Native American Science Research and Education Program

Indian Summer VI

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Indian Summer VI

Cultural diversity is like an orchestra. Each cultural group, like each instrument, retains its identity, making its own kind of music. Nevertheless, it becomes part of the whole, which would not be as beautiful without it.

The staff at Shoshone-Bannock High school and mentors are helping students understand that though cultures are different, no one culture is superior to another; that each culture benefits our society as a whole; and that we all benefit from the ethnic and culture diversity of American society. We must all work toward developing a society that respects the worth of every individual. We must make allowances for difference. Let people be glad to be different (Gilliland 1988).

The Shoshoni Indians once roamed over vast stretches of mountains and sagebrush-covered plains in what are now Idaho, Utah, Nevada, western Montana, and Wyoming. Theirs was a land of creeks and rivers, hot and cold springs, valleys and meadows. The Bannock Indians lived in the same area, but spoke a different language. The two tribes often camped and hunted together, or gathered in the Snake River bottoms for great festivals of singing, dancing, and storytelling (Heady 1973).

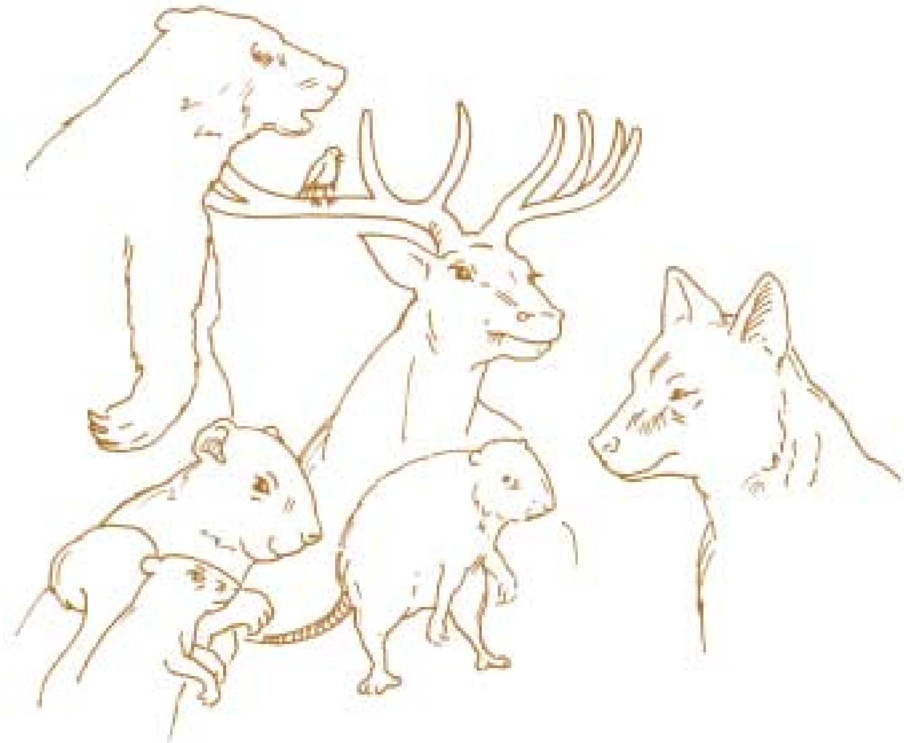
Storytelling was a form of entertainment and teaching. The Indians had no written language. Traditions were passed on by the storytellers, men and women trained to teach the children and to amuse everyone. On long winter days, the storytellers gathered the sagebrush fire in a tipi and told the tales of their fathers.

Many of the stories were legends, some told of the tribal religion, still others were just for fun and entertainment. All had lessons to be learned. The tale we share is mostly for fun and education. (Heady) 1973.

“With one mind we address our acknowledgement, respect, and gratefulness to all the sacred Cycle of Life. We, as humans, must remember to be humble and acknowledge the gifts we so freely receive in our daily lives” (Audrey Shenandoah).

The fire is ready; come and hear our story!

The Seasons



Once very long ago before everything was planned and finished, the animals held a council in wikiup of Ejupa, the coyote, to decide on the seasons; how much winter, how much summer, how much spring, how much fall.

Ejupa called the meeting to order and began a long speech. “We need ten moons of summer,” he insisted. “That would give us lots of time to hunt, and we wouldn’t have to fight the snow and the cold.”

“No, no!” shouted Uura, the bear. “We need more winter, so there will be plenty of time to rest.”

“Uura is right,” said Yaha, the groundhog. “Everyone needs a long winter for sleeping.”

“I can’t sleep all winter. Neither can Tuhea, the deer, nor Baadi, the elk. They grow very hungry during the winter when snow covers the plants and there are no green leaves,” declared Ejupa.

“But if there were so much summer, everything would get very dry,” said Tippi, the rock squirrel. “We need winter to bring rain and snow to make the plants grow.”

“Who cares about plants?” sniffed Ejupa, “I don’t like plants.”

“I agree with Uura and Yaha,” said Bambooka, the muskrat. “We need a time to rest, even though I don’t like the cold.”

Then Suikokko, the robin, chirped from his spot on one of the tipi poles, “I think winter and summer should be nearly equal, with a time in between each when it is not too cold nor too hot.”

“That’s fine for you, Suikokko,” scoffed the coyote.” You can fly south to a warmer country when winter comes. What difference do the seasons make to you?”

Spring is the best season,” insisted Suikokko. “It’s not too hot nor too cold. There’s enough rain to make the worms come up and not wet enough to wet my feathers.”

So they argued on and on and on. It grew dark in the wikiup, so Ejupa made a fire in the center to give them light. And as he lighted the fire, he began to shout, “You are all wrong, all of you who don’t want ten moons of summer, all mistaken, all foolish.”

As Ejupa shouted and worked over the flames, he grew very hot. He screamed at the gathered animals, ”I’m sick of these arguments, and I’m hot.” Then he rushed out the door flap of the wikiup and fell exhausted beside the entrance.

