



## Water Wars in the Klamath Basin

Wynn W. Cudmore, Ph.D.

In the early 1900s, the federal Bureau of Reclamation was enthusiastically engaged in converting what was seen at the time as wasted marshlands into productive farmland. Elaborate systems of diversions, reservoirs and canals drained the marshes and the promise of abundant water for farming was used to lure homesteaders to these “reclaimed” areas. One such project, the Klamath Reclamation Project, was implemented in a broad area that straddled the Oregon-California border. Under this project, water rights were ceded to the federal government from the states in exchange for the creation of new farmland. In the following years, thousands of acres of wetlands were drained and converted to irrigated agricultural land in an area that receives only about 15 inches of rain on an average year.

In recent decades, demands on water supplies have mounted as farmers, fishing interests, urban dwellers and wildlife refuges all compete for a limited supply of water. This competition came to a head in the winter and spring of 2001 when drought conditions in the Klamath Basin resulted in the shut off of nearly all irrigation water to 90% of farms in the area. Approximately 220,000 acres of farmland and two national wildlife refuges within the Klamath Reclamation Project were affected. This action was taken to preserve the water supply for two species of endangered suckers that live in Upper Klamath Lake and endangered Coho salmon in the Klamath River. Irrigation head gates control the movement of water into 700 miles of irrigation ditches that provide water to grow potatoes, onions,

alfalfa, oats, barley and other crops from high desert soils. National attention was drawn to the controversy during the summer of 2001 when irate farmers forced opened irrigation gates. The gates were later closed by federal authorities and some protesters were arrested for trespassing.

In addition to farmers, fishers and wildlife refuges, several Native American tribes have also been affected by the original reclamation project and the ongoing lack of water. Water rights provided to farmers failed to acknowledge previously existing treaties with Native American tribes. The Klamath tribes, for example, depended on spring runs of suckers for sustenance for thousands of years before the government built the project. They are now limited to one catch per year for ceremonial purposes. Hydroelectric dams on the Klamath River cut off spawning beds; and algal blooms caused by agricultural runoff kill many others. The Yurok and Karuk tribes rely on salmon fishing for sustenance and their economy. Dwindling Coho salmon runs, which have been listed as threatened under the Endangered Species Act, are now less than 1% of historic levels. Chum and pink salmon in the system have long since become extinct.

There are four major hydroelectric dams on the Klamath River owned and operated by *PacifiCorps*. These dams were up for re-licensing in 2007 by the Federal Energy Regulatory Commission (FERC). To protect salmon in the river, FERC, at the request of the National Marine Fisheries Service, required

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the addition of fish ladders and other changes to these dams before the license to operate would be re-issued. With an estimated cost of \$230-470 million, compared to a cost of \$90 million for dam removal, *PacifiCorps* has been “doing the math.” Farmers want the dams to stay because they generate cheap electricity for their irrigation pumps; tribes want the dams to be removed to help recover salmon populations.

Clearly, the Klamath Basin situation represents

a complex, highly contentious issue with numerous stakeholders all competing for a natural resource in short supply. As such, it can serve as a useful case study to illustrate for students how controversial environmental issues arise and how they might ultimately be solved. NCSR has developed a curriculum module using the Klamath Basin situation that proposes one way instructors might engage students to understand complex environmental issues such as these (see *Town Meeting: An Approach to Exploring Environmental Issues*).



Formal announcement of Klamath Basin Agreement  
18 February 2010 - Salem Capitol Building  
Photo by Alyssa Cudmore

After nearly two years of closed door negotiations among the various stakeholder groups, a proposed settlement for the Klamath Basin was released in January 2008. The “Klamath Basin Restoration Agreement” (KBRA) allocates water in the Klamath River watershed among irrigators, tribes, fishermen and other water users; and seeks removal of four Klamath River hydroelectric dams beginning in 2020. The KBRA also includes a plan to begin ecological restoration of the Klamath Basin including the re-establishment of salmon and other native fish. If approved for implementation, the plan would lead to the biggest dam removal in U.S. history.

In February 2010, in an elaborate ceremony at the Capitol Building in Salem, Oregon, all major parties came together to sign the agreement. Implementation requires a signoff by the U.S. Secretary of Interior, congressional approval of \$500 million for restoration and a hefty payment to *PacifiCorps* for the cost of dam removal. Given the contentious nature of the debate over the fate of the Klamath Basin, it is unlikely that the last word has been spoken on the issue.

