

**EVOS PROPOSAL SUMMARY PAGE**

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Project No. G-030684

Date Received 9/4/02

Project Title: Towards sustainable management in the Kenai River watershed: linking human and resource development with nutrient and energy pathways across terrestrial, aquatic and marine systems.

Project Period: October 1<sup>st</sup> to September 30<sup>th</sup>, 2003 FY 03

Proposer: Asit Mazumder, University of Victoria, P.P. Box 3020, Stn. CSC, Victoria, BC V8W 3N5, 250-472-4789(Ph), 250-472-4766(Fx), [mazumder@uvic.ca](mailto:mazumder@uvic.ca)  
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EVOS Funding: FY 03 \$59,900

Matching Funds: CIAA – facilities in kind ~\$1k  
ADF&G – materials, information in kind \$12k, salary in kind - \$15k  
UVIC – salary, communication in kind \$20k  
KRSFA – \$10k cash  
USFW – \$20k cash

Study Location: Kenai River watershed, Kenai Peninsula, Cook Inlet, Gulf of Alaska

Trustee Agency: ADF&G, University of Victoria

Abstract: The proposal intends to take the larger Kenai River watershed research plan and focus it through ongoing community and stakeholder involvement, agency participation into a directed and implemented research program. In the past year we have produced communication bulletins, a draft document and organized workshops to foster an understanding of watershed issues and stakeholder interest and input. From this exercise we recognize the need to maintain and build this dialogue, but gain further involvement. A message from our recent Aug02 workshop indicates a strong interest to take the research plan and build it beyond a single completion EVOS report. The consensus expressed by KRW participants, is that a research plan should be implemented that: (a) captures the continued involvement of local, state and federal perspectives; (b) a white paper be developed that presents scientific issues and interests in a plan with broad political, agency and stakeholder distribution; (c) extends the time to maintain dialogue and interests beyond the initial research planning process; and (d) develop a detailed research program with management structure, specific project outlines, funding, and deliverables.

**I. INTRODUCTION**

This proposal intends to take the initial Kenai River watershed (KRW) research plan (Detecting and understanding marine-terrestrial linkages in a developing watershed: Nutrient Cycling in the Kenai River Watershed) developed through EVOS funding (FY02 # 02612) and augment and focus it into a directed action plan with implementation through acquired political support, community involvement and support, agency participation and ongoing research funding. We are seeking funding to support ongoing communication and facilitation to provide an infrastructure for building interest and achieving collaboration for political and stakeholder support of ongoing research funding in the Kenai River watershed. The funding requested will also be used for travel and participation at 2 dedicated workshops to gain input from KRW Scientific and Public Advisory Committee members (Table 1). The ultimate goal of the proposed project will be a coordinated initiative with program funding to support directed interdisciplinary research projects and communication.

Interest in nutrient energy pathways in the KRW began in 1998, when Alaska state fisheries biologists and University of Victoria researchers proposed a research approach to investigate the effects of marine derived nutrients through salmon carcasses on juvenile salmon on the Kenai River. In March 2001, a group of individuals representing agencies and organizations with interest in the Kenai River watershed met to discuss and identify issues related to marine and terrestrial derived nutrients in the watershed. A proposal was subsequently developed by state agency staff (ADF&G) and independent researchers (University of Victoria) and funded by the Exxon Valdez Oil Spill Trustee Council, Kenai River Sportfishing Association, The Nature Conservancy and Alaska Department of Fish and Game to explore and potentially develop an integrated research plan for the watershed. The funded project is led by co Principle Investigators: W. Hauser, A. Mazumder, and J. Edmundson with support from a Scientific and Public Advisory Committee. Workshops were convened in January and August 2002 to bring together those interested in potential collaboration in a larger research initiative for the Kenai River watershed. Two technical bulletins have been created as background to communicate issues and ideas about the watershed and develop a state of knowledge literature and GAP analysis for the Kenai River. A broad research plan is being completed (Oct 30, 2002) to serve as an initial guide to assist researchers, managers and stakeholders to build collaborations and successfully create and manage a long term integrated interdisciplinary research initiative on nutrient and energy pathways in the Kenai River watershed. This proposal is intended as the second and final step towards building interest, collaboration, management support and directed funding for a long term (10 year) research program toward sustainable management and often conflicting resource users including fisheries, wildlife and forest in the Kenai River watershed.

## ***II. NEED FOR THE PROJECT***

### ***A. Statement of Problem***

The Kenai River Watershed is a unique site within Alaska and the Pacific Northwest, which deserves to be considered and sustained as a national treasure. It is a productive, diverse system supporting a wide variety of anadromous and non anadromous fish species, marine, freshwater, sport, commercial, subsistence and personal use fisheries, wildlife, and forest resources

contained within a large scale terrain setting comprised of lakes, streams, wetlands, mountains and glaciers connected to the Cook Inlet and the greater Gulf of Alaska ecosystem (Boggs et al. 1997).

