereafter. All birds captured will be banded with a U.S. Fish and Wildlife Service band, processed, and released. Processing involves recording species, age, sex, breeding condition, fat, weight, molt, and wing length.

Data from mist net captures at two of the four sites in operation from 1996 – 1998 indicate that the peak of fall migration in this area is in early September (Nelson et al. 1997). Mist nets at each site will be operated twice per week, on non-consecutive days, weather permitting, from approximately the third week in August to the first or second week in October. Mist net operations will occur at each site about 14 times during the fall migration season. The ending date will be dictated by the opening of waterfowl and upland gamebird hunting, usually in the first two weeks of October.

Advantages to using mist nets is that they do not rely on the identification skills of human observers, so observer biases are decreased (Karr 1981, Remsen and Good 1996). Mist nets allow for 'detection' of secretive or rarely vocal species (Karr 1981, Ralph 1981, Martin and Karr 1986), which is especially useful in the fall. Mist nets also allow for physical examination of a bird to dermine such factors as sex and age identification, and condition of energy reserves (by relative amounts of subcutaneous fat deposits), factors that would difficult or impossible to identify in the field during fall migration (Ralph et al. 1993). Overall, mist net captures can provide information on bird species composition and relative abundance among sites (Winker et al. 1992, Ralph et al. 1993, Weisbrod et al. 1993).

Disadvantages and biases of mist nets do exist and must be taken into consideration. One bias is that mist nets only sample certain vertical regions (single mist nets: from 0 – 2.5 meters) of the vegetation in the area. Because of this bias, areas that are similar but that have different canopy heights are sampled unequally by mist nets, making comparisons among habitats (especially relative abundance) difficult (Winker et al. 1992, Remsen and Good 1996). When comparisons among habitats are made using

mist net data, habitat variables such as canopy height and vegetation density must be controlled for, if possible (Remsen and Good 1996). All of our study sites were chosen based on similarities in plant structure, including shrub height and density. Vegetation measurements around each mist net have shown that over 75% of woody vegetation is characteristic of that site (Willow or Russian-olive). We have also established two stacked mist nets at each site, to survey birds up to approximately five meters.

Another mist net bias is that birds may learn to avoid nets (MacArthur and MacArthur 1974). The limited amount of time spent by migratory birds at stopover sites (1-6 days: Rappole and Warner 1976, Moore and Yong 1991) decreases the chance of this bias. In addition, adverse weather may affect mist net capture rates (Taylor et al. 1994). This will be controlled for by ceasing to operate nets on days of rain, high winds (over 15 mph), or extreme temperatures.

Results from mist net captures will be used to calculate songbird relative abundance (birds per sampling effort), species diversity (total species detected), and age ratios (young vs. adults) at each site, and will be examined for significant differences between the Willow and Russian-olive dominated sites. Analysis of variance (Ott 1993) will be used to test for significant differences among sites, between vegetation types, and over time (by week). For individual species that occur statistically more often in one cover type over another, songbird species ecology and insect relative abundance at each site will be used to try to understand why those species are found more abundantly in that vegetation type.

Insect surveys

A survey of insects at each study site will help determine the importance of that site and vegetation type as a food source for the insectivorous migratory bird species. Many of the migratory songbird species found in the study area during fall migration, such as sparrows and warblers, are insectivorous to some degree.

Insects will be surveyed by collecting them in sticky traps, sweep nets, and limb beating trays (Southwood 1966). Each of these three methods will be employed once per week. Therefore, each of the three insect survey methods will take place seven times throughout the season.

Sweep net and limb beating surveys will be employed at five evenly spaced plots within each study site. For sweep net surveys, a 0.5 meter radius insect net mounted on a pole is swept five times along the outer branches of a Willow or Russian-olive shrub species near the survey plot centerpoint. The pole will be one meter long and will sample heights of 1.5 – 2.5 meters for insects. The insects captured are emptied into a container for later identification (Southwood 1966; Drs. Eigenbrode and Johnson, University of Idaho professors of Entymology, pers. comm.). For limb beating surveys, a 1-meter squared collapsible canvas tray is held under a branch (at shoulder/head height), and the branch is hit hard (hard enough to potentially damage the branch) five times in succession. The branch will be indicative of that site (Willow or Russian-olive). The insects captured are emptied into a container for later identification. (Southwood 1966; Drs. Eigenbrode and Johnson, University of Idaho professors of Entymology, pers. comm.). In the lab, insects collected from limb beating and sweep netting are counted, measured to the nearest millimeter, and identified to order. Sweep net surveys and limb beating will be carried out weekly at each site on a day when mist nets are not in

operation. Each site will be sampled within six hours after sunrise, the same time period as the bird surveys.