## NCSR Fisheries Curriculum Goes to Sea

**Wynn W. Cudmore, Ph.D.**

While most NCSR curriculum is developed with the traditional undergraduate classroom in mind, we have recently become aware of a non-traditional application for our new *NCSR Marine Fisheries Series*. These educational materials will be used to train individuals who will contribute to changes in the way that marine fisheries are being managed.

Commercial fisheries off the Northeast Coast have been the focus of national attention since the decline of the Atlantic cod in the early 1990s. The fishery is managed under the Northeast Multispecies Fishery Plan by the New England Fishery Management Council. In an effort to begin implementing a groundfish catch share program that allocates portions of the total allowable catch to individual fishing vessels, the Council has begun issuing fishing permits to “sectors” - groups of fishermen holding limited access fishing permits. These sectors will be allowed to fish in previously restricted areas from Maine to New York and granted a portion of the total allowable catch. In return, they have voluntarily entered into a contract and agreed to certain fishing restrictions and other stipulations.

Among these requirements is to allow “at-sea fisheries monitors” on-board while the vessel is fishing. These monitors will collect scientific, management, compliance, and other fisheries data by interviewing fishermen, photographing catch, and measuring portions of the catch and fishing gear. Monitors will sample portions of the catch to measure lengths and weights of both kept and discarded fish. Interactions with protected species such as marine mammals and sea turtles will be documented, as well as information on gear type and fishing locations. Data are collected electronically on a hand held computer. Implementation of the monitoring

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program, planned for May 2010, is seen as an integral component of catch monitoring and assures that catch limits are not exceeded.



Observers at work: Fishery observers collecting samples from both the kept and the discarded catch during a bottom trawl fishing trip. Photo by NOAA Fisheries Service/NEFSC/ Fisheries Sampling Branch.

NOAA Fisheries offers a 10-day course to train these new “at-sea fisheries monitors.” Training will include fisheries management, safety, species identification, conflict resolution and computer reporting requirements. Bristol Community College in Fall River, Massachusetts has been charged with developing a training program and the *NCSR Marine Fisheries Series* will be used as part of that training effort. Bristol Community College plans to produce 24 graduates this May with the ultimate goal of 150 graduates in the near term. Materials will be made available to students on an e-learn system. In addition to the at-sea monitoring program NOAA Fisheries also plans to implement a dockside monitoring program, which will require similar training. NCSR welcomes this innovative use of our new curriculum.

## A Tale of Moose and Wolves on Isle Royale

Lester W. Reed, Ph.D.

Isle Royale National Park is a 200-square mile island located in the northwest corner of Lake Superior. In the early 1900s, moose arrived on Isle Royale for the first time, probably arriving by swimming the fifteen miles from Canada. In the 1950s, they were joined by wolves, which crossed over from Canada on a temporary ice bridge. The lives of Isle Royale moose changed dramatically once the wolves arrived.



Built for the cold: A bull moose forages for food.  
Photo by Lester Reed

As an island ecosystem, (the ice bridge is now gone) the setting is ideal for observational studies. Wolves and moose are inextricably linked - wolves are the sole predator of the moose, which represent 90% of the wolves' diet. This unique predator-prey relationship has been studied by wildlife biologists for the past 50 years. Recent studies examine the effects of global climate change and a limited gene pool on these island residents.

Warming temperatures have caused dramatic declines in the moose population in recent years. Due to the tight connection between the two species, when hard times fall on moose, the wolves suffer as well. In 2000, there were 1100 moose on the island. Since then, unusually warm summers have dealt a double whammy to the big herbivores. High temperatures cause them to lose their appetites and to seek refuge in lakes to escape the heat. Climate change also seems to favor ticks, causing a massive infestation that has yet to abate. The ticks cause hair loss and drain blood from the moose, which spend their time fighting the ticks instead of eating. Consequently, they eat less during the summer and add fewer fat reserves for the winter. As a result of these factors, there are now fewer than 350 moose. As moose decline, wolves soon follow. Since 2000, the wolf population has declined from 30 to 21.