The resources of the Kenai River watershed have high economic and ecological value to the function, health and prosperity of ecosystems and human settlements in the Kenai Peninsula and Alaska. These resources include Alaska's largest sport fishery for chinook and sockeye salmon, wild rainbow trout, and marine fisheries (crab, salmon, eulachon, razor clams etc.) and abundant populations of moose, bears, wolves, caribou, whales, sea lions, and otters in a landscape reaching from the Gulf of Alaska, the Cook Inlet to the Kenai River watershed and the height of land in the Harding Ice Field.

The original focus for interest in nutrients and energy in the Kenai River watershed is associated with the potential influence of marine derived nutrients supplied by returning anadromous salmon on overall salmon population and watershed productivity. Willson and Halupka (1995), Larkin and Slaney (1997), Cederholm et al. (2000), Gresh et al. (2000) and Naiman et al. (2002) have suggested that there may be negative consequences to the productivity of watersheds and individual stocks of salmon with the loss of marine derived nutrients from salmon and carcasses by harvesting fish. Annual fish harvests in the Kenai River watershed have diverted approximately 80% ( $5.3 \times 10^6$  kg) of salmon biomass and nutrients over the past two decades destined to return to the watershed (Johannes et al. 2002a, Mazumder 2002 unpublished maps). The diversion of nutrients from many salmon watersheds, including the Kenai, has prompted interest in examining and understanding the role of salmon and other nutrient sources in maintaining the productivity of watersheds. During the past three decades the Kenai River watershed has also experienced considerable change from a number of anthropogenic activities including: fish and forest harvesting, climate change, habitat degradation, increased land use, and invasive species. The watershed comprises unique and diverse landscapes and a network of lakes, rivers and wetlands with strikingly different geomorphology including: 1) the Moose River and Beaver Creek - slow-moving, low-lying meandering systems which drain wetland areas and lakes; 2) the Snow and Killey Rivers - higher-gradient, glacier headwater systems; and 3) the Russian River - high-gradient, clear-water system. Each sub-basin, wetland and tributary contributes different nutrients to the Kenai River and the marine ecosystem and each drainage benefits differently from marine-derived nutrients. These observations have created strong support for a research initiative to explore and examine the diversity of sources, sinks and pathways of nutrients and energy, how nutrients cycle and the sensitivity of the Kenai River watershed to changes in nutrient quality and quantity (Johannes, Mazumder, Edmundson 2002 a,b).

### ***B. Rationale/Link to Restoration***

The Kenai River watershed is one of the most interesting and important systems for sport and commercial fishing of anadromous and non anadromous salmonids in Alaska. The overall productivity of KRW may have been shifted in recent years due to the 1989 oil spill event (Edmundson et al. 2002) and overall changes in coastal and open water conditions of the marine

environment. Unless we understand the coupled interactions among species, their environment and the greater Gulf of Alaska ecosystem, this unique and productive system may not function to support development and resource use in a sustainable manner. The interdisciplinary watershed – level research plan linking freshwater habitats, their surrounding drainage basins and downstream coastal ecosystems, will allow us to develop tools, techniques and models for restoration and management of the Kenai River watershed. More importantly, the science and integration developed from this project can be applied to other Alaskan, and international watersheds exposed to similar human and resource use and development towards sustainable management.

### ***C. Link to GEM Program Document***

The goals for development of research in the Kenai River Watershed are consistent with the Gulf Ecosystem Monitoring (GEM) program. The mission of the GEM program is "to sustain a healthy and biologically diverse marine ecosystem in the northern Gulf of Alaska (GOA) and the human use of the marine resources in that ecosystem through greater understanding of how its productivity is influenced by natural changes and human activities". The goal of this project is to detect, and better understand the dynamics of nutrients in the Kenai River watershed ecosystem to provide information about how its productivity is influenced by natural changes and human activities so that better land use and resource management decisions can be made in the future. Freshwater nutrients, salmon, climate, among others, can provide direct links between the Kenai River watershed and the GOA ecosystems.

The future research that will result from this plan are consistent with the GEM Monitoring and Research Plan (EVOS TC June 5, 2001).

- GEM - chapter 2.2 identifies a variety of human activities, which may impact the GOA ecosystem. These impacts can have a profound response in the Kenai River watershed and information that leads to a better understanding about how that watershed functions will aid in land use planning and regulation of those human activities and preservation of important habitat.
- GEM - chapter 4 identifies the interactions of key ecological factors, including physical forcing, productivity, food, and habitats as the main theoretical controls on ecosystems and its animal / plant populations. Research from the KRW plan will help to answer questions about productivity, food, habitat and removals and how they will affect the Kenai River watershed and the GOA ecosystem and the interdependence of these ecosystems.
- GEM - chapters 5 identifies the importance of marine-terrestrial interactions and physical and chemical oceanography of the GOA. Research from KRW will contribute through examination of how marine-derived nutrients are used and cycled in freshwater and how nutrients and freshwater that are derived from watersheds contribute to the productivity of the GOA ecosystem. A river that supports runs of anadromous fish provides a two-way conduit for the transport of nutrients, which enhance both the freshwater watershed and the marine ecosystem (i.e. Willson and Halupka 1995, Larkin and Slaney 1997), but a detailed study of nutrient origin, flow and processing is lacking from a productive

