**Democracy in Action: Science and Conflict in**

**Yellowstone National Park**

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This paper describes a professional development workshop that took place in June 2008. The workshop was designed to provide secondary life science and social studies teachers with the tools that they needed to teach about the tensions between environmental and public policies. The workshop gave teachers the knowledge base, pedagogy and curriculum materials necessary to enhance their classroom instruction concerning the scientific, government and economic concepts fundamental to issues surrounding the efficient use of certain types of public land. The workshop used the following conflicts over public land usage in Yellowstone National Park to illustrate the basic concepts of both Environmental Systems Management and Public Economics.

* The free roaming of Yellowstone National Park (YNP) bison, many of which carry the disease brucellosis, off park lands during the winter. Livestock herds exposed to brucellosis must be destroyed. Over the past two years, both Montana and Wyoming have lost their “brucellosis free” status which has put an added stress on the cattle industry. How does this affect the economic status and lifestyles of local ranchers? (http://www.hpj.com/archives/2008/sep08/sep15/USDAdowngradesMontanasBruce.cfm )
* The reinstitution of wolves to the park, along with their endangered species classification puts private livestock herds at risk as wolves prey on sheep and calves. A federal judge has recently overturned a lower court decision to remove the wolf from the endangered species list How will this impact the local economy of communities surrounding the park? (<http://dsc.discovery.com/news/2008/07/21/gray-wolf-endangered.html>).
* The National Park Service placed restrictions on certain kinds of recreational activity in the park, with a special emphasis on winter use by snowmobiles and snow-coaches. How can the livelihood of people surrounding the park be balanced with the ecological needs of the park ? (http://articles.latimes.com/2003/mar/09/nation/na-yellowstone9 ).
* Recently, biotechnology firms have shown interest in prospecting minerals from the thermal features of the park. Will this potential economic use of the park’s features change the overall essence of the experience at Yellowstone National Park? Who holds the use rights to these scarce resources? (http://articles.latimes.com/2000/jul/10/news/mn-50565).

The project was a part of Indiana State University’s American Democracy Project (ADP), a program sponsored by the American Association of Colleges and Universities ADP is committed to producing college graduates that are active citizens in their communities. If these efforts at colleges and universities could be combined with similar efforts at the secondary level, a new crop of active, engaged democratic citizens could be produced. This program encouraged teachers to engage their students in the democratic process. The National Science Foundation has been working for the past twenty five years to bring ecological researchers together with social scientists (NSF, 2002). The Long-Term Ecological Research Network has been working on a model to show how social and ecological systems work together to inform more effective environmental public policy (Redman, Grove, & Kuby, 2004). The project described here integrated expertise in biophysical and social science processes, and modeled that integration for secondary teachers. Using the natural and social science platforms for understanding these complex environmental management issues provided teachers with an experience that they will be able to take into their classrooms and share with their students.

Beard and Wilson (2006) found that experiential learning brought several learning theories together for students in ways that require them to actively engage the material. Their research claimed that learning should be personal and connect with what students already know and understand. Learning experiences outside of the classroom, like those experienced in field work, engage many senses, allowing the impact of an experience to have lasting qualities. This project provided participants with the opportunity to explore concepts and abstract ideas within a concrete contextual foundation.

 If secondary students are to effectively grapple with understanding complex environmental management issues, they need a foundation that includes the economic and civic concepts necessary to create effective public policy responses. They also require tools to help them organize and these multifaceted issues into structures with which they are familiar. Wood, Bruner, and Ross (1976) call this form of teacher-assisted structuring, scaffolding. According to Mcgrew and VanFossen (In-press), the teacher should provide just enough structure to allow a student to master a task or concept that the student is initially unable to grasp independently. This is very important in helping students learn the complex concept within a given context. The professional development workshop modeled how teachers could partner with university faculty and students to learn these difficult concepts in a meaningful context. Following the professional development workshop experience, secondary teachers should be able to help their own students: ask research questions; design high-quality research projects to collect the data needed to find answers to those questions; gain experience using the statistical tools that determine how valid those data are; and develop cogent arguments and analysis that might be used by decision-makers to better understand these issues.

The following three indicators from US Government Standard 5 of the Indiana Academic Standards (Roles of Citizens in the United States) are at the heart of the goals of the American Democracy Project ([**http://dc.doe.in.gov/Standards/AcademicStandards/PrintLibrary/index.shtml#social\_studies**](http://dc.doe.in.gov/Standards/AcademicStandards/PrintLibrary/index.shtml#social_studies) ).

Explain and give examples of important citizen actions that monitor and influence local, state, and national government as individuals and members of interest groups.

Describe opportunities available to individuals to contribute to the well-being of their communities and participate responsibly in the political process at local, state and national levels of government.

Use information from a variety of resources to describe and discuss American political issues such as environmental issues, women’s rights and affirmative action.

Yellowstone National Park provided a natural backdrop for teachers to learn about how these concepts and skills relate to real public policy issues faced by park management and constituency groups. Teachers interacted with decision-makers and grass roots organizations to see how science could support varying positions. The participants also learned how they could bring these kinds of complex issues into their own classroom.