The declining wolf population is directly connected to the limited availability of moose. John Vucetich, an assistant professor at Michigan Technological University, states, "The main reason (for the declining number of wolves) is a lack of food." In most ecosystems, when faced with the decline of a single prey species, large predators such as wolves would shift to other species. In Yellowstone National Park, for example, where elk are the main prey item, bison, deer and moose are available should elk decline. In the isolated ecosystem of Isle Royale, however, the availability of large herbivorous prey is more limited.

Another factor impacting Isle Royale wolves is their small, isolated population. For the first time in a half-century of studying wolves on the island, scientists have found conclusive evidence that inbred animals are developing physical deformities. Scientists say this finding raises questions on how long the inbred wolves can continue to thrive and whether humans should intervene by releasing new wolves onto the island – a controversial process called “genetic rescue” that would refresh the pack’s gene pool.

The wealth of data on the population of moose and wolves on Isle Royale makes it ideal for studying the impact of limited genetic diversity and climate change on a relatively fragile ecosystem. Studies such as these can point to the dilemma faced by biologists as they attempt to develop and implement wildlife management plans. For more information and data on the research at Isle Royale, visit [www.isleroyalewolf.org](http://www.isleroyalewolf.org).

## **NCSR Submits Preliminary Grant Proposal**

**Lester W. Reed, Ph.D.**

NCSR has submitted a preliminary grant proposal to NSF’s Advanced Technological Education (ATE) program for 2011-2015. The proposal requests \$1.4 million to continue serving as a National Resource Center for natural resource education. The grant request proposes to develop classroom-ready modules focused on technical and environmental issues associated with aquaculture and the impact of invasive species on marine and wetland ecosystems. These modules will provide faculty the results of recent scientific research and current management practices associated with aquaculture operations and the detection and control of invasive species. To support developing sustainable literacy for associate degree graduates, the Center proposes to develop an overview course on the current and projected global environmental and socioeconomic conditions that require action to ensure a sustainable future. The course will be supported by modules focused on specific discipline sustainability concepts. Additionally, NCSR would conduct a series of professional development institutes focused on adaptation of environmental materials into technical and supporting science courses at

the associate and baccalaureate degree level. To support modernization and adoption of environmental science education programs at the associate degree level, NCSR proposes to develop a classroom-ready three course environmental science sequence. The sequence would integrate the latest scientific research and laboratory and field activities based on this new information and support both technical and transfer offerings. Further, to promote developing college-bound natural resource students at high schools, the Center would expand efforts to assist teachers in adaptation of community-based natural resource materials and activities into secondary education science curricula. A new community-based curriculum development guide would be developed based on current practices including integrating community partners into the teaching process. Finally, NCSR would develop pilot products supporting environmental science education using advanced social networking applications.

After receiving reviewer feedback, a final proposal will be developed and submitted in October 2010. If funded, the new grant would be effective in July 2011.

## UN Rejects Protection of Fish

Lester W. Reed, Ph.D.

In a March 2010 meeting of the United Nations' Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), governments voted against better international trade controls for shark species and the Atlantic bluefin tuna. Hope of some nations for establishing a strong precedent that marine fish were in the same category as wild mammals and deserved equal protection did not materialize. The majority of CITES members voted against increased protections for the bluefin and five shark species (three hammerhead sharks, the Oceanic whitetip shark and the Spiny dogfish). The hammerhead and whitetip sharks species are in severe decline because of overfishing for their high-value fins while the Spiny dogfish is targeted for its meat. While the migratory bluefin tuna stocks have by, some estimates, fallen by 75% due to widespread overfishing. Led by opposition from Japan, which imports 80% of Atlantic bluefin, Canada and scores of developing nations opposed the measure to protect the

bluefin. These nations rejected the increased protection on the grounds that a ban would devastate fishing economies. Japan restated its position that CITES should not regulate tuna and other marine species. CITES members did vote to include the Porbeagle shark – overfished primarily for its meat and fins – in Appendix II. (CITES Appendix II lists species that are not necessarily now threatened with extinction but that may become so unless trade is closely controlled.) Conservation groups and nations that favor increased protection of fish by CITES, including the U.S. and U.K., have indicated that CITES bowed to commercial pressures at the March 2010 meeting in Doha, Qatar. The vote not to list these species is seen as a vote in favor of treating these endangered fish species like commercial food stocks, not wildlife. The conflicting interests reflected at the CITES meeting is an excellent example of an international situation that fits NCSR's instructional strategy presented in the module, *Town Meeting: An Approach to Exploring Environmental Issues*.



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