watershed such as the Kenai River. GEM chapter 5 also states: “Watershed studies linking the freshwater and marine portions of the regional ecosystem could pay important benefits to natural resource agencies. As agencies grapple with implementation of ecosystem-based management, conservation actions are likely to focus on ecosystem processes and less on single species.” Research from the KRW plan will support important for decision making by local, state and federal agencies for management of resources, people and lands.

### ***III. PROJECT DESIGN***

#### ***A. Objectives***

The Kenai River watershed research initiative is intended to integrate interdisciplinary knowledge on nutrients and energy and their sources and pathways within the Kenai River watershed, and link the cycle of nutrients / energy with watershed and resource productivity among terrestrial, freshwater and marine systems within the larger Gulf of Alaska ecosystem. The project will involve long term research to develop integrative science and to communicate and transfer knowledge to a broad group of partners and stakeholders. The science and information will allow us to better manage diverse ecosystems in the Kenai River watershed and potentially provide a template for other watersheds towards sustainable multiple resource development.

The objectives of this proposal include:

1. continue to identify and gather support and collaboration from local, state and federal stakeholders;
2. collect and communicate stakeholder perspectives on watershed issues, research questions, sustainable resource management in the Kenai River watershed and GOA;
3. create a white paper which presents scientific issues and interests in a simple plan for broad political, agency and stakeholder distribution and communication to gather interest and support;
4. use of an additional year of time to maintain and create dialogue and interests beyond the initial research planning process;
5. develop a detailed future research program
6. develop an effective management structure for a larger research initiative
7. develop specific project outlines for component research;
8. develop funding sources and opportunities;
9. create a schedule of short and long term research deliverables for the larger research initiative.

## ***B. Procedural Methods***

This proposal will use the following methods to deliver a detailed research plan, management structure, funding protocols and ongoing communication to the KRW contact list and interested stakeholders, community groups, researchers and agencies.

These methods include:

1. monthly email update to KRW contact list
2. 2 directed workshops
3. technical bulletins
4. dedicated web site with existing information on KRW
5. research documents including: white paper, detailed research plan, study outlines, research deliverable schedule and funding protocols and opportunities.

## ***C. Statistical Methods***

Not applicable for this proposal. One of the deliverables of this proposal will be detailed research outlines with in depth statistical methods.

## ***D. Description of Study Area***

The Kenai River watershed provides a unique setting for interdisciplinary research on a coastal watershed with a mixture of clear, glacial, wetland and salmon based ecosystems. Very few other Alaskan watersheds of this size and scale exhibit such varied terrestrial, freshwater and estuarine landscapes. The watershed is 5,054 km<sup>2</sup> in area, with a diversity landscapes and habitats; six important species of salmonids; six abundant mammal species; and large forested and natural areas.

Nutrients such as phosphorus and nitrogen enter the watershed from a variety of marine, terrestrial and atmospheric sources. Meltwater from headwater glaciers also contributes nutrients and large amounts of rock flour and silt to the drainage. The largest lakes in the system (Kenai and Skilak) function as important buffers to variations in river discharge, silt and nutrient loading from the upper watershed. These lakes are the main nursery habitat for juvenile sockeye salmon, the most abundant salmon stock in the watershed. The river channel below the largest lake (Skilak) is low gradient and meanders through wetland bogs. The wetlands, and the tributaries which drain them, are nutrient rich relative to portions of the upper watershed, and provide complex habitats in support of chinook, coho, chum and pink salmon, and a diversity of wildlife species including moose, bear and wolves. On average over one million salmon, smelt and other anadromous fish enter the drainage annually to spawn and die, leaving marine-derived nutrients (phosphorus and nitrogen), lipids and proteins from carcasses throughout the watershed. A major challenge is to characterize, quantify, model and predict the role of marine-derived nutrients in supporting and sustaining aquatic and terrestrial productivity and their benefits to other natural resources, species biodiversity, ecosystem health and human use within the Kenai River watershed.

***E. Coordination and Collaboration with Other Efforts***

This proposal is an extension of FY 02 EVOS funded 02612, “Detecting and understanding marine-terrestrial linkages in a developing watershed: Nutrient Cycling in the Kenai River Watershed”. The goal of this second proposal is to augment the broad research planning approach developed in the initial Kenai River watershed research planning project (02612). The research initiative has gained considerable support and we wish to use this momentum to support the final stages of the research program’s development by completing a detailed research program with management structure, specific project outlines, funding, and short and long term project and research deliverables. The goals of this proposal and the future research program in the Kenai River watershed, estuary and associated nearshore marine habitats are consistent with GEM program including “cross-habitat tools and strategies” and “habitats” topics to build research and synthesis projects, to model nutrient and energy dynamics and facilitate community involvement across a broad set of terrestrial, freshwater, coastal marine and Gulf of Alaska habitats.

