Bonneville Power Administration
Fish and Wildlife Program FY99 Proposal

Section 1. General administrative information

Restore Chinook Watershed

Bonneville project number, if an ongoing project 9123

Business name of agency, institution or organization requesting funding
Sea Resources

Business acronym (if appropriate)

Proposal contact person or principal investigator:

Name	Brent Davies
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Subcontractors.

Organization	Mailing Address	City, ST Zip	Contact Name

NPPC Program Measure Number(s) which this project addresses.

NMFS Biological Opinion Number(s) which this project addresses.

Other planning document references.

Subbasin.
Chinook

Short description.
Implement Chinook Watershed Restoration Plan using students guided by a team of scientists and wetland restoration experts.

Section 2. Key words

Mark	Programmatic Categories	Mark	Activities	Mark	Project Types
X	Anadromous fish		Construction	X	Watershed
	Resident fish	X	O & M	X	Biodiversity/genetics
	Wildlife		Production	X	Population dynamics
X	Oceans/estuaries	X	Research	X	Ecosystems
	Climate	X	Monitoring/eval.		Flow/survival
X	Other	X	Resource mgmt		Fish disease
		X	Planning/admin.	X	Supplementation
			Enforcement	X	Wildlife habitat en-
			Acquisitions		hancement/restoration

Other keywords.
hatchery-wild interactions, nutrient dynamics, life-histories, education

Section 3. Relationships to other Bonneville projects

Project #	Project title/description	Nature of relationship

Section 4. Objectives, tasks and schedules

Objectives and tasks

Obj 1,2,3	Objective	Task a,b,c	Task
1	Restore more natural movement of sediment and organic matter in the Chinook Watershed	a	In cooperation with the private industrial landowners, conduct a road inventory to identify, prioritize, and fix major road related problems to reduce the risk of landslides and debris torrents in the Chinook watershed.
		b	Cooperate with the private

			industrial landowners to create a forest management plan that minimizes the risks to recovering salmonids in the basin. Pay particular attention to the identified refuge areas.
2	Restore estuary/marsh habitat in the lower river and increase the movement potential for salmonids and organic matter through the tide-gate at the Hwy 101 bridge.	a	Design a management plan for currently existing tide-gate so that the gates are closed during high tide cycles or during periods of high water in the Columbia and open the rest of the time.
		b	In cooperation with transportation agencies, design a new tide-gate which has greater capacity to allow much more natural movement of water through the estuary. Set a timeline for installation of the tide-gate.
		c	Conduct an engineering survey of lower river to determine risks to private landowners of flooding with the redesign of the tidegate. Identify any areas of diking to recover as much marshland as possible and minimize the risks to private land-holdings.
		d	Negotiate a contract with Washington State University to take over the lease on their extensive landholdings in the lower river. Design a management plan that pays for the lease and recovers a significant amount of the marsh-estuary habitat.
3	Broaden the suite of life-histories of salmonids in the Chinook watershed to strengthen the recovery of naturally reproducing populations.	a	Determine the current suite of life-histories found in the salmonids in the Chinook watershed, and which life-histories are currently successful.
		b	Determine if several large key beaver ponds in the basin will support coho salmon through the summer.

		c	Determine what the suite of life-histories were likely found historically in the Chinook watershed.
		d	Write and implement a plan to recover the lost elements of salmonid life-histories within the Chinook watershed.
		e	Design and implement a hatchery management plan based on the needs of the Chinook watershed. Focus on improving survival rather than increasing the number produced by the hatchery.
4	Monitor the naturally produced and hatchery salmonids within the basin.	a	Complete a whole-basin dive count in early summer to monitor the distribution and abundance of salmonids in the Chinook watershed.
		b	Capture and collect life-history information for all returning adults to the Chinook watershed.
5	Map existing riparian vegetation in the watershed according to species-age composition. Use this information to prioritize riparian planting opportunities in the basin.	a	Conduct a vegetation inventory to create a vegetation map using GIS.