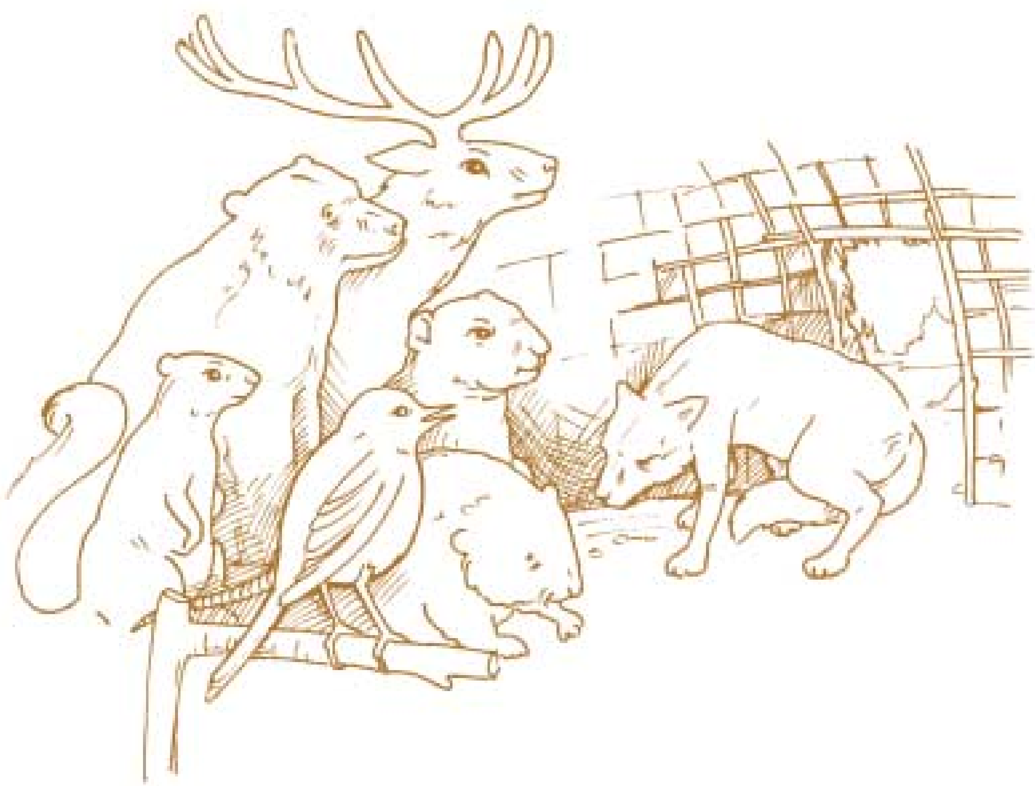
Suikokko, the robin took charge. Calmly he explained why it would be better to have the four seasons divided evenly. He pointed out that this would give time to hunt, time to sleep, time to build nests, and time to gather harvests for all the creatures of the land.

Ejupa's anger had persuaded no one. "Suikokko is right," said Uura, the bear. "That is the way it should be."

"Yes, yes," shouted all the animals and birds. When Ejupa, the coyote, returned to the wikiup, he had nothing more to say. He only nodded unhappily when the other animals told him their decision.

And since that day, there has been winter to please the animals who like a long sleep, spring to please those who like new green leaves and growing plants, summer for those who like warm days and nights to hunt, and autumn for those who like to store nuts, cones, seeds, and the twigs for winter food.

So ends the story. What lessons did you learn?



Indian Summer Projects

"Only by being true to the full growth of all individuals who make it up, can society by any chance be true to itself." John Dewey

Indian Summer's emphasis is on teaching with technology and research. The emphasis in teaching must be on the positive, the good things that can be done to help the student. We are working together to help these students reach their potential. This is achieved by:

1. Building on local cultures and values

2. Encouraging life-long learning by extending tech nology access beyond the classroom

3. Collaborating using Internet activities through onsite training, online tutoring, and cooperative teaming

4. Maintaining and extending a network database of teaching, assessment, professional development, and student-created resources organized by Goals for American Indians, and national standards

5. Creating a research based evaluation model that can be shared

Since 1995, the U.S. Department of Naval Research have collaborated with the Shoshone-Bannock Tribe / High School on a fish recovery project within the Salmon River basins. The project participants have focused on assessing stream health, enhancing the climate for egg incubation, restoring stream habitat, and educating the public about the program. In this way, Indian Summer integrates Native American culture and technology into education that enables students to maintain their heritage while taking full advantage of research technology that will help their future.

With the overall goal of increasing egg-to-fry hatch rate, the Indian Summer team took nearly 1 million steelhead eggs from the Pahsimeroi and Sawtooth hatcheries and placed them in streamside incubators. The team also continued the Purcell Springs Ecosystem Outdoor Classroom project to restore fish and wildlife habitat in the Lemhi area. In addition to the summer program, for the third year the team placed and hatched salmon eggs in the successful winter project. And for the second time, the team used the same fish recovery techniques within Fort Hall, the home of the Shoshone-Bannock tribe.

Project Goals and Scope

The Indian Summer team developed three goals to help increase the hatch rate of salmon and steelhead in Idaho waters:

1. Examine current fish populations and habitat conditions

2. Determine what factors may be affecting fish population

3. Address the factors limiting fish populations.

The following objectives were formulated to help students reach the goals of the project:

1. Test the technology for successful hatching

2. Increase egg-to-fry survival

3. Determine optimum incubator densities and configurations

4. Minimize cost

5. Minimize process

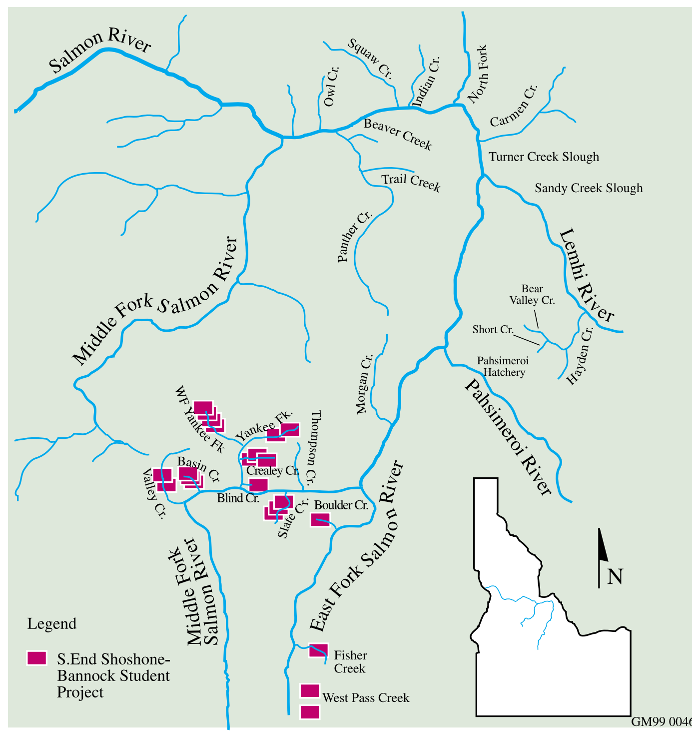
6. Minimize handling of fish

7. Test new equipment and designs

8. Increase community education and involvement.

Since the streamside egg incubation project started in 1995, we have expanded from 4 to 8 sites. The 8 project sites are in the Salmon and Challis National Forests.

All of these activities are described below. First, let's consider goals 1 and 2 -- examining current fish habitat and determining what factors may be affecting fish populations. We will look at the at the economic impact and the history of salmon and steelhead in the northwest.