Sticky traps will be left at three evenly spaced points within each study site for 6-7 hours once per week. This will occur on mist net operation days, but sticky trap points are not on the main mist net trail so as not to flush insects into the sticky traps. Each sticky trap consists of a 2X3 foot rectangle of 1/8th inch hardware cloth covered with Tanglefoot™ sticky substance, and is hung by a wire in a Willow or Russian-olive shrub at 1.5 to 3.0 meters high (at center). Sticky traps are hung before mist nets are opened, and removed after mist net operations are finished. At removal, sticky traps are covered with plastic wrap. Later in the laboratory, insects are plucked from traps and counted, measured to the nearest millimeter, and identified to order.

Limb beating, sweep net, and sticky trap surveys are relative methods of insect sampling. Assumptions are that all or most of the insects present in the survey area will be captured; and that at least some of the insects we capture are used as food by insectivorous migratory songbirds. All three sampling methods are recommended by Southwood (1966) and by two Entymology professors at the University of Idaho (Drs. Eigenbrode and Johnson), especially when doing comparison studies, and because they provide a high return at low cost. Previous data collected at the study sites have shown that some of the most commonly detected migratory songbird species are insectictivores that feed mainly on aphids (Homoptera), gnats and flies (Diptera), and spiders (Arachnida), and that feed by foliage gleaning as one of their primary feeding behaviors (Ennor 1991). Therefore, sampling insects from limbs and leaves (sweep nets and limb beating) and from the air (sticky traps) will capture many insects that serve as potential food sources for songbirds.

Relative insect densities for each order of insect will be compared among sites and between vegetation types. Analysis of variance will be used to test for significant differences in insect relative abundance and ordinal richness at each site. Ultimately relative insect abundances of insect orders commonly fed on by songbirds will be examined, to attempt to determine why certain species of songbirds may be found more abundantly in one vegetation type over another during fall migration stopovers.

g. Facilities and equipment

The mist net surveys will require approximately 37 mist nets (3 meter high x 12 meter long, 30 mm x 30 mm mesh), and electrical conduit and rebar on which to mount them. Insect surveys will require three sweep nets, three limb beating trays, about 15 2x3foot pieces of 1/8th inch hardware cloth, and 6 quart cans of Tanglefoot™ sticky substance, and sufficient glass vials in which to store the insects. This equipment is already available to our project except for the Tanglefoot sticky substance, extra electrical conduit and rebar to replace bent or broken ones, and extra hardware cloth. U.S. Fish and Wildlife Service bird bands, and a bird banding subpermit, will be supplied by the Point Reyes Bird Observatory (Stinson Beach, California).

This project will also require three vehicles to be used in the field, and housing and hourly stipends for five field assistants from August to October, 1999. The crew supervisor will require housing from August to December, 1999, and a monthly stipend from July to December (6 months). This stipend is required because the crew supervisor

will be a graduate student at the University of Idaho and this will be considered a Research Assistantship for fall semester. Overhead cost for the University of Idaho is also required.

h. Budget

If funding for the stipends to be paid to the field assistants, graduate research assistantship, supplies, and travel are provided by BPA, the USFWS has agreed to supply vehicles, housing, and publication fees. The graduate research assistantship stipend is for 24 weeks, 40 hours per week, at $7 per hour, with fringe benefits of 1%. Stipends for five field assistants is $6.50 per hour for 10 weeks, 40 hours per week, with 13% fringe benefits. Supplies include mist net and insect trapping equipment, at $1500. Travel to scientific meetings is $1000. University of Idaho overhead costs are 20.7%, and Department of Biological Sciences overhead costs are 3.5%. Research Assistant tuition and fees are $2400.

Section 9. Key personnel

Dr. Patricia Joanne Heglund

EDUCATION

Ph.D. 1992. Fisheries and Wildlife, University of Missouri, Columbia, Missouri. Dissertation entitled: Patterns of wetland use among aquatic birds in the interior boreal forest region of Alaska.

M.S. 1988. Fisheries and Wildlife, University of Missouri, Columbia, Missouri. Thesis entitled: Relations between waterbird use and the limnological characteristics of wetlands on Yukon Flats National Wildlife Refuge Alaska.