The completion of this project will allow the research team to effectively connect and collaborate with existing research efforts to compile and synthesize the influence of direct (marine derived nutrients through returning salmon and land use planning) and indirect (climate) influences of the Gulf of Alaska on terrestrial and freshwater components of Alaskan watersheds.

The present Kenai River watershed research group is structured to support a balanced management and collaboration structure through Scientific and Public Advisory Committees with broad membership (Table 1). This proposal is intended to extend and balance the participation of stakeholders from various communities of interest and place in this research initiative. It is the ultimate goal of this research initiative to develop effective research questions and directed projects to provide better information for informed decision making towards sustainable management of multiple resources and human land use activities in the Kenai River watershed.

**Table 1: Project planning and coordination (will continue to change with interest and participation – March 2002)**

<b><i>Management</i></b>	Interests / Expertise	Affiliation
Asit Mazumder – Project Leader	Nutirent / energy pathways, aquatic fodwebs	UVIC
Jim Edmundson – Project Leader	Lakes, freshwater, food webs	ADF&G
Mark Johannes - Coordinatior	Terrestrial – aquatic links, Ecosystems/ watersheds	UVIC
Bill Hauser – ADF&G Manager	Aquatic ecology, GEM	ADF&G
<b><i>Public Advisory Committee</i></b>		
James Brady		ADF&G - Commercial
		ADF&G - Sportfishing
Gary Fandrei		Cook Inlet Aquaculture Association.

Brett Huber		Kenai River Sportfishing Association
Randy Hagenstein		The Nature Conservancy
Phil North		US - EPA
	To be named	Trout Unlimited
	To be named	US Fish and Wildlife
	To be named	Kenai Peninsula Borough
	To be named	Commercial Fishing Group
<i>Science Advisory Committee</i>		
Keith Boggs	Wetlands, terrestrial interface	Alaska Natural Heritage Program, U. of Alaska, Anchorage
Robert deVelve	Forest, Terrestrial	USDA Forest Service
Kris Hundertmark	Wildlife - terrestrial	ADF&G
Russ Hopcroft	Nearshore Marine	U. of Alaska, Fairbanks
Tom Kline	Nutrient, energy geochemistry	Prince William sound Science Center
Sandy Milner	Streams, glaciers, terrestrial	U. of Alaska, Fairbanks
Jason Mouw	Terrestrial – aquatic hydrologic interaction	ADF&G
John Richardson	Streams, benthos	U. of British Columbia
Daniel Schindler	Nutrients, food webs	U. of Washington
To be named	GIS Modeling	

#### ***IV. SCHEDULE***

##### ***A. Project Milestones***

The objectives of this proposal include:

- continue to identify and gather support and collaboration from local, state and federal stakeholders; [Ongoing FY 03]
- collect and communicate stakeholder perspectives on watershed issues, research questions, sustainable resource management in the Kenai River watershed and GOA; [FY03 Dec, 30, 2002, April 30, 2003 Sept 30, 2003]
- create a white paper which presents scientific issues and interests in a simple plan for broad political, agency and stakeholder distribution and communication to gather interest and support; [for public distribution and review April 2003, finalize May 2003]
- use of an additional year of time to maintain and create dialogue and interests beyond the initial research planning process; [ongoing FY 03]
- develop a detailed future research program [June 2003]
- develop an effective management structure for a larger research initiative [June 2003]
- develop specific project outlines for component research; [June 2003]
- develop funding sources and opportunities; [June 2003]
- create a schedule of short and long term research deliverables for the larger research initiative [June 2003].



## ***B. Measurable Project Tasks***

FY 03, 1st quarter (October 1, 2002-December 31, 2002)

- Monthly progress update for distribution to KRW contact list
- Communication bulletin #3 (2 have already been produced) – research ideas and interests to date (see attached bulletins as examples)
- KRW Website to act as repository for existing research ideas and update
- 1<sup>st</sup> Scientific and Public Advisory Workshop December 2002

FY 03, 2nd quarter (January 1, 2003-March 31, 2003)

- January 13-17: Annual EVOS Workshop (joint symposium with GLOBEC and NMFS)
- Monthly progress update for distribution to KRW contact list
- Communication bulletin #4 – research ideas and interests to date
- KRW Website to act as repository for existing research ideas and update
- Draft document – specific research action plan, potential funding sources

FY 03, 3rd quarter (April 1, 2003-June 30, 2003)

- 2<sup>nd</sup> Scientific and Public Advisory Workshop April 2002
- White paper research planning document for broad distribution
- Monthly progress update for distribution to KRW contact list
- KRW Website to act as repository for existing research ideas and update

FY 03, 4th quarter (July 1, 2003-September 30, 2003)

- Monthly progress update for distribution to KRW contact list
- Communication bulletin #5
- KRW Website to act as repository for existing research ideas and update
- Final document completion
- Funding alternatives and approaches
- Detailed study project plans, collaborators, research management structure, research deliverables timetable.