Objective schedules and costs

Objective #	Start Date mm/yyyy	End Date mm/yyyy	Cost %
1	10/1998	10/2000	7.00%
2	10/1998	10/2002	15.00%
3	6/1998	10/1999	50.00%
4	6/1998	10/1999	25.00%
5	6/1998	8/1998	3.00%
			TOTAL 100.00%

Schedule constraints.
extreme weather conditions

Completion date.

Section 5. Budget

FY99 budget by line item

Item	Note	FY99
Personnel	Executive director, salmon biologist, restoration coordinator, genetics consultant	$92,000
Fringe benefits		$21,250
Supplies, materials, non-expendable property	cables and assoc gear for snorkel counts, scales, dissolved oxygen probe coded-wire tagger	$21,500
Operations & maintenance	publications printing, mapping, life-history library	$30,000
Capital acquisitions or improvements (e.g. land, buildings, major equip.)	building improvements, pond naturalization, smolt trap	$110,000
PIT tags	# of tags: 500,000	$25,000
Travel		$2,500
Indirect costs		$15,000
Subcontracts	WA State to tag fish	$17,500
Other		
TOTAL		$334,750

Outyear costs

Outyear costs	FY2000	FY01	FY02	FY03
Total budget	$334,750	$200,000	$200,000	$200,000
O&M as % of total	10.16%	10.00%	10.00%	10.00%

Section 6. Abstract

Using a whole-basin approach, Sea Resources intends to become the best hands-on salmon restoration center in the Pacific Northwest, defined by its restoration of the Chinook River. Our overall objectives are to: restore natural sediment flow throughout the Chinook watershed; demonstrate a new role for hatcheries in watershed restoration and establishment of natural spawning, galvanizing restoration efforts in the broader region; develop a community-based framework with the necessary expertise and tools to collaboratively restore a heavily degraded watershed; and monitor progress (data analyses

of fish returns will be described in annual reports and scientific papers, community involvement, and student academic success and drop-out rates). This project will restore and protect healthy runs of chinook, coho, and chum salmon. Significant recovery of this heavily degraded basin will take generations, but the effects of this restoration work will be seen annually through increased fish returns. This project will rebuild salmon populations in the Columbia Basin which have declined as a result of the Bonneville Power Administration's hydropower system, a goal equivalent to that of the FWP. These results will be monitored through the collection of life-history data from returning fish and dive counts. Annual reports will be written evaluating the restoration progress, and scientific papers will be submitted to fisheries journals on the abundance and survival of each life-history of existing salmonids.

Section 7. Project description

a. Technical and/or scientific background.

The Chinook River is a small (12 square mile) watershed in Washington, near the mouth of the Columbia River. It used to be a clear, free-flowing, navigable river with wild runs of chinook, coho, chum, and sea-run cutthroat trout. At the turn of the century, the town of Chinook had the wealthiest per capita income in the country, mostly on the largesse of salmon. Biologists estimate that overharvesting in Baker Bay decimated runs in the Chinook by the turn of the century. In 1927, a tidegate was installed at the mouth of the river. In the 1970s, the watershed was clearcut. The river is now heavily silted and slow-moving, a testament to the intense use of the watershed.

The human health of the region reflects the natural health: residents of Pacific county have a per capita income $4000 below the Oregon/Washington average, and roughly 65% of their students receive government assistance.

The hatchery is oldest hatchery in Washington. It closed in the 1930s and was reopened by a group of community members who formed Sea Resources, a nonprofit organization, in 1967. For the past 30 years, students from Ilwaco High School have taken courses at Sea Resources in aquaculture. In 1995, the focus of the educational component of the hatchery shifted from aquaculture to restoration ecology, and the focus on fish production shifted away from production numbers to creating a healthy habitat, rich with food sources. A watershed assessment was completed in 1996 by Charley Dewberry who then wrote Restoring the River, A Plan for the Chinook Watershed (Dewberry 1997, see Appendix I).