B.S. 1979. Wildlife, University of Minnesota, St. Paul, Minnesota. Undergraduate thesis entitled: The flora and fauna of the Coppermine River region, Northwest Territories, Canada.

AREAS OF EXPERTISE

Avian ecology, landscape ecology, conservation biology, endangered species, wetland ecology.

EMPLOYMENT

August 1994 - current: Research Faculty/Visiting Faculty, Idaho Cooperative Fish and Wildlife Research Unit, and the Departments of Biological Sciences and Fish and Wildlife Resources, University of Idaho, Moscow, Idaho.

January 1994-present: President and Senior Ecologist, Turnstone Ecological Research Associates, Ltd., Moscow, Idaho. January 1994-present: President and Senior Ecologist, Turnstone Ecological Research Associates, Ltd., Moscow, Idaho.

January - May 1995: Adjunct Associate Professor, Division of Natural Sciences, Lewis-Clark State College, Lewiston, Idaho. Course taught: Ornithology (for 20 college seniors).

August 1987-December 1993: Research Biologist, National Biological Survey, Alaska Fish and Wildlife Research Center, Anchorage Alaska.

1984-1992: Teaching Assistant/Instructor and Graduate Research Assistant, School of Natural Resources, University of Missouri, Columbia, Missouri. Courses taught: Limnology, Wetland Ecology; teaching assistant for Limnology. M.S. degree issued August 1988. Ph.D. granted May 1992.

1982-1984: Project Leader and Biological Technician, U.S. Fish and Wildlife Service, Ecological Services, Anchorage, Alaska.

1982-1984: Project Leader and Biological Technician, U.S. Fish and Wildlife Service, Ecological Services, Anchorage, Alaska.

1981-1982: Fish and Game Technician III, Alaska Department of Fish and Game, Limnology Section, Fisheries Research and Enhancement Division, Soldotna, Alaska1981-1982: Fish and Game Technician III, Alaska Department of Fish and Game, Limnology Section, Fisheries Research and Enhancement Division, Soldotna, Alaska.

1981: Biological Technician, U.S. Forest Service, Tongass National Forest, Wrangell, Alaska.

1980-1981: Biologist, U.S. Fish and Wildlife Service, Alaska Maritime National Wildlife Refuge, Adak and Amchitka Islands, Alaska.

1980-1981: Biologist, U.S. Fish and Wildlife Service, Alaska Maritime National Wildlife Refuge, Adak and Amchitka Islands, Alaska.

1977-1980: Museum Assistant, James Ford Bell Museum of Natural History, University of Minnesota, Minneapolis, Minnesota.

1976: Undergraduate Teaching Assistant, German Department, University of Minnesota, Minneapolis, Minnesota.

1976: Undergraduate Teaching Assistant, German Department, University of Minnesota, Minneapolis, Minnesota.

HONORS AND AWARDS

Selected for National Academy of Sciences Young Investigator Program on Agricultural Impacts on Water Quality in Latvia and Lithuania (selected as program ornithologist/wetland ecologist), 1994 and 1995.

Received Performance Award, U.S. Fish and Wildlife Service, Anchorage, Alaska, 1993

Received Performance Award, U.S. Fish and Wildlife Service, Anchorage, Alaska, 1992

Academic Enrichment Honors Program, University of Minnesota, St. Paul, MN, 1979

National Honor Society, 1975.

HONORS AND AWARDS

Selected for National Academy of Sciences Young Investigator Program on Agricultural Impacts on Water Quality in Latvia and Lithuania (selected as program ornithologist/wetland ecologist), 1994 and 1995.

Received Performance Award, U.S. Fish and Wildlife Service, Anchorage, Alaska, 1993

Received Performance Award, U.S. Fish and Wildlife Service, Anchorage, Alaska, 1992

Academic Enrichment Honors Program, University of Minnesota, St. Paul, MN, 1979

PATRICIA JOANNE HEGLUND

Department of Biological Sciences
University of Idaho
Moscow, Idaho 83844
208-885-2665
208-883-8027
E-mail: pheglund@uidaho.edu

EDUCATION

Ph.D. 1992. Fisheries and Wildlife, University of Missouri, Columbia, Missouri. Dissertation entitled: Patterns of wetland use among aquatic birds in the interior boreal forest region of Alaska.

M.S. 1988. Fisheries and Wildlife, University of Missouri, Columbia, Missouri. Thesis entitled: Relations between waterbird use and the limnological characteristics of wetlands on Yukon Flats National Wildlife Refuge Alaska.