## ***V. RESPONSIVENESS TO KEY TRUSTEE COUNCIL STRATEGIES***

### ***A. Community Involvement and Traditional Ecological Knowledge (TEK)***

At present our KRW contact list incorporates 69 individual contacts from 36 different stakeholder groups and agencies. Our project is sensitive to ongoing information dissemination and communication and will endeavor to maintain ongoing and establish new stakeholder interest and support. We recognize that involving local communities in KRW research planning is extremely important we will make this a top priority throughout the delivery of this proposal.

## ***B. Resource Management Applications***

This research proposal and the final research initiative in the watershed is not intended to explicitly deliver management solutions for terrestrial, freshwater, fisheries and marine resource and human use issues. However, the intent of this research is to allow perspective management agencies and stakeholders to support informed decision making towards sustainable ecosystem management in the watershed and marine areas of influence to the Kenai River.

## ***VI. PUBLICATIONS AND REPORTS***

The following reporting will be delivered through this proposal:

- Technical bulletins – Scientific and Public advisory committee review
- White paper for broad distribution
- Published and peer reviewed final research study plan
- Web site.

## ***VII. PROFESSIONAL CONFERENCES***

Not applicable

## ***VIII. PERSONNEL***

### ***A. Principal Investigator (PI)***

Project Leader: Responsible for delivery of all project objectives.  
Asit Mazumder, University of Victoria, P.P. Box 3020, Stn. CSC, Victoria, BC V8W 3N5,  
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ADF&G and Kenai River watershed primary contact:  
Jim Edmundson, ADF&G – Commercial Fisheries, 43961 Kalifornski Beach Road, Soldotna,  
AK 99669, 907-267-2917 (Ph), [jim\\_edmundson@fishgame.state.ak.us](mailto:jim_edmundson@fishgame.state.ak.us)

Project Manager – EVOS primary contact:  
William J. Hauser, ADF&G – H&R, 333 Raspberry Road, Anchorage, AK 99515, 907-267-  
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### ***B. Other Key Personnel***

Mark R.S. Johannes Ph.D., Department of Biology, University of Victoria, P.P. Box 3020, Stn.  
CSC, Victoria, BC V8W 3N5, 250-472-4789(Ph), 250-472-4766(Fx),  
[mark@ecosystems.bc.ca](mailto:mark@ecosystems.bc.ca) - science, workshop facilitation and communication

See Table 1.

### C. Contracts

Not applicable

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## IX. PRINCIPAL INVESTIGATOR QUALIFICATIONS

### A)

Asit Mazumder, Ph.D., Professor  
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### EDUCATION

1990	NSERC PDF - Trent University, Peterborough, Ontario
1989	PDF - National Water Research Institute, Canada
1989	Ph.D. – University of Waterloo, Waterloo, Ontario
1983	M.Sc. – Brock University, St. Catharines, Ontario
1980	M.Sc. – University of Chittagong, Bangladesh
1978	B.Sc. – University of Chittagong, Bangladesh

### EXPERIENCE

2000-present	NSERC-IRC/Professor	Biology, University of Victoria
1999-2000	NSERC Senior Chair/Associate Professor	Biology, University of Victoria
1999-present	Adjunct Professor	Sc. Biol U. de Montreal.
1997-1998	Visiting Professor	University of Victoria
1995-1999	Associate Professor	Université de Montréal
1995-1998	Director, Station de Biologie	Université de Montréal
1991-1994	Assistant Professor	Université de Montreal
1989	Research Professional Environment Canada.	NWRI, Burlington, Ontario
1980	Lecturer in Zoology	University of Chittagong

### RESEARCH INTERESTS

During the last 10-12 years, Dr. Mazumder has published over 40 peer-reviewed papers in international journals, made 100 invited, plenary and conference presentations, served as associate editors of several international journals, as committee members for provincial and national granting agencies and as advisory members in several government panels. His major areas of research expertise are nutrient-foodweb dynamics, salmon ecology, isotope biogeochemistry, water quality, microbial ecology, contaminant transport, ecosystem and watershed ecology and plant biodiversity. In 1999, Dr. Mazumder joined University of Victoria as the NSERC-Industry Senior Research Chair in Environmental Management of Drinking Water. The major focus of this Research Chair Program is to develop the understanding, models and techniques linking ecosystem and watershed process with the quality of water at the source and their relationships with the chemical and biological quality of water. His current research focuses are in the area of nutrient-foodweb dynamics of sockeye systems and ecosystem and watershed ecology relating land-use and water-use patterns to water quality. His inter-disciplinary expertise in ecosystem and watershed ecology for fisheries and water quality, his experience in partnership research with industries, NGOs and Government, and his experience in leading large inter-disciplinary research programs makes him qualified as a PI of this proposal.