Background: Economic Impact of Steelhead and Salmon in Idaho

Idaho's first natural resource industry, salmon and steelhead, account for significant economic activity. The salmon's direct and indirect economic benefit to Idaho include the following:

1. More than $72 million per year in direct spending

2. More than 2,100 full-time Idaho jobs supported by salmon fishing industry

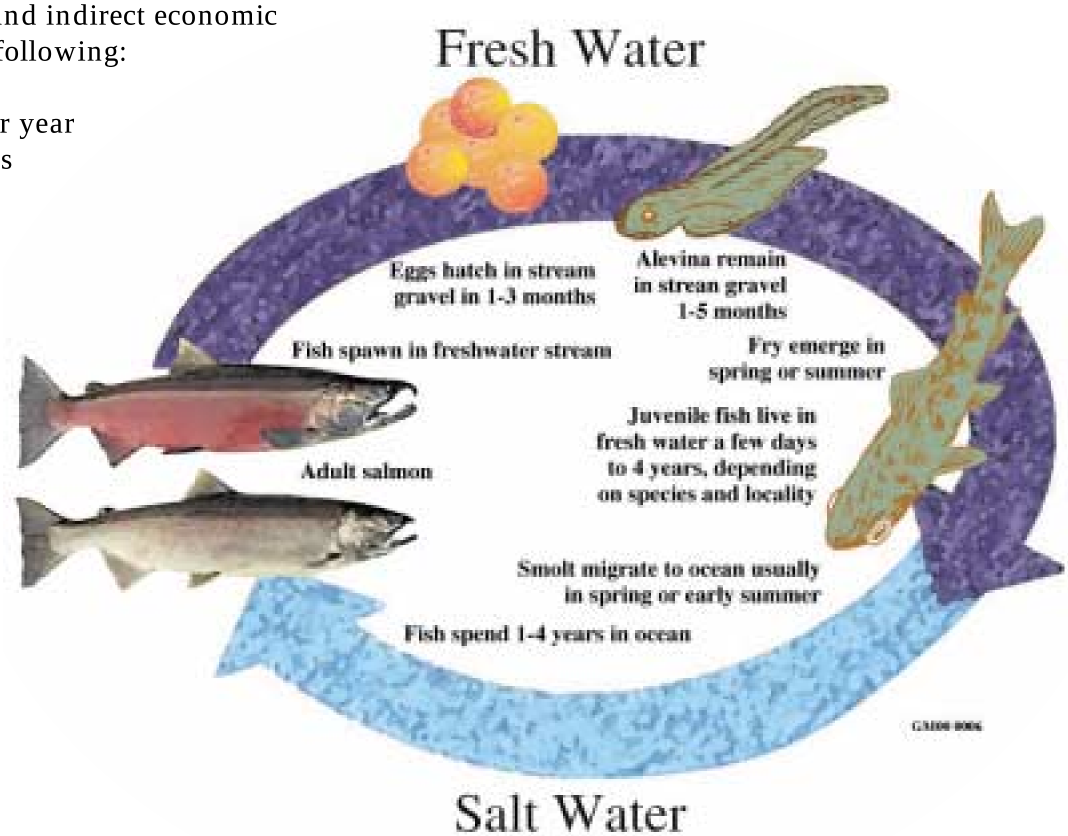
3. 700 jobs in Idaho riverside communities such as Riggins, Orofino, Salmon, and Challis.

The steelhead's direct and indirect economic benefit to Idaho include the following:

1. More than $170 million per year in expenditures by anglers

2. Approximately 5,000 full-time jobs (Idaho Fish and Wildlife Foundation 1999)

3. In the State of Wyoming, the Snake River fishery contributes nearly $1,527,000 per year to the economy (Wyoming Game and Fish Department Administrative report, John Kiefling)



Reaching the Home Stream

Salmon Life Cycle

The Columbia River Basin provides habitat for five species of anadromous salmon (Chinook, Coho, Chum, Sockeye and Pink), Steelhead, Shad and Lamprey. Anadromous salmon hatch in freshwater rivers and tributaries where they live a year or two. They then migrate to and mature in the ocean, and return to their place of origin as adults to spawn.

Factors in Salmon Decline

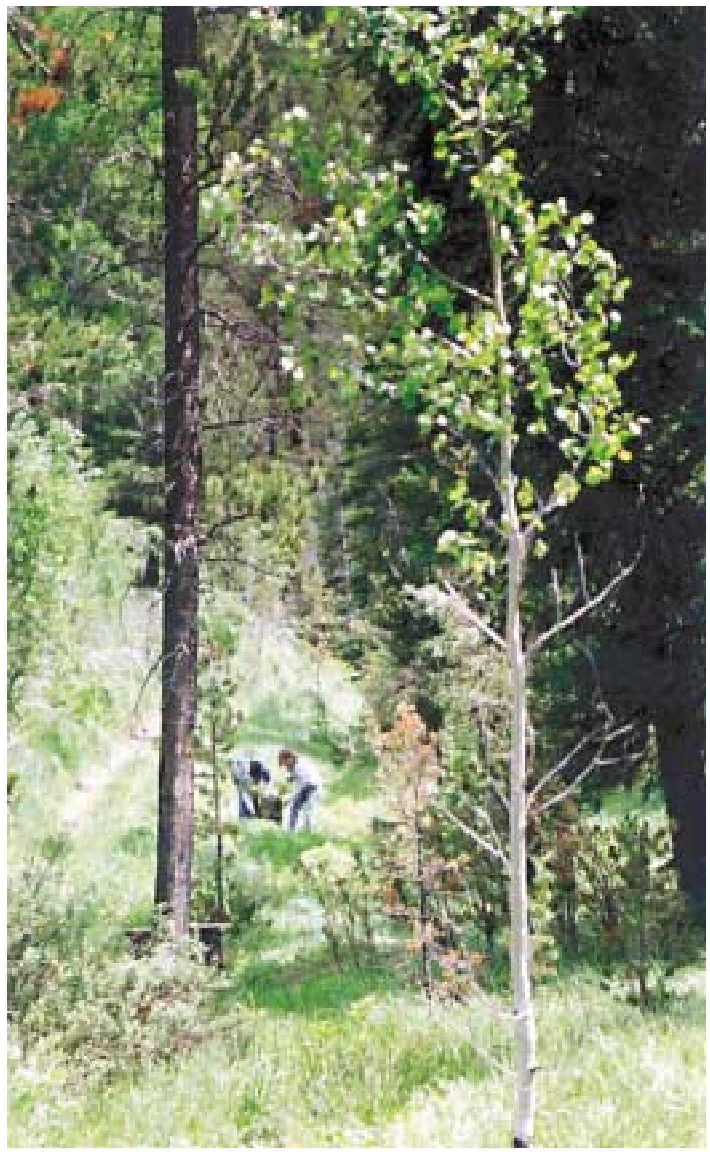
Reaching the home stream to spawn is a difficult journey for salmon and steelhead. A number of factors have contributed to the decline of the salmon and steelhead stocks in the Columbia and Snake River Basin. Over harvesting in the late 1800's and the early 1900's, effects on habitat from farming, cattle grazing, mining, logging, road construction, and industrial pollution and the complex of tributary and mainstream dams all have had an impact. A variety of ocean conditions including currents, pollution, temperature changes, and nutrient base affect salmon survival. Dams clearly have had a significant impact, particularly those that eliminated access to freshwater habitat (preventing adult fish from returning to spawn), and those through which fish passage is provided but at reduced levels from natural conditions.

