CRA Mini-Grant Proposal

Submitted 9/30/02

By

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Kotzebue High School
Kotzebue, AK

CRA Mini Grant Application Form
(Project Control Number – to be assigned by CRA:_____)

1. Contact Information:

Name of Project Leader: Sandra Sumrall-Lloyd

Executive Summary

The proposed project targets the salmon resources. Several inter-related topics will be addressed dealing with the actual life cycle – from egg to fry- as well as water quality testing, stream mapping and DNA studies looking at the Major HistoCompatability genes of collected salmon. Participants will include all science classes at the high school level (approximately 130 grades 9-12) as well as 20 middle school students (grades 6-8). The biology classes and the field biology class will carry out the majority of the work. The earth science class will complete some mapping of streams and local salmon routes. Middle school students will be responsible for maintenance of the salmon tank.

People living in the Northwest Arctic rely on salmon as an important food source. This project is designed to increase the awareness of how salmon develop, some of the genetic factors that may be important to the fish population, as well as where they may develop so that care can be taken to protect those areas.

The project exercises will enhance not only the science skills of the participants but also mathematics components will be targeted. The project will allow students to apply both science and math skills to regional issues; applying scientific method, data collection, identification and interpretation. They will be collect data from local area and will address the issues of Natural Resources in their own back yard. The final reports will also include regional, statewide, and global issues that may impact this important food source.

Project Need:

Salmon are an important food source for the Northwest Arctic Borough that consists entirely of rural villages. They are eaten fresh as well as being dried and smoked for winter food. Because of their valued roll as a subsistence food, anything that might negatively impact the salmon production should be important to the entire community. With changing land use, increased population and the impact of outside pollution, sport fishing, etc., community education about salmon has become more important. In addition, baseline data about the local conditions and the local salmon gene pool are equally needed.

This project could begin to address some of these issues. The hatchery aquarium, which would be available for the community to see, would give many people a chance to observe the different stages. Posters and information at each stage would focus on the particular vulnerabilities of that stage again increasing community awareness. This would be especially true of the early stages that many people have never observed.

Determining some baseline data on water quality of local streams may be used to assist communities in keeping these streams clear of pollution. Mapping watersheds could help avoid pollutant run off issues or sewage disposal problems that may not have been identified.

The genetic studies, although not definitive at this level, would be used to focus on the problems of releasing fish inappropriately, or introducing alien salmon into the existing population. The information would be presented in such a way that everyone would have a basic understanding of the issue.

Project Description:

Primary goal – to increase the level of student and community understanding of the biology and importance of the natural resource salmon represent to the region and its subsistence lifestyle. In the process students will increase science and mathematics understanding using regional and local applications of their skills.

In order to reach the primary goal of this project the following objectives will be met:

1. Students will understand scientific facts, concepts, principle, and theories relating to the natural environment
    a. *understand transfers and transformations of matter and energy that link living things and their physical environment, from molecules to ecosystems.*

Students will study the environment needed by the salmon to successfully reproduce. This will mean learning about water chemistry, energy flow through ecosystems, predator – prey relationships and how to protect the water shed. In order to do this, they will take water samples and use usual water quality tests. Testing will be done weekly as long as water samples from local salmon waters can be obtained. Water from the hatchery tank will also be tested routinely and comparisons made. Discussions of water chemistry will be carried out and posters made to illustrate proper environmental parameters needed. Once fry are being fed, students and the community will follow the food use, how waste is taken care of in the tank, and growth of the fish will be charted. A food web will be constructed showing the relationship of the salmon -egg to fry -to other organisms in the environment.

    b. *Understand that similar features are passed on by genes through reproduction*

The genetic studies will include basic information on genes and heredity. Students will then take this information and apply it using the extraction of DNA, use of primers to locate and sequence MHC sites, and mapping of those sites. Further studies could be done to look at population genetics. This portion of the project will involve collaboration with University of Alaska, Fairbanks who will provide primers. Equipment needed for the DNA extraction and sequencing is already on site for a project involving similar studies with caribou. This work was started on site last year.

c. *Understand the theory of natural selection as an explanation for evidence of changes in life forms over time.*