B.S. 1979. Wildlife, University of Minnesota, St. Paul, Minnesota. Undergraduate thesis entitled: The flora and fauna of the Coppermine River region, Northwest Territories, Canada.

AREAS OF EXPERTISE

Avian ecology, landscape ecology, conservation biology, endangered species, wetland ecology.

EMPLOYMENT

August 1994 - current: Research Faculty/Visiting Faculty, Idaho Cooperative Fish and Wildlife Research Unit, and the Departments of Biological Sciences and Fish and Wildlife Resources, University of Idaho, Moscow, Idaho.

Instructor for courses in Mammalogy, Ornithology, Wildlife Ecology and Management I, Introduction to Fish and Wildlife Ecology, Advanced Avian Ecology, and General Biology. During my tenure with the Idaho Cooperative Fish and Wildlife Research Unit, my primary responsibility has been to conduct research on avian habitat relation models. I currently serve as the principal investigator on several studies including: 1) the reliability of predicted wildlife distributions across a variety of scales (stand level to landscape to ecoregion) using geographic information systems; 2) the examination of predator-prey interactions in relation to songbird nest survival; 3) a study of land use patterns (grazing and timber management vs. timber management only) in relation to songbird nest productivity; 4) an examination of changes in avifauna as center-pivot irrigated cropland is converted to hybrid cottonwood forests in the shrub-steppe region of north-central Oregon; 5) determination of adult-juvenile songbird survival ratios in early successional forests; and 6) examination of observer bias during point count surveys. I was also assigned to the steering committee for a national workshop on wildlife monitoring programs and I am currently the lead author for a monograph assessing large scale monitoring programs. I am now working on the development of a symposium scheduled for October 1999 on wildlife habitat relation modeling: issues of scale and accuracy. I briefly functioned as National Coordinator for Aquatic Gap Analysis Program (1995-1996). I currently serve as major professor to three Master of Science candidates and on the advisory committees for three Ph.D. and four Master of Science students. I am assistant editor (wildlife) for the journal Northwest Science and serve as a reviewer for The American Naturalist, Biological Conservation, Auk, and as a National Science Foundation and National Academy of Science panel member.

January 1994-present: President and Senior Ecologist, Turnstone Ecological Research Associates, Ltd., Moscow, Idaho.

As chief administrator and program director, I oversee an annual budget of about $200,000. I am responsible for the development of grant proposals, the administration of grants and the management and direction of all biological programs for the company. My responsibilities include the hiring, training and supervision of two permanent biologists and 14 temporary employees working on a variety of research projects. These projects include: 1) Songbird use in relation to forest structure and landscape patterns; 2) Forest songbird monitoring in USDA-Forest Service Region 1; 3) Avian nest success in early successional forest landscapes; 4) Influence of land use patterns on juvenile survival rates of forest songbirds; 5) Investigation of predator assemblages in relation to forest management practices; 6) Distribution and abundance of reptiles and amphibians in managed landscapes. For these programs, we work across industrial (private), federal, and state forest lands and in wilderness areas (Selway-Bitteroot). It is my responsibility to set deadlines for projects and all resulting products. I encourage the development and submission of manuscripts for publication in peer-reviewed journals from the staff and have established a network of in-house and external reviewers for preliminary critiques of all manuscripts. As part of our service to the community we host local seminars and allow members of the public to participate in research activities such as in the operation of bird banding stations. At the request of the forest products industry, we have worked extensively with the local and regional press to demonstrate and describe our field efforts. Through my research I have acquired large data sets from the northern Rocky Mountain region (MT, ND, ID), Washington, Oregon, and Idaho. Cooperators include Potlatch Corporation, Boise Cascade, U.S. Forest Service, U.S. Fish and Wildlife Service, Idaho Department of Fish and Game, Partners-in-Flight, National Fish and Wildlife Foundation, Sustainable Ecosystems Institute, and the University of Idaho for use in the development of landscape models.

January - May 1995: Adjunct Associate Professor, Division of Natural Sciences, Lewis-Clark State College, Lewiston, Idaho. Course taught: Ornithology (for 20 college seniors).

August 1987-December 1993: Research Biologist, National Biological Survey, Alaska Fish and Wildlife Research Center, Anchorage Alaska.