Dewberry was guided by a technical team that included Jim Lichatowich, Pete Bisson, Peter Schoonmaker, and Kathleen Sayce. Dewberry holds a Ph.D. from the University of Oregon. He has been a field biologist for the Oregon State University Stream Team. In 1992, under contract to the Pacific Rivers Council, he wrote a white paper on stream

restoration for the US Congress, which was incorporated in the book Entering the Watershed (Pacific Rivers Council 1993). He is the lead coordinator on the cooperative restoration project on Knowles Creek in the Siuslaw basin. Jim Lichatowich is a fishery biologist with 27 years experience, working mostly with salmon. He is a private consultant who serves on the governor of Oregon's salmon recovery team, and who also serves on the Independent Scientific Advisory Group. Bisson has been a research biologist at the US Forest Service's Pacific Northwest Research Station in Olympia since 1995. Before that he served for 21 years as an aquatic scientist for the Weyerhauser Company. Schoonmaker is Vice-President of Interrain Pacific in Portland. He holds a doctorate in forestry from Harvard and is currently the lead editor for an atlas mapping salmon in the coastal temperate rain forest. Sayce is an ecologist and a life long resident of Willapa Bay. She is the science program director for the Willapa Alliance.

Restoration is a long-term process. The working hypothesis of this project is that human activities have significantly degraded the productive capacity of the Chinook watershed for over 150 years, and that significant restoration will take more than a century. This project understands that no short-term technological fixes will reverse the degradation. Rather, critical areas of the watershed must be protected and allowed to recover naturally, thereby providing high quality salmon habitat. However, some physical work will be done over the course of the next several years. Historically, large accumulations of wood existed in Baker Bay. The plan calls for building a corral in Baker Bay to hold slash and old Christmas trees, to provide habitat and feeding grounds for juvenile salmon and other species such as herring. The plan also calls for planting cedar in the riparian areas. Sea Resources will also work with Willamette Industries to identify roads that can be put to bed and debris torrents that can be stabilized and repaired. In addition, the hatchery is reducing its production numbers and plans to diversify the suite of life histories. Initial research shows that the runs all head south in the ocean; the hatchery plans to incorporate runs that head north, too. See the Appendix II from a paper being prepared for submission to Northwest Science by Sea Resources' staff and students (Harper et al., in prep.). To ensure each of the management actions has the desired effect, Sea Resources is in the process of establishing data protocols to enable thorough monitoring in the years to come. This project aims to achieve an understanding of the Chinook drainage that is more complete than any other drainage in the Northwest. Tom Kantz, who holds a Ph.D. in estuary ecology from Louisiana State University, is the restoration coordinator for the 1997-98 water year. He is establishing protocols and collecting the following data: daily maximum and minimum air temperature and rainfall; water quality information, including daily maximum and minimum water temperature, depth, velocity, sediment load, and water chemistry; and biological information from benthic macroinvertebrate samples, leaf packet decomposition rates with adjacent benthic samples, fish counts (via snorkel and seine), and estuary productivity.

b. Proposal objectives.

1) Restore more natural movement of sediment and organic matter in the Chinook Watershed.
2) Restore estuary/marsh habitat in the lower river and increase the movement potential for salmonids and organic matter through the tide-gate at the Hwy 101 bridge.
3) Broaden the suite of life-histories of salmonids in the Chinook watershed to strengthen the recovery of naturally reproducing populations.
4) Monitor the naturally produced and hatchery salmonids within the basin. Annual reports and scientific papers will be written describing the project's progress.
5) Map existing riparian vegetation in the watershed according to species-age composition. Use this information to prioritize riparian planting opportunities in the basin.

c. Rationale and significance to Regional Programs.

The strategy identified in the Plan for the Chinook Watershed (Dewberry 1997) parallels the findings of the Independent Science Group as described in their report, Return to the River. The Plan for the Chinook adopts this premise: we can no longer examine streams in isolation from their watersheds. The plan takes a whole-basin approach, and also recognizes that significant restoration is a long-term process. The watershed approach to recovery will further the goals of the FWP by providing quality habitat for healthy runs of native salmon. Two other projects have taken the whole-basin approach to watershed restoration: Oregon's Knowles Creek (Siuslaw Basin) and Lobster Creek (Rogue River Basin) Restoration Projects. Other restoration projects have had little significant, long-term effect on fish and wildlife habitat restoration.