Students will study the life cycle of the salmon and the environmental pressures they face. This will be tied in to the theory of natural selection. Particular work will be presented on the development of the unique salmon life cycle. Discussions and written material will study how predation can lead to certain characteristics being enhanced by being passed on to offspring. Students will try to determine why spawning in streams may be an advantage for survival of the salmon and why living in the sea might be an advantage to the adult.

d. *Understand the interdependence between living things and their environment, that all living environment consists of individuals, populations, and communities and that a small change in a portion of an environment may affect the entire environment.*

This objective will be met naturally along with the study of the salmon life cycle. It will be presented to the community as well during science fair and in community meetings at the end of the project. Science Fair projects will present different aspects of the study. Students will present their work to judges as well as the community at large. There will be an open house where community members view projects and ask questions of the participants. Projects will be presented at the High School for the local community, again at the District fair to the regional community, and finally at the State Fair in Anchorage.

e. U*se science to understand and describe the local environment*

Students will spend a large amount of time working in the local environment doing water quality studies, stream assessment, and watershed mapping. In addition, studies will be made of Alaska waterways to relate the local fish population to that of the state and the surrounding waters.

2. Students will possess and understand the skills of scientific inquiry

f. *Use the processes of science. Design and conduct scientific investigations using appropriate instruments.*

Students will be using the scientific method in their observations of the hatchery as well as designing experiments for studies of the waters and environments that impact the fish. Students doing the genetic work will follow published protocol using the latest technology.

g. *Understand that scientific inquiry often involves different ways of thinking, curiosity, and the exploration of multiple paths* .

Students and the community will be exposed to multiple types of experimentation from simple observation to complex technological techniques such as DNA extraction. By involving elders from the community, science staff from UAF, assistance from Parks and Wildlife, teachers, and input from other community members, participants will be exposed to many different ideas. A variety of approaches will be taken to collect data and carry out experimentation.

h. *Realize that ethics, integrity, appropriate skepticism, along with creativity, working together, and logical reasoning are needed for scientific investigations.*

Through exposure to written materials, other media materials, community resources and the like, students will need to assess the relevance of many materials. Through discussion and experience, students and the community will be able to personally evaluate the data and apply ethical standards. Students will collaborate between groups and take information gathered and evaluate it in an overall picture.

i. *Employ strict adherence to safety procedures in conducting scientific investigations.*

Students will be advised of all safety standards and will have appropriate supervision at all times.

2. Understand the nature and history of science

a. *Understand basic ideas of how scientific information is collected, validated, and shared. Realize that there are societal and cultural impacts of science and that scientific breakthroughs may effect beliefs and how new ideas are accepted by society*.

During their studies of the salmon life cycle, students will learn how early work was done and how new technology has allowed an increase in the information. They will see how science builds on known facts, and then through the scientific method continue to ask questions and search for answers. They will learn how new information about salmon and its uses, for subsistence, tourism, and commercially, has affected the fishery and controls on it.

Emphasis will be placed on the local knowledge about salmon and the environment in which they live. Elders will be consulted on past salmon catches, techniques used in the region and other relevant information. This will be done through interviews and at meetings. In addition, stories may be collected that have salmon as an important part of them and used to illustrate to students how cultural aspects such as storytelling can be used by science to learn scientific history or local facts.

3. Apply scientific knowledge and skills to make reasoned decisions about the use of science and scientific innovations.
    a. *apply scientific knowledge and skills to understand issues and everyday events.*

The nature of raising the salmon will meet this objective by showing the students and the community the science behind their important subsistence salmon fishing resource.

    b. *Recommend solutions to everyday problems by applying scientific knowledge and skills; evaluate the scientific and social merits of solutions to everyday problems; participate in reasoned discussions of public policy related to scientific innovations and proposed technological solutions to problems; and act upon reasoned decisions and evaluate the effectiveness of the action.*

Near the end of the project, all groups will come together to discuss the results and observations that have been made. Depending on these results, students and the community will discuss what, if anything should be done concerning the salmon fishing in the area. This discussion, along with discussions at the science fair projects, will allow students and the community to meet these objectives.

4. apply mathematical concepts and processes to situations within and outside of school
    a. *Explore problems and describe results using graphical, numerical, physical, algebraic, and verbal mathematical models or representations; use mathematics in daily life; use mathematics in other curriculum areas*

Students involved in all areas of the project will be using mathematical skills of various levels. Those maintaining the hatchery tank will have conversions to make, counts of eggs, hatching rates, fry survival, to determine percent survival, to make solutions and proper concentrations. They will also be charting the results to present to the community. Students doing the water quality studies will be using multiple mathematics skills and presenting graphical representations of their data. The DNA studies require making solutions, determining concentrations and models. Many of the skill they will be using will enhance current skills but new ones will also need to be acquired.