Prior to my position at the University of Idaho, I was the principal investigator on a project to examine the ecology and genetic variation of the threatened Spectacled Eider. This study was conducted along the Indigirka River Delta, Sahka, Russia. I supervised all aspects of the research, selected, supervised and trained employees, coordinated efforts with Russian and American scientists, and worked in collaboration with the project leader for the American eider research program (project duration: 1993-1996). Through this work, I conducted Section 7 (ESA) reviews, served as an ad hoc scientific advisor to the Spectacled Eider Recovery Team, developed the sampling design and protocol, established a working relationship with our Russian colleagues, and secured and administered all the required permits for tissue sampling and specimen importation. We are currently in the process of examining tissue samples collected from museum specimens (30 to 120 years old) and comparing their genetic structure with tissues collected from live specimens across the breeding range. We are interested in whether the global population of eiders has undergone a population bottleneck or not, or if there are any local populations of concern. I was also principal investigator on a seven year study of wetland habitat use by water birds on Yukon Flats National Wildlife Refuge. I also was part of a team of scientists studying the breeding ecology and habitat use of northern pintails and spectacled eiders on the Yukon-Kuskokwim Delta, Alaska and I served as an observer during annual aerial waterfowl surveys across Alaska. Because of my strong background in wetland functions, processes, wetland-wildlife interactions, and statistics, I was regularly consulted on the development of monitoring programs, evaluating ecosystems, and data analysis.

In addition to my own projects, I was assisted the neotropical migratory bird program biologists with the development of their habitat evaluation protocol and for assisted in operating banding stations. I was assigned to several work groups within the Center for the purpose of developing new research programs and study proposals. These work groups included: Migration studies, Global climate change studies, and Resource selection studies. Prior to my main assignments on pintails and eiders, I completed a doctoral degree by working in collaboration with the Alaska Fish and Wildlife Research Center and the University of Missouri Cooperative Fish and Wildlife Research Unit. The work involved designing and conducting a program aimed at the development of a regional classification for interior Alaskan wetlands, the development of environmental models for estimating aquatic bird habitat use and the development of models for the evaluation of wetland quality in relation to use by birds (project duration: 1988-1992). I examined relations among aquatic bird use and productivity with wetland physical, chemical and structural characteristics. I conducted aerial photo-missions to obtain medium altitude photography for computer enhanced (GIS) habitat mapping and pattern recognition modeling. I served as the Center's vegetation ecologist with skills in terrestrial and aquatic plant identification, collection taxonomy, and habitat sampling. Among my final acts with NBS
included an assignment to a very contentious interagency committee for the design of new office space and my team was successful in securing approval of our design for the Migratory Bird Branch offices.

1984-1992: Teaching Assistant/Instructor and Graduate Research Assistant, School of Natural Resources, University of Missouri, Columbia, Missouri. Courses taught: Limnology, Wetland Ecology; teaching assistant for Limnology. M.S. degree issued August 1988. Ph.D. granted May 1992.

My graduate research program focused on the examination of the nutrient dynamics and productivity of aquatic ecosystems in the interior boreal forest region of Alaska. I used this information to develop predictive models of avian use over a variety of wetland types. In addition, I examined changes in lake trophic conditions following major wildfires in surrounding uplands and supported my conclusions with experimental evidence. Other responsibilities included serving as instructor for Limnology and serving as a teaching assistant for Wetland Ecology and Limnology. All fieldwork was conducted under extremely remote conditions and access to sample sites was via float plane or backpacking in to an area. I learned to improvise and developed a number of techniques for conducting laboratory analyses in the field and for storing samples until additional laboratory processing under controlled conditions could occur.

While at the University of Missouri, I successfully completed additional course work in environmental law through the University law school and in endangered species management through course work in the Department of Forestry, Fisheries and Wildlife. I studied conservation biology and population modeling through course work at Montana State University. I am well versed in the Endangered Species Act and its amendments. I am familiar with the legal processes resulting from the Act, listing protocol for endangered species, and the development of recovery plans.

In addition to my Ph.D. research, I developed a proposal, study plan, and field protocol for an examination of the role fire plays in the trophic status, structure, and vegetational composition of boreal wetlands (project duration: 1987-1990). This research required me to develop a strong background in regard to trophic interactions within and among terrestrial and aquatic ecosystems and fire ecology. It also required an understanding of the interagency fire management groups goals and functions. I worked with personnel from the Bureau of Land Management-Alaska Fire Service (BLM-AFS), BLM-Boise Interagency Fire Center, State of Alaska, and the Fish and Wildlife Service on a daily basis. I coordinated and updated field efforts with fire line personnel to assure safety and that study plans were followed.