Approaches To Preserving Species

Single-species recover efforts in Idaho have employed various techniques, including captive breeding (peregrine falcons and sockeye salmon), reintroductions (peregrine falcons), population augmentation (woodland caribou) and cross-fostering (whooping crane eggs placed under nesting sandhill cranes). These and all of Idaho's other Threatened or Endangered species have benefited from education, information, and law enforcement efforts, as well.

The Indian Summer program has taken another approach. We tried to educate young tribal members on preserving habitat as well. The ecosystem approach is much more cost-effective than single-species approach that may cost hundreds of thousands of dollars, yet guarantees no more success than an ecosystem-based program.

As you will see, all things are truly related to each other. What we do for one affects many. Indian Summer is much more than science or research with Native American students. Indian Summer is teaching student to see and listen beyond their own needs, to maintain the balance between receiving and giving back. Indian Summer is about respect. Respect for nature, respect for one's self.



Life in Camp

Father John Bryde said, "Practically all educators will agree that the overall purpose of education is to turn out happy and socially contributing human beings. This means that as a result of their education the students feel that they are on top of their environment, and contributing to its development, and have a joyful sense of achievement according to their ability."

We expect every student to succeed. We make sure that every student has success every day, and that the students are aware of it. We believe that every person must have the memory of his successes to build self-confidence and sustain his efforts when he has difficulty.

How is this done? Success begins in camp. Students are expected to help themselves. Students get up on time, eat, help clean up, then begin the day. Within the first few hours of our day students can succeed, and we let them

know. Students are expected to keep journals. Each student is awarded journal prizes (by a great mentor!) We find good things to emphasize, and we are sincere about those things. We compliment instead of criticizing. We believe that our attitude toward our students is mirrored in the student's thinking. They can build the self-respect that is necessary to a happy life and to success in school only if they live in a school atmosphere that is warm and supportive, where each student who is recognized by himself and others as a worthy individual is wanted, respected, and liked. Our "schoolroom" is nature. Learning does not always happen in the classroom. Learning can and does happen EVERYWHERE! In camp, in the Sawtooth Mountains, on the streams.

A good way to show students the utility of science is to teach it as a problem-solving activity (Guthridge 1986). Starting with environmental or other problems or just student questions, students can learn the scientific method of making hypothesis,

controlling variables, collecting and recording data in a systemic way to test the hypothesis, and drawing conclusions from the evidence. Group experiments focused around group problem solving can be emphasized with students. This is what Indian Summer is about.

As educators our task is to integrate science and technology with Native American culture so that our students may cope with modern living as consumers, producers, and citizens. We understand traditional Native views, and we strive to foster curiosity, problem-solving skills, and recording techniques. All these are basic techniques of being a good scientist.

To become scientists, Native American students need to recognize the importance of science in their lives and develop a lasting interest in science. One of the goals of our program is to give the students the feeling they can do science and to provide them the opportunity to learn the necessary skills and knowledge base (Reyhner 1989).

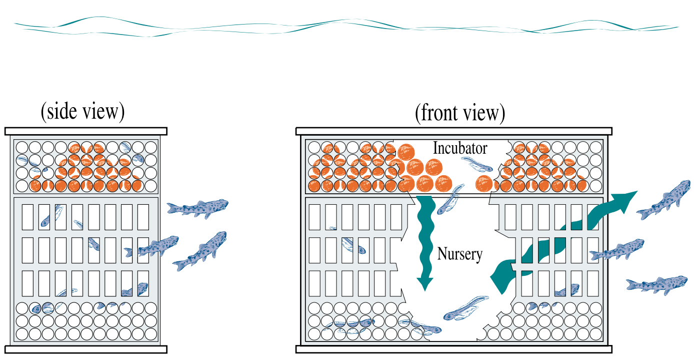
Technologies Used to Enhance Streamside Egg Incubation

Based on the success of the 1995-1999 projects, the students decided to use the same methods in 2000 for the south-end sites. They used a modified incubator box and Whitlock Vibert boxes to hatch steelhead eggs obtained from the Pahsimeroi and Sawtooth hatcheries.

Whitlock Vibert Box and Streamside Incubator

The original Vibert box was developed in France in 1950 by Richard Vibert. The students Whitlock Vibert (WV) box is an improved version of the original Vibert box. It is larger than the original and uses modern materials and design, which has

Whitlock Vibert box



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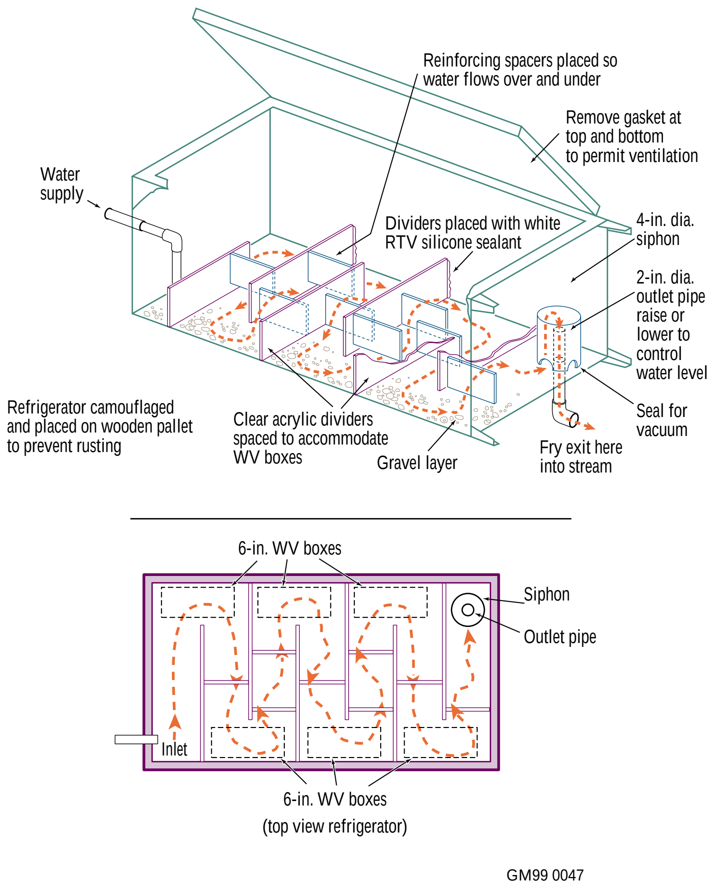
improved its function. The box can be used for trout, salmon, and char eggs in any water that supports the species. The WV box is constructed of polypropylene and measures 145 x 90 x 60 mm(6 x 3.5 x 2.5 in.). The sides, top and bottom have rectangular slots for water circulation, desilting, retaining and releasing the eggs and fry, and prohibiting predators from entering. The nursery portion of the WV box protects the eggs until they are hatched. After they are hatched, the fry remain protected from predators in nursery until the yolk sac is absorbed. Then the fry escape through the slots and live in the streamside incubator until they are ready to exit to the stream.