Overall, this project will show the relevance of science and math skills to the everyday world and the local environment. In addition, through the use of higher order thinking skills involved, students will be better prepared for further schooling. Their presentations will assist in building confidence and self-esteem and by providing a forum for discussion of an important local issue, both students and the community will realize they do have an impact on the environment.

Timeline:

Hatchery set-up and development from eyed eggs to fry – November - February

Daily monitoring, weekly meetings, weekly water assessment

DNA extraction – begins in November completed in early December

Samples will be obtained from tissues collected from local sources and/or fry

Weekly meetings and experimentation as samples are collected – DNA extraction takes 1 day, sequencing timing will depend on timing from UAF EPSCOR Lab.

Stream assessments – being in October and continue until samples can no longer be obtained due to ice.

Samples will be taken weekly and tests completed either in the field or as quickly as possible thereafter.

All work will be completed by February so that science fair projects can be completed.

March 17th – first presentation of science fair projects

March 22nd – District science Fair/Final Community Presentation

Partnerships, Roles and Commitments

Project Leader : Sandra Sumrall-Lloyd – Teacher, Kotzebue High School
Adjunct Instructor –Chukchi Campus

Project will be shared with CRA, Chukchi, Kotzebue High School, and the community through several open meetings as well as a web page. Notices will be made on the radio and on the scanner (community TV page) as well as flyers on public notice boards. It is hoped that at the end of the project a CD can be produced in addition to a video to be presented at the final meeting and at the science fair.

Sandra Sumrall-Lloyd

Proposed Budget	From Requested	Match
For Grant Year 2002 to 2003	Grant Funds	
Professional/Staff Costs	_____	____$520____
Travel	___$2252_____	_____$500____
Materials & Supplies	___$1589.40___	_____$475____
Computer Costs	____$ 230_____	_____
Other (ie Volunteer time)	____$ 415_____	_____$390____

Total $_6371.40_____ equals ____$4486.40___ plus $____1885_____

Professional/Staff Costs

Matching – substitute teachers during extended field work

- secretarial assistance for advertising of meetings, answering phone questions, calling to arrange meetings, speakers

Travel: As part of the Outreach plan, 3 students will be selected to attend the State Science Fair in Anchorage to present their findings and project results. One student from each aspect of the project will be selected. Travel funds also include costs for one chaperone. Airfare to Anchorage @ 400. Per diem 3 x $40, 1 x $56 for 2 days – based on NWABSD rates, lodging 2 nights $150 per night.

Matching - $500 – two vans to carry students to do field work. $25 x 2 for 10 trips

CRA funds ____$2252 Matching funds ___$500 Total $2752

Materials & Supplies:
Salmon Hatchery Tank with chiller and Supplies - $900 to be acquired from 4H/Cooperative Extension Service UAF This is the central item for the project. Eyed eggs will be obtained and raised in the tank with the chiller. Supplies will include pump, and filter, testing materials, food, and miscellaneous maintenance equipment.

Stand for aquarium to be built locally $100 (estimate only)

Miscellaneous equipment $100 – video tapes, batteries, rubber gloves, microscope slides etc., special computer photo paper

2 Teaching-Photographic Tanks - $70.40 (Carolina Biological TR-18-2250) This is a special tank that allows viewing of aquatic organisms without killing or damaging them. It also can be used to photograph the animals. It will be used by the students in the project for photography as well as taking measurements of the fry.

GPS - $245 (Carolina Biological RG-18-1032) The GPS will be needed during the stream assessment studies to give exact locations of the sites being tested.

10 Presentation Boards with headers $70 (Educational Products Inc.) To be used for presentations to the community as well as the science fair presentations.

Flexcam Teaching Camera $995 (Carolina Biological RG-59-1742) Main equipment to be used for class observation of the hatching salmon. It will also be used to video important events (egg development, hatching, change to fry) to be shown at community presentations. In addition, it will be used to show and film collected small aquatic organisms that may be important to the salmon in the natural environment.