The Chinook watershed is a workable size and location; the strategic location at the mouth of the Columbia River and the manageable size will begin to provide answers to the many unanswered questions about salmon life-histories and the methods and feasibility of salmon restoration. This information will be of great importance to FWP's approach to salmon enhancement and restoration.

In taking a basin -wide approach, the restoration effort aims to create a management plan that minimizes the risks to recovering salmonids in the basin, with particular attention paid to the proposed refuge areas. This will help create a more natural movement of sediment and organic matter in the watershed (see Dewberry 1997): a key to the success of this plan.

The plan not only calls for the restoration to examine the stream in the context of the entire watershed, it calls for the hatchery to integrate into the natural production of the watershed. Recognizing the myriad detrimental effects hatcheries have had on natural salmonid runs, this plan shifts the focus of the hatchery from production numbers to creating a protected, healthy habitat with natural salmon runs. Data from the hatchery has been recorded since 1981, greatly increasing the possibilities for a better understanding of

salmon life-histories. Currently, two students enrolled in Sea Resources advanced natural resources course are working under the tutelage of Dr. Dewberry and Dr. Kantz on scientific papers that analyze the release and return rates of Chinook salmon. These papers are in preparation for submission to the journal Northwest Science (see Appendix II). Another student has translated field notes from a 1880's journal which described the vegetation of the Chinook watershed. From this data, a vegetation map depicting the Chinook watershed prior to European settlement will be completed.

Fish supplementation has failed to recognize the importance of the quality of the surrounding habitat. Hatcheries have historically separated themselves from their watersheds and this project recognizes that this system has failed (the Chinook hatchery has an average annual return rate of 0.04%). Sea Resources' hatchery aims to be a leader in shifting the focus of hatcheries from producing fish in separation from the river to incorporating watershed restoration and habitat health into their practices.

The plan is a modest, long term effort that will produce important results for the entire region.

d. Project history

e. Methods.

Objective 1
Task a: The method for this inventory and prioritization will be based on the Pacific Watershed Associates' handbook (Weaver and Hagans 1994). The basin will be monitored throughout the storm season and landslides and debris torrents will be inventoried and mapped into the GIS watershed inventory. During the snorkel survey, any debris torrents and landslides will be inventoried. Once a year, an flight survey of the basin will be done to verify that recent landslides and debris torrents have been reported.

Task b: Develop a management plan using existing principles. Sea Resources is currently establishing relationships with Willamette Industries, Longview Fibre, Washington State University, and the dozen (approximately) small landowners in the watershed.

Objective 2
Tasks under this objective will use standard engineering techniques.

Objective 3
Task a: The general approach in this section follows the recommendations of Return to the River (1996) and Lichatowich et al. (1995).

Task b: Weekly measures of the water temperature and oxygen profiles in the beaver ponds. Results will be compared to literature values found for coho salmon.

Task c: Literature review.

Task d: Method of Lichatowich et al. (1995).

Task e: Careful monitoring of the fish (hatchery and naturally produced fish are essential to the management plan, see Objective 4).

Objective 4
Task a: Complete a whole-basin snorkel survey of the Chinook watershed in early summer. (Hankin and Reeves 1988). The 1996 watershed survey found 812 coho, 406 steelhead one year or older, 1,284 steelhead less than one year old, and 6 cutthroat trout. A smolt trap will be placed above the hatchery to estimate the population of naturally produced salmonids in the basin. These fish will also be tagged. Standard techniques of collecting, anesthetizing, weighing, measuring, and population estimates will be followed. (PNW Forest Service, Anadromous Fish Group, J.R. Sedell and G. Reeves- unpublished information, example- Lumianski 1997).