## RECENT PUBLICATIONS

- Mazumder, A. and J. Edmundson, 2002. Impacts of nutrients and stocking on the patterns of trophic interaction and productivity of juvenile sockeye salmon. *Can. J. Fish. Aquat. Sci.* 59: 1361-1373.
- Weng, Z., N. Mookerji and A. Mazumder, 2001. Nutrient-dependent recovery of Atlantis salmon streams from catastrophic flood. *Can. J. Fish. And Aquat. Sci.* 58: 1672-1682.
- Choi, J., A. Mazumder, and J. Hansell, 1999. Measuring perturbation in a complicated thermodynamic world. *Ecological Modeling* 117: 143-158.
- Mookerji, N., A. Mazumder, Z. Weng, M.A. Rodriguez, and J. Rasmussen, 1998. Interspecific Interactions between salmonids: Implications for nutrient enrichments. *J. Am. Fish. Soc.* 38: 7-11.
- Mazumder, A., W.D. Taylor, and D.J. McQueen, and D.R.S. Lean, 1990. Effects of fish and plankton on lake temperature and mixing depth. *Science* 247: 312-315.
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## **B)**

Jim Edmundson, M.Sc., Fisheries Biologist

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## EDUCATION

- 2000-Present Ph.D. Candidate – University of Victoria, Victoria, BC
- 1995-1997 M.Sc. University of Alaska Fairbanks, Fairbanks, Alaska USA
- 1973 – 1977 B.Sc. University of Vermont, Burlington, Vermont USA

## EXPERIENCE

- |              |                              |                 |
|--------------|------------------------------|-----------------|
| 2000-present | Fisheries Biologist          | Soldotna, ADF&G |
| 1998-2000    | Project Limnologist          | Soldotna, ADF&G |
| 1984-1998    | Fisheries Research Biologist | Soldotna, ADF&G |

## RESEARCH INTERESTS

My research focuses on nutrient-foodweb dynamics in lake ecosystems with particular emphasis on the trophodynamics of sockeye salmon. I am attempting to demonstrate how nutrient cycling, foodweb structure, and lake typology differences determine the production of juvenile sockeye salmon. My approach centers on comparing trophic interactions and growth of juvenile sockeye salmon across a broad spectrum of Alaskan lakes. The desired outcome of my research will yield habitat-based carrying capacity and salmon-spawner recruitment models, which may lead to improved escapement management of salmon stocks.

## PUBLICATIONS

- Edmundson, J. A. and A. Mazumder. 2002. A regional and hierarchical perspective of thermal regimes in subarctic, Alaskan lakes. *Freshwater Biology* 47:1-17.
- Edmundson, J. A. and A. Mazumder. 2001. Linking growth of juvenile sockeye salmon to temperature in Alaskan lakes. *Transactions of the American Fisheries Society* 130:644-662.
- Edmundson, J. A., V. P. Litchfield, G. L. Todd, J. M. Edmundson, and L. Brannian. 2000. Central Region Limnology 2000 annual report of progress. Ak. Dept. Fish. and Game, Regional Information Report No. 2A00-27:25p.
- Edmundson, J. A., D. C. Schmidt, S. R. Carlson, and G. B. Kyle. 1999. Alaska lake fertilization program: restoration and enhancement of sockeye salmon. Pages 49-82, *in* Proceedings by J. G. Stockner and G.

Milbrink [editors] *Restoration of Fisheries by Enrichment of Aquatic Ecosystems*. International Workshop, Uppsala University. Uppsala, Sweden.  
Edmundson, J. A. and S. R. Carlson. 1998. Lake typology influences on the phosphorus-chlorophyll relationship in subarctic, Alaskan lakes. *Lake and Reservoir Management* 14:440-450.

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## C)

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## EDUCATION

1973 Ph.D. – University of Maine, Orono, Maine  
1968 M.Sc. – Montana State University, Bozeman, Montana  
1965 - B.Sc. – University of Wisconsin, Madison, Wisconsin

## EXPERIENCE

1994 – present Fishery Biologist IV. ADF&G, Habitat and Restoration Division  
1980-1994 Fishery Biologist IV. ADF&G, Commercial Fisheries Division

## RESEARCH INTERESTS

Bill Hauser has had a continuing interest in studies of life history, ecology, and habitat utilization by stream fishes and the dependencies of freshwater and marine resources for anadromous fish. One recent project focused on the importance of the entire watershed to provide different habitats for different species of fish, during different life stages, and different seasons.