The top lid of the WV box has sixty 3.5 x 13-mm slots for water circulation and swim up fry escape passage. It also restricts predators and works as a desilting mechanism. The flap of the top lid opens into the incubator and has sixty-nine 2 x 2-mm vents also for circulation, ventilation, predator protection and silt retention. The top compartment can hold one or two layers of approximately 250 salmon eggs or 500 trout eggs. Typically, hatch success in the WV boxes averages from 75 to 95%. Fry that successfully leave the WV box and enter the stream average from 20 to 50% of the original number of eggs.

The streamside incubator houses the WV boxes to provide a secure environment. The students use old refrigerators for the incubator, modifying the interior. Acrylic dividers and rocks were placed in the bottom of a refrigerator so water flowing through it created currents similar to a small stream. Water from the stream was supplied using 1-inch diameter polyvinyl chloride (PCV) piping. A 2-inch diameter outlet pipe was used to control the water level and allow the fry to exit the incubator. The total cost of the converted incubator was $30. The incubator was camouflaged and placed at the side of the stream on a pallet to prevent it from rusting. The WV boxes fit along the sides within the incubator. Anywhere from 20,000 to 40,000 eggs can be grown in the incubator.

Unlike hatcheries, the incubator using the WV boxes allows the eggs to survive in an almost natural environment. Once the eggs are placed in the box, they are not handled again by humans. Much like natural spawning, eggs in the WV boxes are subject to random mortality, which allows the stronger, “smart” fish to develop greater survival skills. The new fry protected in the incubator develop a more advanced yolk sac, producing stronger, mature fry, that after leaving the box, have a better chance of survival from natural losses.

Trout Streamside Incubator

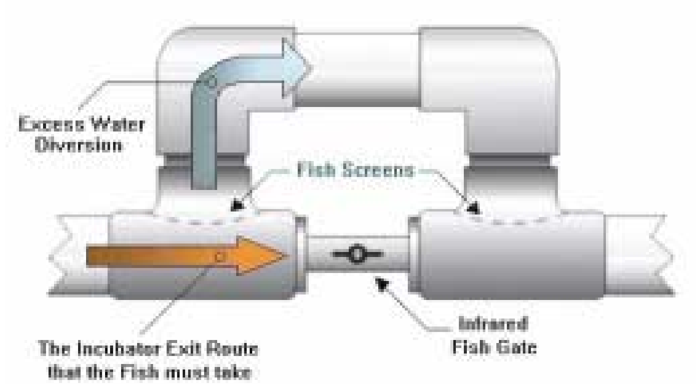


Fish Data Logging Device

The fishgate detector assembly shown below is a working model of a fish detector that has been developed and field tested for the last several years.

The purpose of the detector is to monitor the outflow of fry from the streamside fish hatcheries. Any fish leaving the hatchery are detected and logged by the fishgate, allowing data to be collected on the migration habits of newly hatched fish.

The drawing shows the basic structure, which is composed of a narrow channel which houses an infrared emitter and detector to detect passing fish, and an excess water diversion channel which carries any hatchery outflow not able to pass through the detector channel. Fish are prevented from traveling through the bypass channel by fish screens placed in the inlet and outlet of the device.



Global Positioning System

For the south-end sites, a new device was added and tested this year: Global Positioning Systems (GPS) technology. We used GPS technology to log our sites. The reasoning was two-fold. First, we wanted to see if we could get satellite transmission in our remote mountain sites. We found we could. Second, we also wanted staff and students to be exposed to the use of satellite telemetry. The FCC approved our use of GSP technology in remote sensoring applications. Field testing this equipment was completed in the summer of 1999 and used again in 2000. We used satellite telemetry to gather data remotely from the incubator boxes in the field to our lab computer with an e-mail message. This greatly enhanced our ability to monitor things like dissolved oxygen, water flow, and fish migration. We also can receive a message in alarm mode if water flow stops or fish are migrating from the box.

The next photo shows an actual working demonstrator model of the current detector assembly. The detector is assembled with standard PVC fittings and pipe. (Color is optional - field units are unpainted at this time, except for the fishgate detector channel which is painted black). The black box mounted at the top right is the junction box in which the wires from the emitter and detector are spliced to a single shielded cable that runs to the logger apparatus. This particular demo unit is fitted with a calibration pot and jack to facilitate setting up the demonstrator in differing ambient lighting conditions.

The fish screen requires the fish to exit via the detector channel, and is made from a piece of nylon mesh found in craft shops. The material is usually called plastic canvas, and is used for stitchery projects.

The detector channel is constructed from 3/4-in. PVC pipe, fitted to the rest of the detector assembly with two PVC reduction fittings. The channel is painted black on the outside to preclude any ambient light from entering the channel around the sensors. An infrared emitter and detector are inserted into the channel through two small holes drilled exactly opposite of each other in the PVC pipe. Tightly twisted lead wires are run to the junction box at the top of the assembly. When in operation, the infrared detector is illuminated by the emitter and biased just beyond the switch-on point. Anything interrupting the signal between the emitter and detector will cause the detector to switch off, indicating the presence of something in the gate. The majority of fish traveling the detector channel will do so in the middle, where velocity of the water is quickest, as opposed to the area nearest the inside wall of the pipe. A single infrared detector pair covering the middle of the channel seems to detect the migration of fish quite satisfactorily. It is important to note, we are detecting and measuring migration patterns, not counting individual fish, and this detector seems to be well suited to that end.

Using this detector, we found that large numbers of fish departed at about the same time of day (11 p.m. through 5 a.m.). The fry left the hatch box at night, when it was cool and they were less susceptible to predators. This was the best time for them to survive on their own. This was important because it showed us that the fish were beginning to act like wild fish, even at the fry stage.

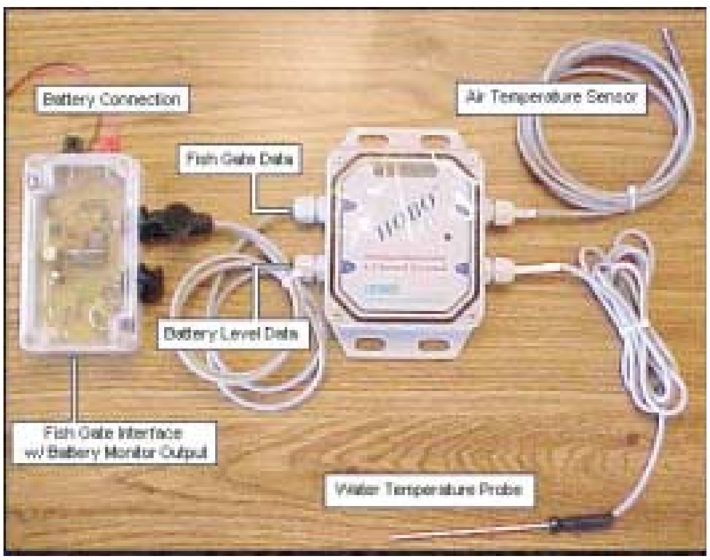
Analog Fishgate Interface

The fishgate interface (FGI) is a microprocessor-based device that works with the fishgate detector (described above) to sample fish migration from the streamside incubation system. All of the fish migration data logging hardware built to date have been one of a kind prototype devices. To expand the research in the area of streamside incubator migration patterns, we felt it was necessary to make the fishgate more easily adapted to off-the-shelf data logging systems. An analog fishgate interface was developed to facilitate the use of this data collecting methods by others. The first of these analog fishgate interfaces is shown here.