Task b: Mark each life history strategy in the hatchery and in the basin with a unique coded-wire tag to determine the success of each strategy and trends over time. This method follows Lichatowich et al.'s (1995) general strategy.

Objective 5
Task a) Map existing riparian vegetation using standard techniques at Interrain Pacific.

Special Considerations: *Handling*- All fish handled from the smolt traps will follow standard techniques of PNW Anadromous Fish Unit. The whole-basin dive count will use snorkeling rather than electrofishing to minimize risk to salmonids. *Sampling*- All adult fish returning to the weir at the hatchery are sampled and naturally reproducing fish are passed above the hatchery. The whole basin dive count is conducted throughout the entire watershed where anadromous fish are found. Our sampling frequency is 1 of 3 pools, 1 of 8 glides, and 1 in 10 riffles. This frequency is the most commonly used for fish counts in the area, and it is also the frequency used most often by PNW Anadromous Fish Group.

Factors which may limit the success of the project:
1) Last year the naturally reproduced coho in the basin appeared to migrate out of the basin in February. We can not effectively trap smolts during high flow events in February.
2) Two tributaries and the lower Chinook river have very low visibility for snorkeling. Coho are present but population estimates are not possible in those areas. We are attempting to seine those areas but seining is also difficult in those areas. We will underestimate coho production in those portions of the lower river.

Otherwise, the Chinook watershed is small enough to adequately sample the critical life-stages of the salmonids in the Chinook watershed, a basin that provides a microcosm of problems that face the entire Columbia Basin.

f. Facilities and equipment.

Facilities at Sea Resources need improvements to sufficiently accomplish this project. The hatchery ponds must be naturalized so experiments, such as natural feeding and the introduction of predators, can be done properly. The building is over thirty years old and needs structural repairs and modification. The Ocean Beach School District has a 1997 Macintosh computer at Sea Resources for the students to use and the staff of Sea Resources is permitted to work on it when classes are not in session. The computer system owned by Sea Resources is nine years old and must be up-dated for the staff to work more efficiently and to ensure high quality reports. A smolt trap must be purchased for the project, because Sea Resources currently uses borrowed traps.

g. References.

Dewberry,T.C. 1997. Restoring the River, A Plan for the Chinook Watershed. Sea Resources, Chinook, Washington.

Harper, G., P. Lindahl , T.C. Dewberry, T.S.Kantz, and R.Millner. In prep. The effects of El Nino events on the return rates of Chinook salmon to the Chinook River, Washington. In preparation for submission to Northwest Science.

Hankin,D.G. and G.H. Reeves 1988. Estimating total fish abundance and total habitat area in small streams based on visual estimation methods. Can. J. Fish. Aqu. Sci. 45:834-844.

Independent Scientific Advisory Group. 1996. Return to the River: Restoration of Salmonid Fishes in the Columbia River Basin. Northwest Power Planning Council, Portland, Oregon.

Lichatowich, J., L. Mobrand, L. Lestelle, and T. Vogel. 1995. An approach to the diagnosis and treatment of depleted Pacific salmon populations in Pacific Northwest watersheds. Fisheries 20(1): 10-18.

Lumianski, J. 1997. Smolt production studies in the upper Clackamas River subbasin, 1994-96.in: Shively,D. and Doug Cramer (eds.). 1997. Fisheries Partnerships in Action. Clackamas River subbasin, OR., USDA Forest Service.

Weaver,W.E. and D.K. Hagans. 1994. Handbook for Forest and Ranch Roads: A guide for planning, designing, constructing, reconstructing, maintaining and closing wildland roads. Pacific Watersheds Associates.

Section 8. Relationships to other projects

Section 9. Key personnel

Tom Kantz, Restoration Coordinator for Sea Resources; 40 hours/week.
Charley Dewberry, Salmon Biologist; 1997: 20 hours/week; 1998: consultant.
Brent Davies, Assistant Director of Sea Resources: 40 hours/week.