## RECENT PUBLICATIONS

Hauser, W. J. and E. W. Weiss. 2001. Landowners Guide to Fish Habitat Conservation and Restoration Practices. Alaska Department of Fish and Game. Habitat and Restoration Division. Technical Report No. 01-3.  
Hauser, W. J., M. J. Fink, D. W. Hughes, P. A. Hansen and R. A. Clark. 2000. Kenai River Rehabilitation and Protection Program: Assessment of Streambank Habitat Treatments. Alaska Department of Fish and Game. Habitat and Restoration Division Technical Report No. 01-1.  
Hauser, W. J. 2000. Annotated bibliography of juvenile salmon rearing habitat: selected references. Alaska Department of Fish and Game. Habitat and Restoration Division.  
Hauser, W. J. 2000. Ecological Considerations for On-Bottom Aquaculture of Littleneck Clams (*Protothaca staminea*) in Kachemak Bay, Alaska: A Literature Review. Alaska Department of Fish and Game. Habitat and Restoration Division.  
Hauser, W. J. 2000. Ecological Considerations for On-Bottom Aquaculture of Littleneck Clams (*Protothaca staminea*) in Kachemak Bay, Alaska: A Literature Review – Bibliography with Annotations. Alaska Department of Fish and Game. Habitat and Restoration Division.

## ***X. LITERATURE CITED***

Boggs, K., J. C. Davis, A. M. Milner. 1997. Aquatic and terrestrial resources of the Kenai River watershed : a synthesis of publications. U.S. Environmental Protection Agency, Region 10,, Seattle, WA.

Cederholm C J, Johnson DH, Bilby RE, Dominguez LG, Garrett AM, Graeber WH, Greda EL, Kunze MD, Marcot BG, Palmisano JF, Plotnikoff RW, Percy WG, Simenstad CA, Trotter PC. 2000. Pacific salmon wildlife-ecological contexts, relationships, and implications for management. Special Edition Technical Report, Prepared for DH Johnson and TA O'Neil (Manag. Dirs.) Wildlife-Habitat Relationships in Oregon and Washington. Washington Department of Fish and Wildlife, Olympia.

Edmundson, J.A., A. Mazumder and W.J. Hauser. 2001. Detecting and understanding marine-terrestrial linkages in a developing watershed: Nutrient cycling in the Kenai River Watershed. Exxon Vadex Oil Spill Trustee Council funded proposal # 02612. Alaska Department of Fish and Game, and University of Victoria. June 2001. 14p.

Edmundson, J.A., T.M. Willette, J. M. Edmundson, D.C. Schmidt, S.R. Carlson, B.G. Bue, and K.E. Tarbox. 2002. Sockeye salmon overescapement (Kenai River component). Restoration Project 96258A-1 Unpublished Report (In review). Alaska Department of Fish and Game, Soldotna, 58p.

Gresh, T, J. Lichatowich, and P. Schoonmaker. 2000. An estimation of historic and current levels of salmon production in the Northeast Pacific ecosystem: Evidence of a nutrient deficit in the freshwater systems of the Pacific Northwest. *Fisheries* 25(1):15-21.

Johannes, M.R.S., Mazumder, A. and J. A. Edmundson. 2002. Nutrient cycling in the Kenai River Watershed: detecting and understanding marine-terrestrial linkages in watersheds. January 2002. University of Victoria, Victoria, BC. Technical Bulletin 2(1):8p. ISSN 1492-5532

Johannes, M.R.S., Mazumder, A. and J. A. Edmundson. 2002. Nutrient cycling in the Kenai River Watershed: detecting and understanding marine-terrestrial linkages in watersheds. March 2002. University of Victoria, Victoria, BC. Technical Bulletin 2(2):6p. ISSN 1492-5532

Larkin, G. A., and P. A. Slaney. 1997. Implications of trends in marine-derived nutrient influx to south coastal British Columbia salmonid production. *Fisheries* 22 (11):16-24.

Naiman, R.J., R.E. Bilby, D.E. Schindler, and J. M. Helfield. 2002. Pacific salmon, nutrients, and the dynamics of freshwater and riparian ecosystems. *Ecosystems* 5:399-417.

Willson, M. F., and K.C. Halupka 1995. Anadromous fish as keystone species in vertebrate communities. *Conservation Biology* 9:489-497.

## Signature Form

**THIS FORM MUST BE SIGNED BY THE PROPOSED PRINCIPAL INVESTIGATOR AND SUBMITTED ALONG WITH YOUR PROPOSAL.** If the proposal has more than one investigator, this form must be signed by at least one of the investigators, and that investigator will ensure that Trustee Council requirements are followed. Proposals will not be reviewed until this signed form is received by the Trustee Council Office.

By submission of this proposal, I agree to abide by the Trustee Council's data policy (*Trustee Council/GEM Data Policy\**, adopted July 9, 2002) and reporting requirements (*Procedures for the Preparation and Distribution of Reports\**, adopted July 9, 2002).