The 15-second samples are taken at 10-minute intervals, the same as with our dedicated logger and satellite data relay devices. After at least 6 intervals have elapsed, the fishgate interface uses 12-bit digital-to-analog converters to generate a DC voltage level that is proportional to the fish migration density averaged over the last 1-hour period.

Note: The migration density is a measure of the percentage of time in a given sample period that fish are detected in the egress channel from the stream-side incubator.

An overall system for monitoring migration density, battery voltage, water temperature, and air temperature is shown. It is based on an Onset HOBO weather resistant logging system. The stainless steel probe is designed for continuous immersion in water, while a less expensive sensor is employed for air temperature measurement. The FGI is configured with two analog voltage data outputs: one for the migration density voltage, and one for monitoring the battery level. Other combinations of sensors might include sound level, light level, pH sensors, water flow, or any parameters that you may wish to correlate with migration timing.



Normally the system would operate on a 12-volt battery. Originally, the data logger system was powered by a solar panel and battery. The high latitude and whether patterns of the areas where the data loggers were deployed quickly proved to be impractical for small solar panel operations.

In addition, the data logging application was expanded into the winter months to monitor salmon egg incubation. This led to a rewrite of the software to minimize power usage by using statistical sampling of the fishgate. This entails operating the fishgate at 10-minute intervals for quick sampling, then shutting down all the power until the next 10-minute period arrives. The interval sampling method was tested in parallel with the full-time sampling method, and found to be an accurate methodology. The new power-saving interval sampling allowed the use of a fully charged lead-acid battery to operate the logger for a month or more at a time, without the need of solar recharging.

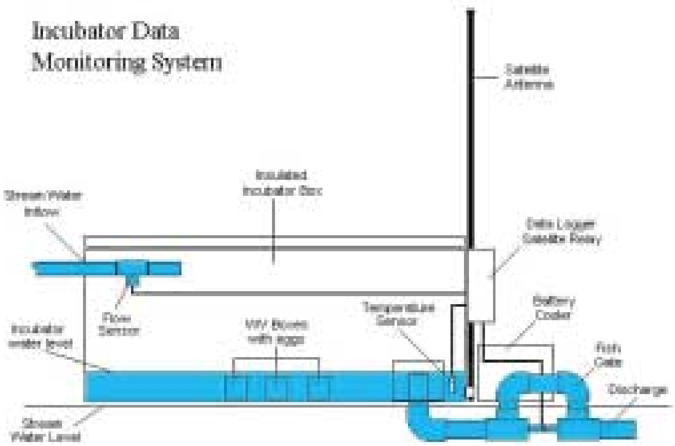
The fish data system is currently in the field. This system will relay the data via a NOAA Satellite using the ARGOES satellite communication system.It will measure water temperature, monitor water flow, and collect fish migration data, as well as monitoring the system battery level. A picture of the Satellite Fish Data Relay is shown.

The antenna connection and fuse post are on the top of the box. Down the right side are the data connector, confidence LED, flow switch connector, and fishgate connector. The temperature probe cabling exits at the bottom of the box, where external battery connection posts are also located. Inside the box, on the left in the picture, is a Seimac Smart Cat - ARGOS PTT (satellite transmitter). The circuit board to the right is a data logging board similar to the one used in the first fish loggers. This board provides special interface components and a specially regulated power supply for the PTT.

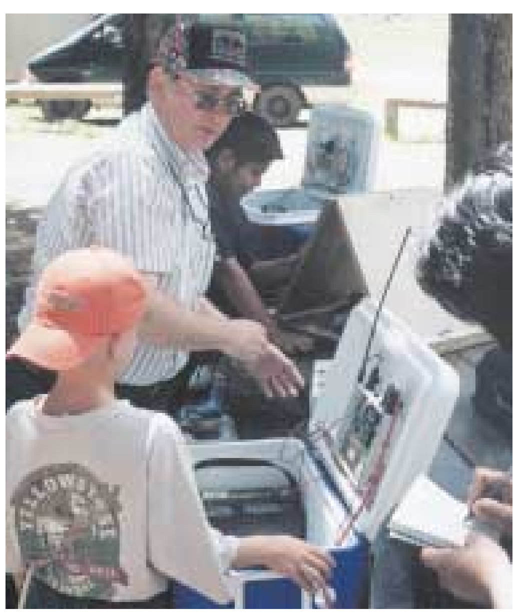
Incubator Data Monitoring System

The software used with the Satellite Data Relay monitors the fishgate at 10-minute intervals, like the Data Logger. On the hour, it checks water temperature, battery level, and water flow.

If all is in order, it goes dormant until the next fishgate monitor interval. If fish migration reaches a predetermined level, or if anomalies in water temperature, flow, or battery charge are detected, the ARGOS PTT is fired up, and a data message is loaded for transmission.



Twenty-four hours of fish migration history is included in each transmission, and the transmitter is held active for a minimum of 8 hours to insure the successful satellite pickup of the message. The program also forces the PTT to go active once every 7 days - just to announce it's still alive and well, a great confidence booster!



This system provides a reliable way of monitoring the streamside Salmon hatcheries during the winter months, when snow can cover them over by 8 feet or more. Routine inspection and data logger access under these conditions is difficult at best, and can be extremely hazardous during periods of heavy Idaho winter weather.

Assessing Fish Habitat and Stream Conditions

Physical and chemical stream conditions are important in producing salmon and trout. Temperature, water clarity, flow, and oxygen contribute to healthy streams.

To learn to effectively manage and enhance fish population, the students gathered basic physical and biological data. With the help of community mentors, they analyzed the data to determine population status and factors limiting fish production.

The students conducted five streamside tests: (1) temperature, (2) nitrate (NO_3), (3) dissolved oxygen (DO), (4) millimeter (mm) size of the eggs and fry, and (5) pH readings in the boxes and stream. The boxes were monitored daily for 10 days and then weekly for 60 days. A summary of the results follows.

Temperature

Temperature was measured to see if the hatch boxes would hold temperature consistently. We found that they did, with temperatures ranging from 4.5 to 10° C. The temperatures remained consistent during the project time (62 days). We had extremes in outside air temperatures from 4 to 26° C, but this did not affect the temperature inside the hatch boxes.

Nitrate

(NO_3) was measured to indicate (1) possible pollution in the streams and (2) pollution of fry in the hatch boxes. We wanted to know if the longer the fry spent in the boxes, would they make a greater concentration of their own pollution, and and if those concentrations were toxic to the fry. We found that all the boxes were at 0 mg/liter.