Thomas C. Dewberry
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Florence, OR 97439

Education:

B.S. 1976. Multiple Disciplinary Social Science. Michigan State Univ., E. Lansing, MI.

M.S. 1978 Michigan State University. Emphasis: Aquatic Ecology-at Kellogg Biological Station.

Ph.D. Candidate. 1978-1981. Oregon State University: Stream Ecology.

Ph.D. 1995. University of Oregon, Eugene, OR. Philosophy of Science. Dissertation topic: Can we diagnose the health of ecosystems?

Experience and Expertise:

Restoration Biologist for the Chinook River (current). Worked with Sea Resources and Ecotrust to assess condition of the river and write a restoration framework. I presently consult with Sea Resources on the implementation of this restoration project. For 8 years, I was employed by Oregon State University (Stream Team) and the Anadromous Fish Unit of US Forest Service, Regional Lab, in Corvallis, Or. as a field biologist and technician. Supervisors: Fred Everest and Jim Sedell. Evaluated Fish Creek project (Clackamas Basin). Since 1991, I have worked for the Pacific Rivers Council as restoration coordinator. I organized a task force of the nation's leading stream ecologists and wrote a white paper for US Congress. It was completed during 1992 and was subsequently incorporated into the book, "Entering the Watershed" by the Pacific Rivers Council published by Island Press; Coordinated the restoration efforts on Knowles Creek (Siuslaw basin).

Publications:

Dewberry, T.C. 1997. Restoring Knowles Creek. In: Schoonmaker, P.K., B. von Hagen, and E.C. Wolf. The Rainforests of Home. Island Press, Washington D.C.

Dewberry, T.C. 1996. Can We Diagnose the Health of Ecosystems? Northwest Science and Photography.

Adams, P. and T.C. Dewberry. 1996. Watershed Processes Section of Curriculum for Ecosystem Workforce Project. Labor Education and Research Center, University of Oregon and Oregon State University.

Dewberry, T.C. 1995. The Knowles Creek Report (1992-1995). Pacific Rivers Council, Eugene Oregon.

W. Nehlsen and T.C. Dewberry. 1995. Tillamook Bay Watershed Analysis Framework. For: EPA Tillamook Bay National Estuary Program. July 1994.

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EDUCATION

Ph.D. Louisiana State University , Baton Rouge, LA (August 1993)
Major: Botany (Phycology and Molecular Evolution)
M.A. University of Texas, Austin, TX (August 1987)
Major: Botany (Phycology) Minor: Zoology
B.A. University of California, Berkeley, CA (August 1984)

EXPERIENCE and EXPERTISE

-Chinook River Watershed Restoration Coordinator (August 1997-present) Ecotrust, Astoria, OR. I am developing watershed monitoring protocols, creating GIS maps of the watershed, coordinating with hatchery personnel, land owners, and government agencies, and supervising high school students assisting with the effort to restore the Chinook River watershed. I am proficient in the design and implementation of monitoring protocols and in the collection and analysis of scientific data.

-Chinook River Watershed Data Coordinator (Sept. 1996-June 1997) Sea Resources, Chinook, WA.

-Assistant Professor of Biology (Jan. 1995-May 1996) Coastal Carolina University, Conway, SC.

-**Lecturer of Biology** (Jan. 1993-Dec. 1994) Coastal Carolina University, Conway, SC.

-Post-Doctoral Research Scientist (July 1992-Dec. 1992) North Dakota State University, Fargo, ND.

PUBLICATIONS

Kantz, T.S. 1996. Modern molecular approaches in ecology and evolution. Ecology 77: 986-987 (book review).

Taylor, K.L. and T.S. Kantz. 1995. Undergraduate research opportunities for all: A case study from the Department of Biology, Coastal Carolina University. Council on Undergraduate Research Quarterly 16: 27-29.

Mishler, B.D., L.A. Lewis, M.A. Buchheim, K. S. Renzaglia, D.J. Garbary, CF. Delwiche, F.W. Zechman, T.S. Kantz, and R.L. Chapman. 1994. Phylogenetic relationships of green algae and bryophytes. Annals of the Missouri Botanical Garden 81:451-483.