1982-1984: Project Leader and Biological Technician, U.S. Fish and Wildlife Service, Ecological Services, Anchorage, Alaska.

I was hired as a biological technician on a project to investigate avian assemblages and habitat use along the Stikine River and its adjacent estuary, southeast Alaska. After one year, I was promoted to project leader. The Stikine River and its estuary provide critical habitat for wintering, migrating and breeding birds. Focus was on the identification of important wintering habitats seabirds, breeding habitats for riparian (cottonwood gallery forests) breeding songbirds and foraging habitats for migrating shorebirds, bald eagles, and waterfowl. I conducted nearly 1000 hours of aerial survey work during this study.

1981-1982: Fish and Game Technician III, Alaska Department of Fish and Game, Limnology Section, Fisheries Research and Enhancement Division, Soldotna, Alaska.

Conducted bioassays for examining rates of carbon uptake and nutrient analyses and along with analyses for trace elements on waters from lakes with high salmon production.

1981: Biological Technician, U.S. Forest Service, Tongass National Forest, Wrangell, Alaska.

I was responsible for conducting all aerial tracking of radio collared moose for a study of their habitat use and availability along the Stikine River corridor in southeast Alaska. I assisted forest hydrologists with studies of streambed quality.

1980-1981: Biologist, U.S. Fish and Wildlife Service, Alaska Maritime National Wildlife Refuge, Adak and Amchitka Islands, Alaska.

I worked for the Aleutian Canada Goose recovery team on a captive rearing and transplant program. I was also responsible for conducting regular seabird and marine mammal surveys. I designed and conducted a study on the movements, productivity and survival of bald eagles. I assisted with a study of Caribou movements and body condition on Adak Island in the winter of 1980. I conducted ground observations and collected tissue samples from live and dead animals.

1977-1980: Museum Assistant, James Ford Bell Museum of Natural History, University of Minnesota, Minneapolis, Minnesota.

I worked assistant museum curator and prepared and catalogued bird and mammal specimens for the public and private research collections.

1976: Undergraduate Teaching Assistant, German Department, University of Minnesota, Minneapolis, Minnesota.

I tutored first year students in German and administered weekly exams.

GRANTS

1999: An assessment of avian population viability in forested landscapes of the Inland Pacific Northwest: effects of habitat fragmentation by agriculture and silviculture. Joint proposal with Sustainable Ecosystems Institute, Meridian, Idaho for a challenge grant from Potlatch Corporation, Boise Cascade, Plum Creek Timber Company, and the National Fish and Wildlife Foundation. **$279,000**. Additional funds for this project have been requested from U.S. Fish and Wildlife- region 1, **$20,000 (pending approval)**, and from Potlatch Corporation, $**45,000 (pending approval).**

1998: Avian use in relation to vegetation structure of hybrid cottonwood stands managed for commercial fiber production. Potlatch Corporation and Boise Cascade. **$14,662.32.**
Examination of avian use of native and non-native riparian zones along the Mid-Columbia River. Mid-Columbia River Refuge Complex. **$16,000.**
An assessment of avian population viability in forested landscapes of the Inland Pacific Northwest: effects of habitat fragmentation by agriculture and silviculture. Join proposal with Sustainable Ecosystems Institute, Meridian, Idaho for a challenge grant from Potlatch Corporation, Boise Cascade, Plum Creek Timber Company, and the National Fish and Wildlife Foundation. **$222,400.**
Landbird habitat use of managed forests in Northern Idaho. Challenge grant: National Fish and Wildlife Foundation and Potlatch Corporation for **$90,000**.

1997: Avian use in relation to vegetation structure of hybrid cottonwood stands managed for commercial fiber production. Potlatch Corporation and Boise Cascade. **$14,662.32.**
An assessment of avian population viability in forested landscapes of the Inland Pacific Northwest: effects of habitat fragmentation by agriculture and silviculture. Join proposal with Sustainable Ecosystems Institute, Meridian, Idaho for a challenge grant from Potlatch Corporation, Boise Cascade, Plum Creek Timber Company, and the National Fish and Wildlife Foundation. **$222,400.**
Examination of avian use of native and non-native riparian zones along the Mid-Columbia River. Mid-Columbia River Refuge Complex. **$16,000.**
Landbird habitat use of managed forests in Northern Idaho. Challenge grant: National Fish and Wildlife Foundation and Potlatch Corporation for **$95,000**.