Matching: $100 office supplies – photocopies, paper, pens, markers, paper, poster paper, colored pencils, computer photography printing
$200 consumable chemical supplies for DNA studies, water testing
$ 50 disposable pipettes, sample tubes, sample vials, droppers
$ 25 cleaning supplies, paper towels, chem.-wipes,
$100 presentation boards, laminating, colored paper for presentations

CRA funds ____$1589.40 Matching funds ___$475 Total $2064.40

Computer Costs:
$230 – Handheld with keyboard – for data collection/notes in the field that can be easily transferred to school computers. Priced from Office Max catalog - Palm m500

CRA funds ____$230 Matching funds ___$0 Total $230

Other: $30 honorarium x 3 Traditionally, elders are given a small honorarium for taking their time to come to speak to classes.
$30 x 5 Drivers will be needed for the vans to take students to stream sites.
$100 – coffee/snacks at community get togethers
$ 75 – carpenter to build stand

Matching
Volunteers $150 – drivers for vans (parents, interested community members)
$ 40 – set-up for community meetings (2 x $20/hr)
$100 – technical assistance – Ms Katie Walker (computer technology)
$100 – technical assistance - Ms Emily Bach (mathematics

CRA funds ____$415 Matching funds ___$390 Total $805

Outreach Plan –

Initial outreach will be through public notices on the radio (KOTZ) and in the regional paper (The Sounder) that we are starting the project. The initial community wide meeting will also be announced on the scanner channel (community notices) of the local cable company.

Noorvik School has an active salmon hatchery tank, and it is planned to connect with the teacher in charge of their tank as mentor. Both schools have recently acquired equipment for video conferencing and we would set up times to do so to compare data from our tanks. This would increase the range of the project for our students. In addition, two new teachers at Kotzebue High School, Ms Emily Bach (mathematics) and Mrs. Katie Walker (technology) have agreed to "get involved" if we receive the grant. Mr. Frank Lynott (English) has also agreed to assist as a volunteer to help with the student writing component of the project.

The entire High School staff, including those named above and others, is excited about the prospect of this grant and how we might work together to get students interested in science in the "real world" as well as work across curricula. Ms Lynn Bates (art teacher) is interested in helping the students with posters and drawings. All but one of these teachers is new to Kotzebue and they are enthusiastic but reluctant to take on the declared responsibility: Hence, only one name on the Project.

The community of Kotzebue is very active at the school. The project will reach them easily through the posters and displays that will be up when they come to athletic meets and games. The school is really the center of the community. Meetings and pot lucks are well attended and the community members are interested in what the students are doing. The Science Fairs (High School and District) are also well attended. Last year there were over 100 projects and several hundred people saw the displays. A presentation is planned to be shown just before the awards ceremony and should have good attendance.

Finally, ongoing reports will be sent to The Sounder, and placed on the schools web page. If technology allows, the web page will also have video clips of what is happening. There is also a school newspaper that is published monthly. I have asked the advisor if there could be a small column designated for the project and he has agreed. Students will be writing the column as well as the information for the newspaper and radio announcements.

Evaluation Plan:

The evaluation of reaching the primary goal will be judged at the science fair to see if students have met the content objectives and observe community interest and questions. Evaluations will also be completed during the project for each of the three components.

Students will be given a short pre-test to determine their initial level of understanding as well as specific content items. At the first community meeting, a survey will also be taken asking a few questions about the salmon life cycle and its interconnectedness with the local environment.

This objective will be assessed through evaluation of the accuracy of the posters presented as well as questioning and reports created. Actual maintenance of the hatchery tank will be a performance evaluation through the use of a check list including such items as: was the tank kept clean without constant reminders, was feeding schedule and water check schedules followed.

Understanding of the genetics component will be evaluated through the students interpretation of the data they collect as well as reports and presentations. In addition, observation of experimental techniques and specific item questioning will be carried out to include performance testing. This will also be used to evaluate the stream assessment and water quality work. There will be deadlines and preliminary reports due in order to make sure students are staying on task and on time.

At the close of the project, students will again take a test to evaluate their level of understanding. As well, the survey will again be given at the final community meeting with the additional item asking if the individual took the survey before.

Sandra Sumrall-Lloyd

Required approvals

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Signature of Project leader Date

_____

Signature of School Principal Date

_____

Signature of CRA Campus Director Date