Kantz, T.S., E.C. Theriot, E.A. Zimmer, and R.L.Chapman. 1990. The Pleurastrophyceae and Micromonadophyceae: a cladistic analysis of nuclear rRNA sequence data. Journal of Phycology 26:711-721.

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EDUCATION University of Washington, College of Forest Resources. Master of Science in Ecosystem Analysis, June 1997.
University of California, San Diego. Bachelor of Arts in Environmental Science and Conservation, June 1992. Provost's Honors.

EXPERIENCE

Present **Assistant Director,** Sea Resources, Chinook, Washington.
- coordinate implementation of Chinook Watershed Restoration Plan
- design a budget and fundraise to meet this budget
- develop and implement community outreach programs
- create a policy and operations manual for Sea Resources/Ocean Beach School District's program.

Fall 1997 **Teaching Assistant**, College of Forest Resources, Univ. of WA.

1994-1997 **Butterfly Farming Project Director**, The Zoological Society of San Diego, San Diego, California and the Xerces Society, Portland, Oregon.

1992-1994 **Director of Membership/Assistant to Director**, Xerces Society, Portland, Oregon.

PUBLICATIONS

Davies,B.M. 1995. "Field Notes from a Costa Rican Butterfly Farm." *Wings: Essays on Invertebrate Conservation*. Vol.18(1). The Xerces Society, Portland, Oregon.

Davies,B.M. 1997. A Handbook for Butterfly Farming, Volume 1: Costa Rica. The Xerces Society, Portland, Oregon.

AWARDS 1997 Kleinhan's Fellow for Research in Sustainable Use of Non-Timber Products from the Rainforest Alliance.
Recipient of the Northwest Orchid Society's 1996 Scholarship.

EXPERTISE

While working for the Zoological Society of San Diego, I organized and trained a cooperative of women in a rural village in Costa Rica to raise and sell butterfly pupae for profit based on ecologically sound principles. I have run community meetings with local organizations and interested citizens to educate the public on the purpose and benefits of conservation-based economic development. I am experienced in coordinating and monitoring development project's progress and implementation.

Garth Gale
PO Box 187, Chinook, Washington 98614
(360) 777-8229, work

EDUCATION

Bachelor of Science in Fisheries Science, Oregon State University. June 1997.

EMPLOYMENT

Present **Salmon Biologist and Hatchery Manager**, Sea Resources, Chinook, Washington.

Duties

- Rear healthy fish (coho, chinook, and chum salmon) in hatchery
- Organize time of release
- Mark fish before release
- Conduct fish sampling upon return to hatchery from ocean
- Educate high school students in aquaculture technology.

EXPERTISE

Educated in fisheries science, I am experienced in the techniques of aquaculture, scale analyses, marking fish, and identification of aquatic organisms. I work well students and members of the community. I am proficient in innovative hatchery techniques and in communicating the hatchery's new plan to be used as a tool for restoration to the public.

Section 10. Information/technology transfer

Open houses will be held at Sea Resources for students and members of the community interested in learning about the project. Community outreach programs will be of high priority for Sea Resource's assistant director, because of the area's long history of reliance on the fish industry, including hatcheries. For the project to succeed, it must maintain the strong support it receives from the community. To accomplish this, the community must understand the rationale behind shifting the focus of the hatchery from numbers of fish to watershed restoration. Sea Resources will also host watershed restoration workshops, so experts can exchange information and learn from the findings of this project. Scientific papers and annual reports will be published describing the progress of the restoration work and recovery of the salmon runs. Sea Resources' staff will also speak at conferences, sharing the information gained as a result of this project. A student at Sea Resources is currently producing a web site describing the organization, the watershed, and the salmon recovery work. Looking to the future, Sea Resources plans

to build an interpretive center which would educate visitors about salmon, the process of recovering healthy fish runs, watershed restoration, and the role the hatchery will play in aiding the recovery.