1996: Landbird habitat use of managed forests in Northern Idaho. Challenge grant: National Fish and Wildlife Foundation and Potlatch Corporation for **$95,000**.
Avian use in relation to vegetation structure of hybrid cottonwood stands managed for commercial fiber production. Potlatch Corporation and Boise Cascade. **$15,513.**

1995: Avian use in relation to vegetation structure of hybrid cottonwood stands managed for commercial fiber production. Potlatch Corporation and Boise Cascade. **$15,513**.

1995: Development of habitat models for migratory landbirds in managed forests. Potlatch Corporation. **$28,000.**

1995-1996: Landbird monitoring (ID) on private lands. National Fish and Wildlife Foundation and Potlatch Corporation. **$62,000.**

1994-1995: Landbird monitoring (ID) on private lands. National Fish and Wildlife Foundation and Potlatch Corporation. **$28,000.**

1994-1995: Status of Pacific loons in Canada. Canadian Wildlife Service. **$1,000.**

1984-1988: Wetland types and their use by aquatic birds in the Yukon Flats NWR. US Fish and Wildlife Service. **$50,000.** Use of GIS in the development of aquatic bird habitat use models. University of Missouri Agricultural Experiment Station. **$12,000.**

HONORS AND AWARDS

Selected for National Academy of Sciences Young Investigator Program on Agricultural Impacts on Water Quality in Latvia and Lithuania (selected as program ornithologist/wetland ecologist), 1994 and 1995.
Received Performance Award, U.S. Fish and Wildlife Service, Anchorage, Alaska, 1993
Received Performance Award, U.S. Fish and Wildlife Service, Anchorage, Alaska, 1992
Academic Enrichment Honors Program, University of Minnesota, St. Paul, MN, 1979

(Start Section 9. Key Personnel here)

Dr. Patricia J. Heglund, Research Faculty
Department of Biological Sciences, University of Idaho

EDUCATION

Ph.D. 1992. Fisheries and Wildlife, University of Missouri, Columbia, Missouri. Dissertation entitled: Patterns of wetland use among aquatic birds in the interior boreal forest region of Alaska.
M.S. 1988. Fisheries and Wildlife, University of Missouri, Columbia, Missouri. Thesis entitled: Relations between waterbird use and the limnological characteristics of wetlands on Yukon Flats National Wildlife Refuge, Alaska
B.S. 1979. Wildlife, University of Minnesota, St. Paul, Minnesota. Undergraduate thesis entitled: The flora and fauna of the Coppermine River region, Northwest Territories, Canada.

PROJECT DUTIES

Principal Investigator. Assistance in research objectives and methods, and written reports. Major Professor for graduate student working on this study.

AREAS OF EXPERTISE

Avian ecology, landscape ecology, conservation biology, endangered species, wetland ecology.

EMPLOYMENT

- August 1994 – current: Research Faculty/Visiting Faculty, Idaho Cooperative Fish and Wildlife Research Unit, and the Departments of Biological Sciences and Fish and Wildlife Resources, University of Idaho, Moscow, Idaho.
- January 1994 – present: President and Senior Ecologist, Turnstone Ecological Research Associates, Ltd., Moscow, Idaho.
- January – May 1995: Adjunct Associate Professor, Division of Natural Sciences, Lewis-Clark State College, Lewiston, Idaho. Course taught: Ornithology (for 20 college seniors).
- August 1987 – December 1993: Research Biologist, National Biological Survey, Alaska Fish and Wildlife Research Center, Anchorage, Alaska.
- 1984 – 1992: Teaching Assistant/Instructor and Graduate Research Assistant, School of Natural Resources, University of Missouri, Columbia, Missouri. Courses taught: Limnology, Wetland Ecology; teaching assistant for Limnology. M.S. degree issued in August 1988. Ph.D. granted May 1992
- 1982-1984: Project Leader and Biological Technician, U.S. Fish and Wildlife Service, Ecological Services, Anchorage, Alaska.
- 1981-1982: Fish and Game Technician III, Alaska Department of Fish and Game, Limnology Section, Fisheries Research and Enhancement Division, Soldotna, Alaska.
- 1981: Biological Technician, U.S. Forest Service, Tongass National Forest, Wrangell, Alaska.
- 1980 – 1981: Biologist, U.S. Fish and Wildlife Service, Alaska Maritime National Wildlife Refuge, Adak and Amchitka Islands, Alaska.