Dissolved Oxygen

DO was monitored to make sure the eggs had enough oxygen to sustain life. The range was high as one would expect in a mountain stream. We were interested in knowing if levels of DO would drop in our incubators as time went on. They stayed the same. Ranges were from 7.75 to 10 mg/liter.

Egg Size

The egg size was used to monitor growth of the fry. We were interested in knowing if their size continued to increase once the eggs were in the hatch boxes. Remember, we do not feed the fry once they are in the boxes. We noted good growth during the project time (62 days). Ranges were from 10 mm in June to 30 mm in August.


What to See

Acid Base of the Stream

The pH of the stream is important to the well being of fry. We were interested in knowing if the pH of the fry in the boxes would change as a result of their environment. We saw no change in stream versus the boxes. The range was 7 to 8 in all boxes.

Summary of Data

Table 2 summaries the results of the stream-side incubator project. The students gathered the data for the sites. This area is located below Galena Summit to the White Clouds area (East Fork of the Salmon River) The students had 241,381 eggs with a 96.5% hatch rate.

Table 2 Steelhead Data 2000

The following table indicates the hatch rate percentages from the Shoshone Bannock school efforts of incubating Sawtooth Fish Hatchery steelhead eggs.

Location	Number of eggs	Hatch rate percentages
1. Clearly Cr.	11,033	97.7%
2. West Fk. (Black Bx)	28,800	99.1%
3. West Fk. (Green Bx)	16,800	Unknown *
4. Netty Box	32,000	98.5%
5. Basin Cr. #1	28,340	94.5%
6. Basin Cr. #2	22,244	98.0%
7. Basin Cr. #3	15,044	97.4%
8. Valley Cr.	24,800	98.8%
9. Big Boulder Cr. #1	16,000	97.0%
10. Big Boulder Cr. #2	20,000	99.4%
11. West Pass Cr. #1	14,000	98.8%
12. West Pass Cr. #2	12,320	79.7%
	Total: 241,381,	Overall % of 11 Boxes = 96.5%

* Data Lost




Indian Winter Study

Our classroom is a year-round classroom; this includes the wintertime. Can students learn about themselves, fish, and nature in the winter? Yes!

2000-2001 Chinook Salmon Incubation Program

We took students out to the mountains at our research site the months of November, December, January and February. The students were to do the science required for the project:. i.e., water temps, air temps, and hatch rates of our Chinook eggs. They also were asked to survive the winter time environment.

Some students were prepared, some were not. Our job as teachers/mentors is to make sure the students are safe and dry, and to stimulate some good learning! The students not only learned about fish, and our outdoor classroom, but about themselves as well. As the months went by, more and more students wanted to go with us to our research site. This speaks well of the students and our program.

Chinook salmon eggs were taken from captive brood stock collected as juveniles in the upper Salmon River and reared to maturity at the Idaho Department of Fish and Game's Eagle Hatchery. They were then planted as eyed eggs at one location in an incubation box.

For the third time in the State of Idaho, we have winter Chinook Salmon incubation data. Our live hatch rate was 99.8% for 2000-2001.

The hatch box was monitored throughout the winter. We are remote sensing our Chinook every 4 hours in deep snow in the mountains of Idaho via satellite and computer. The data we received is water temperature, flow of water, battery output, and fish migration. The transmitter is designed to "call" us if any or all variables are out of normal values. This is important as students get a chance to learn about satellite technology, and our "fish" can call us if they are in trouble! This is cool!


ENFORCEMENT

Purcell Springs Outdoor Classroom

Shoshone-Bannock High School also monitored our shared, outdoor classroom in the Lemhi area. In 1997, we built island frames to improve habitat. In 1998, we were happy to find an abundance of growth with ducks making nests on some of the Islands. What a difference a year makes!

In the summer of 1999, we planted willows along the bank and on the islands we had made, and again planted willows in the summer of 2000. The project was developed as the students and mentors cut willows on the reservation, placed them in a barrel and transplanted them over 200 miles away. We learned much! Students from Leadore High School, located in the central mountains of our state, worked with our school to plant the willows. It is our hope that the ideas of friendship and respect for not only the willows, but for the students were learned that day.

Our thesis here was to improve habitat, and work with Leadore High School on a joint project of habitat restoration. Meanwhile we continue to monitor the recovery effort.

Evaluation of Program

This year we have used a multi-evaluation approach. Our hope is that we can obtain useful data for our program and answer some basic question: Did we do anything worthwhile? Did we meet our stated objectives? Are our Native American students learning? Is this program worth the cost?

The information we are planning to gain from this evaluation will be used to reformulate the purposes of the activities, and the assessments and devices used to determine the achievement of purposes. (Worthen, Sanders, Filtzpatrick 1997)

Approach to accomplishing our goals and evidence of accomplishment of goals:

1. Indian Summer has been preparing American Indian children/students in our education program that is culturally, linguistically, and developmently appropriate. We have Tribal members that join our camp. Students are taught why and how to pray for all life. We learn respect and show respect to the land, animals, air, and water.

2. Establishing a school environment that respects, maintains, and promotes American Indian values, language, and traditions. We feel that the values, languages, and traditions of the Shoshone-Bannock Nation can only be taught by parents and tribal members of the Shoshone Bannock Tribe. Tribal members and parents are a part of our school, both in the indoor classroom, and outdoor or living classroom. Tribal members and parents pray and tell the stories of the traditions, values, and languages of the Tribe to our students. We feel it can only be done this way. This is why we have parents and Tribal members in our camp and classroom.

3. Increasing recruitment, retention, and graduation rates of American Indian students in Idaho's 2-and 4-year colleges and universities, including post-secondary vocational and technical institutions. We have had several students go on to college. We feel this is significant as none were going into specific fields of Fish or Wildlife management. Although none have graduated from college as yet, students are going. This is what is important.

4. Increasing the number of American Indian faculty and administrative and professional staff at Idaho's college and universities. We do have a doctoral student that will finish in two more years. We are interested in quality, not quantity! We have hopes that more will follow once this student is completed.

5. Encouraging American Indian parents, tribal officials, and community leaders to participate in education of American Indian students. As stated earlier, we do have parents and tribal members aid us in our instruction. This is a crucial part of our educational equation. We have found this not only good for our students, but our teaching staff as well.

6. Raising the self-esteem and culture pride of American Indian students. One of the most important goals we have in Indian Summer is this one. Research clearly indicated that self-esteem and cultural pride is a crucial part of Native American education. We do this by having students help us do the research, by showing students we can all reach our goals, and respect each other as well.This is done daily in

7. Developing comprehensive guidance and counseling programs in Idaho schools that meet the career, personal, and social needs of American Indian students and their families. We have addressed this goal by inviting professionals in the field of science, math, law, engineering, and wildlife management to speak to students about jobs in these prospective fields. The professionals counsel students on what they have to do to reach the goals to be in these jobs. We invite professionals year long to come to our classroom, both inside and outside as well. Our school counselor and other staff members help students fill out the necessary forms they need for college so they can achieve their career choice.