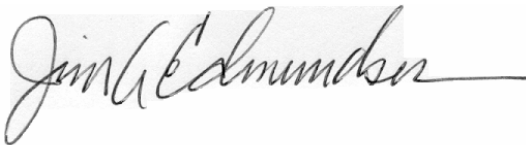


September 4, 2002

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Signature of PI

Date



September 3, 2002

Signature of co-PI

Date

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Signature of co-PI

Date

\* These documents are available on the web at [www.oilspill.state.ak.us](http://www.oilspill.state.ak.us) or upon request from the Trustee Council Office.

**EXXON VALDEZ OILSPILL TRUSTEE COUNCIL  
PROJECT BUDGET**

<b>Budget Category:</b>	Proposed FY 03					
Personnel	\$51.0					
Travel	\$24.0					
Contractual	\$7.5					
Commodities	\$0.0					
Equipment	\$0.0					
Subtotal	\$82.5					
General Administration	\$7.4					
Project Total	\$89.9					
Other Funds	\$30.0					
<p>Comments:</p> <p>Personnel - coordination and leadership, ongoing communication, synthesis / analysis - writing</p> <p>Travel - 2 workshops and travel for Scientific and Public Advisory / stakeholder interests - Approximately 12 individuals travelling to Kenai to discuss details</p> <p>Contractual - communication and printing costs</p> <p>Additional - at least \$30K in matching funds will support this proposal development.</p> <p><b><u>NOTE: The total cost for this project is \$89.9. The amount provided by the EVOS TC is \$59.9.</u></b></p> <p>EVOS funding: \$59.9            Matching funds: <u>\$30.0</u>            Total cost: \$89.9</p>						

**FY 03**

Received 9/4/02

**Project Number:** G-030684  
**Project Title:** Towards sustainable management in Kenai River watershed: linking human and resource development with nutrient and energy pathways across terrestrial, aquatic and marine systems.  
**Agency:** ADF&G, UVIC



**EXXON VALDEZ OILSPILL TRUSTEE COUNCIL  
PROJECT BUDGET**

<b>Personnel Costs:</b>		GS/Range/ Step	Months Budgeted	Monthly Costs	Overtime	Personnel Sui
Name	Description					
						0.0
Asit Mazumder	Project Investigator		6.0	1.8	0.0	10.8
Mark Johannes	Coordinator		6.0	4.6	0.0	27.6
Assistant - to be named	Assistant		6.0	2.1	0.0	12.6
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
Subtotal			18.0	8.5	0.0	
<b>Personnel Total</b>						<b>\$51.0</b>
<b>Travel Costs:</b>		Ticket Price	Round Trips	Total Days	Daily Per Diem	Travel Sui
Description						
						0.0
Research Plan Workshop Travel		0.6	14	3	0.2	9.0
Research Plan Workshop Travel		0.6	14	3	0.2	9.0
Car Rental				6	0.2	1.2
						0.0
						0.0
						0.0
Annual EVOS Workshop attendance Jan 13-17, 2003		0.7	3	6	0.2	3.0
Annual EVOS Workshop attendance Jan 13-17, 2003		0.3	1	6	0.2	1.8
						0.0
						0.0
<b>Travel Total</b>						<b>\$24.0</b>

**FY 03**

Prepared:

**Project Number:**  
**Project Title:** Towards sustainable management in Kenai River watershed:  
 linking human and resource development with nutrient and energy pathways across  
 terrestrial, aquatic and marine systems.  
**Agency:** ADF&G, UVIC

**EXXON VALDEZ OILSPILL TRUSTEE COUNCIL  
PROJECT BUDGET**

<b>Contractual Costs:</b>		Contractual
Description		Sum
Communication - phone / fax / internet		1.1
Communication - printing		6.0
When a non-Trustee organization is used, the 4A and 4B forms are required.		<b>Contractual Total</b>
		\$7.1
<b>Commodities Costs:</b>		Commodity
Description		Sum
		<b>Commodities Total</b>
		\$0.0

**FY 03**

Prepared:

**Project Number:**  
**Project Title:** Towards sustainable management in Kenai River watershed:  
 linking human and resource development with nutrient and energy pathways across  
 terrestrial, aquatic and marine systems.  
**Agency:** ADF&G, UVIC

**EXXON VALDEZ OILSPILL TRUSTEE COUNCIL  
PROJECT BUDGET**

<b>New Equipment Purchases:</b>		Number of Units	Unit Price	Equipmen Su
Description				
				0.0
				0.0
				0.0
				0.0
				0.0
				0.0
				0.0
				0.0
				0.0
				0.0
				0.0
				0.0
				0.0
Indicate replacement equipment purchases with an R.			<b>New Equipment Total</b>	\$0.0
<b>Existing Equipment Usage:</b>			Number of Units	Inventor Agenc
Description				

**FY 03**

Prepared:

**Project Number:**  
**Project Title:** Towards sustainable management in Kenai River watershed:  
 linking human and resource development with nutrient and energy pathways across  
 terrestrial, aquatic and marine systems.  
**Agency:** ADF&G, UVIC