HONORS AND AWARDS

Selected for National Academy of Sciences Young Investigator Program on Agricultural Impacts on Water Quality in Latvia and Lithuania (selected as program ornithologist/wetland ecologist), 1994, 1995.
Received Performance Award, U.S. Fish and Wildlife Service, Anchorage, Alaska, 1993.
Received Performance Award, U.S. Fish and Wildlife Service, Anchorage, Alaska, 1992.

Academic Enrichment Honors Program, University of Minnesota, St. Paul, MN, 1979.
National Honor Society, 1975.

PUBLICATIONS

Karl, J., N. Wright, P.J. Heglund, and J.M. Scott. ***In press.***. Obtaining environmental measures for use in development of wildlife habitat relation models. Wildl. Monogr. 00:000-000.

Heglund, P.J. ***In press***. Range extensions of seven vascular plant species for the Yukon-Alaska Region. Can. Field Nat. 00:000-000.

Heglund, P.J., J.R. Jones, L.K. Lohman. Submitted. Experimental evidence for nutrient limitation in 15 boreal wetlands: nitrogen, phosphorus, and the regulation of lake trophic status. Canadian J. Fish. And Aquatic Science.

Karl, J.W., Heglund, P.J., E.O. Garton, J.M. Scott, N.M. Wright, and R. Hutto. Submitted. Sensitivity analysis of wildlife habitat relationship model performance. Ecological Applications 00:000-000.

Nichols, J.D., J.E. Hines, J.R. Sauer, J. Fallon, F. Fallon, and P.J. Heglund. Submitted. A double-observer approach for estimating detection probability and abundance from avian point counts. Auk 00:000-000.

Grand, J.B., P.L. Flint, and P.J. Heglund. 1997. Movements and habitat selection of breeding northern pintail (*Anas acuta*) on the Yukon-Kuskokwim Delta, Alaska. J. Wildl. Manage. 61:1199-1207.

Sherry Hudson

Dept. of Biological Sciences, University of Idaho
Moscow, Idaho, 83844

EDUCATION

Masters Candidate, Dept.of Biological Sciences, University of Idaho: Fall 1997 to present
B.A., Biology, Earlham College, Richmond, Indiana: 1986-1990 GPA: 3.67

PROJECT DUTIES

Design and implement project with the aid of Dr. Heglund and other members of Graduate Committee. Hire, train, and supervise field crew; work with crew in field; analyze and summarize data collected; write Masters Thesis and scientific paper(s).

EXPERTISE

I have worked on various songbird survey projects since 1994, and have extensive experience with songbird banding and mist net operations. I have also surveyed and monitored bird populations using techniques such as point counting and nest searching. Many projects I have worked on have been in riparian areas, and I have been trained in various vegetation measurement methods. I have been intimately involved in the background studies leading up to this research project, and in the planning of this project.

EMPLOYMENT/EXPERIENCE

- Research Assistant, Teaching Assistant - Department of Biological Sciences, University of Idaho: Fall 1997 to present.

Duties: Crew leader for 1998 migratory songbird research project (project description same as proposed project). Hired and supervised field crew of five; planned and implemented songbird banding using mist nets, and insect trapping and collection using sticky traps, sweep nets, and limb beating; entered data and compiled information in a progress report; presented information at The Wildlife Society in Moscow, Idaho, 1998. Teaching Assistant for Botany lab, Spring 1998.

- Field Biologist – Point Reyes Bird Observatory, California: Seasonal, 1995 – 1997.

Duties: Crew supervisor for crew of three. Supervised and carried out songbird banding using mist nets, point counting, area searching, and nest searching in riparian areas of northern and central California. Entered data using Foxpro database.

- Biological Technician - U.S.F.W.S., eastern Oregon and Washington. Seasonal 1995-1997.

Duties: Planned and implemented songbird monitoring project in riparian areas. Surveyed birds using mist net operations, point counts, and area searches. Evaluated vegetation in study areas. Entered data using Microsoft Excel.

- Bird Banding Intern – Institute for Bird Populations, California. Summer 1994.

Duties: Surveyed breeding songbirds in central-south Oregon by conducting point counts and bird banding using mist nets. Evaluated vegetation at all sites.

Section 10. Information/technology transfer

This project will culminate in a Masters Thesis for the Department of Biology at the University of Idaho. At least one scientific paper will also be written and submitted to a peer-reviewed journal.

Congratulations!