8. Expanding adult basic education programs for the American Indian. This goal is being addressed by working with tribal education and school officials to see if we can develop a Tribal College. This would be a 2-year college that would work on basic education programs, such as reading and writing. It has been estimated that there is a large number of Tribal members who need this information and skill. This will take some time to accomplish, but we are working on accomplishing this goal.

The Scope of this program is as follows:

1. Integrate learning from all disciplines while communicating effectively, solving problems, working in groups, and developing self-discipline.

2. Expand students learning beyond the classroom.

3. Build partnerships with business, industry, and government agencies.

4. Involve teachers and students in real-world projects that give them a realistic look at deadlines, frustrations, problem-solving, and commitment.

5. Capture teachers and students interest, excitement, and motivation.

6. Provide the teachers and students with the tools to use computers, computer graphics, spreadsheets, and databases.

Evidence that scope of programs has been achieved:

1. Integrate learning from all disciplines while communicating effectively, solving problems, working in groups, and developing self-discipline. We now have students in art, math, science, English, vocational agriculture, and consumer education, all in our program we call Indian Summer. Students write journals, build egg incubation units, do streamside chemistry, tabulate data, and learn about Tribal and State law as it pertains to the Salmon. This is done in groups at our camp, and back in the classroom. Students develop self-discipline as they reach this goal. They are required to do the scientific work in the field, and help maintain our camp and classroom as well. We have high expectations for the students, and they reach those goals that we set for them.

2. Expand students learning beyond the classroom. Living with students at the research site located in the central mountains of Idaho is certainly expanding students learning beyond the classroom, and it's fun as well!

3. Build partnerships with business, industry and government agencies. Indian Summer is continuing to build partnerships with business, industry, and governmental agencies. We have partnerships

with businessmen and vendors in the materials we use for the incubation box construction. Local stores give us a discount on building supplies or sometimes offer free materials. Industry has provided technical help with water quality tests and mentors that work with our students. Governmental agencies like INEEL have been supportive of our research efforts. They provide technical assistance, as well as mentors to work with our students. Without all three, business, industry, and government agencies, Indian Summer would not be nearly as successful as we are.

4. Involve teachers and students in real-world projects that give them a realistic look at deadlines, frustrations, problem solving, and commitment. The Shoshone-Bannock Nation has some real-world problems. One is water quality on the reservation. The water must be tested for contamination from pesticides and fertilizer compounds. The depletion of the Salmon is another. High unemployment and high suicide rates are concerns as well. These are problems that many face, not just the Shoshone-Bannock. Teachers and students are working together to find solutions to these and other problems. Indian Summer is about helping students and teachers find solutions to these and other problems together.

5. Capture teachers and students interest. Indian Summer has students and staff working outdoors in one of the greatest classroom of all, Nature. The mountains, grass, air, and water does have a way of capturing teachers' and students' interest. You can see it in the faces of students and teachers alike.

6. Provide teachers and students with tools to use: computers, computer graphics, spreadsheets, and databases. All data collected is in spreadsheet format. We are now exploring computer graphics, and have some new and exciting projects in store using GPS/GIS computer graphics technology. Our data in the field is downloaded using a laptop computer. We have built our own computer technology to use satellite technology to remote sense our research site via computer. This is still in the experimental stage, but initial tests look promising.

In summary, we feel we are meeting the goals of the program. Our data is obtained by using formative and summative data techniques (pre/post test). Randomization of students in program will help our quantitative and qualitative data collection. Asking the participants questions and documenting positive and negative results helps us obtain additional data on the program. Obtaining broad goals and checking to see if we are reaching those goals is another multi-evaluation approach.

Are we teaching students and solving problems? Yes. Are we obtaining our goals that we said we would? Yes. Is this program worth the cost? Yes. Are parents and tribal members becoming involved in the students' education? Yes. Are young Native American students going to college? Yes. Are we developing new and exciting research techniques, with practical application? Yes. Is the Office of Naval Research supporting education research that helps Native Americans on and off the reservation? Yes. Will we see change soon? No. Is change happening? Yes.

Future Research Plans

We want to continue development of our remote sensing techniques. We have been experimenting with satellite technology. We now have data on the fry of Steelhead and Salmon. This has not been done before. We want to explore GPS/GIS technology. We feel there is a great need to map the reservation. This could provide jobs and give the reservation some much needed data. We want to share our technology that we have been developing with not only other Native Americans, but other schools as well. We want to expand our model beyond the boundaries of the reservation and see if we can help other endangered species, as well as students.

We know that change takes time. The Salmon and Steelhead need at least two generations of work in the same location or 10 - 15 years to show if change has occurred. We believe the same amount of time is needed for our students. Change will come if we are persistent and patient. Indian people are great examples of both of these traits. Time will tell if we are successful.





Indian Summer Combining The Old With The New

For thousands of years the Shoshone-Bannock people have been working with “technology”. The skills learned to survive often meant life or death for the people. The willow weir basket is one example. The people learned that the willow is a great gift.

This plant has helped the people survive in many ways. For example, as a tool for catching Salmon, as a tool for cooking meals, holding the young (cradle boards) and even as a medicine plant.

Our students are once again learning the value of this great plant. With help from Tribal mentors, they are making willow weir baskets at our school. They are learning the “old”.

Our students are also learning the “new”. Once again with the help from mentors, the students are learning that the old refrigerators that they have worked with to help raise steelhead and salmon can be used to learn about computers and satellite technology. The students are learning that the incubation units (old refrigerators) can be monitored via satellite. They are learning the “new”.

As staff members we are excited to see our students learn both. Combining the old with the new. It is good to see.

Acknowledgements

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Ed Galindo- As a Native American science teacher at the Shoshone-Bannock Junior/Senior High School, Ed continues to provide his students with the resources, enthusiasm, and care that all young people need and deserve. Ed's commitment to his profession and to his students is rewarded each year when his students graduate and begin to work toward their goals.

Ben Rinehart - With DOE's Hydropower Program for 20 years, Ben is a science and engineering mentor retired. Ben continues his commitment and support to this program for he has worked with young students for 52 years (scouting), and he feels the young adults need people to support them, so they can make it in life. Ben provides technical advice, resources and yearly support to the Native American Science Research Program.

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Incubator Designs

Whitlock Vibert Box, Contact Evelyn Taylor (406) 585-7592.

Refrigerator Incubator Designs, Contact Dr. Fred Eales, (307) 382-4857.

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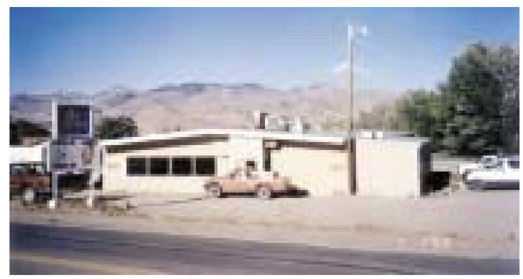

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