**Yellowstone National Park: An Experiential Learning Field Activity**

 What does real civic engagement look like in secondary classrooms? Could involving students in finding answers to larger, ill-defined environmental management issues involving conflicts over public land usage in Yellowstone provide students with the desire to engage in democratic citizenship? The ADP’s *Stewardship of Public Lands* program (<http://www.aascu.org/programs/adp/stewardship.htm>) provides a platform where these land use issues may be identified and explored. Environmental education provides high-interest topics that students find appealing. This program, brought teachers together with ISU faculty and students in order to discover how the natural and social sciences can work together to better understand environmental conflict issues.

 Throughout the United States, but especially in the West, the question of who will control public lands is a hotly debated topic. The public lands of the west…national parks, national forests, grazing and prairie lands… all are sites of controversy and conflict. Conflicts over property rights, decision-making authority and processes are common. Developers, farmers, ranchers, hunters, business owners, recreational users, environmentalists…all assert claims to influence and use. Classroom discussions as well as interactions with experts and advocates in the field at Yellowstone addressed such questions as:

* In our democratic and market based society, how do the interests of all of these groups get addressed and resolved?
* To what extent are science, politics and economics involved in the decision-making process?
* What is the role of individual citizens in the formulation and execution of public policy?
* How can individual citizens have a meaningful role in these debates?

 By observing the resources that are in dispute and talking personally with independent experts as well as advocacy and stakeholder groups, project participants explored the answers to these and other questions. Speaking personally with the individuals whose lives are directly impacted by the way in which the conflicts are resolved, provided the experiences that helped the participants gain a better understanding of the issues involved and allowed them to see how these decisions affected real people’s lives.. The understanding generated helped these teachers demonstrate to their own students the importance of knowledgeable participation in the democratic process..

The workshop began with eight day-long sessions at Indiana State University. This part of the workshop provided content instruction in the scientific, civic, and economic concepts needed to understand the issues and conflicts over public land use at YNP. The concepts covered are listed in Appendix A. In addition to the academic concepts, discussions are held on how to teach these concepts in the secondary classroom. Participative and interactive lessons are demonstrated and discussed. The links between the concepts and lessons and the Indiana Academic Standards in Science and Social Studies are emphasized in all discussions.

Following the on-campus workshop, participants traveled to YNP for seven days of field work. During the time at Yellowstone, participants toured the park with scientific and economic experts from ISU and from the Yellowstone Association (http://www.yellowstoneassociation.org/). Participants also hear from local experts, advocates, and stakeholders. In addition to providing presentations, there is a great deal of interaction between the presenters and workshop participants. A listing of the contributing organizations is presented below.

**Advocacy Groups and Stakeholders Interviewed During Field Work:**

Business Groups:
 Hotel/Restaurant Owners and Snowmobile Providers/Guides
 Outdoor Recreation Companies (rafting, fishing, hunting, touring, horseback, etc.)
 Local Chambers of Commerce

Environmental Groups:
 Mainstream: Northern Plains Resource Council
 Activist: The Buffalo Field Campaign

Experts:
 State Veterinarian
 State Department of Natural Resources
 National Park Service
 Yellowstone Association

Local Stakeholders:
 Ranchers
 Politicians
 Native Americans

**A Professional Development Model**

The project develops a model of professional interaction between higher education faculty and secondary teachers that brought together the unique expertise of each group. This partnership provided a foundation for an institutional structure allowing social and natural science content and skills to be used in an investigation of a variety of issues in a field research/learning experience for middle and high school students.

A major challenge for secondary teachers is to find ways to introduce their students to academic concepts in ways students will find both interesting and meaningful. By bringing together representatives from higher education, the public sector, and constituency groups, teachers will be better equipped to help their students investigate the complexity of the modern scientific and social issues that they will face as participative citizens. As the secondary teachers developed strategies for introducing these concepts into their classrooms, they also developed a relationship to the faculty at ISU. The project provided the opportunity for the secondary and higher education faculty to better understand how these concepts fit into the secondary classroom.

The longer term goal of the project is to create a deeper partnership between the higher education faculty and the secondary teachers. This relationship would involve mentoring, professional development, and both concept and local issue expertise. One of the innovative aspects of this partnership is the creation of “teams” of higher education, high school, and middle school teachers. These teams would work together in the development of ongoing professional, research oriented, field based projects involving, not only university faculty and students, but also middle school and high school teachers and students. The team would be designed to bring together science and social science teachers from a middle school that feeds into a high school, so that participating students would be able to continue with this professional, research project through their later middle school and early high school years. Such programs can stimulate interest in the natural and social sciences in students where none existed before; bringing to life the kind of work these professionals do on a daily basis.

A few select quotes from local YNP presenters are provided in Appendix B to illustrate the kinds of discussions held at Yellowstone. Two teacher reflections on the learning experience written after the completion of the field work are also included in the appendix.

**Appendix A**

**Academic Concepts Addressed in the Workshop**

**Science concepts,**

* The nature and impact of science and technology
* Critical scientific thinking and the role of evidence-based decision making
* Ecosystems integration and management
* Influence of people and social systems to the environment
* Natural selection and adaptation in plants and animals
* Systems homeostasis and equilibrium
* Global warming and climate change
* Integrative natural resource management
* Natural and unnatural resource recycling; water, energy, air, minerals, waste
* The role of short and long-term Earth hazards, disasters and consequences
* Animal and plant population dynamics
* Diseases in animal and plant populations
* Renewable and nonrenewable energy resources and consequences
* The influence of politics and political decisions on natural resources management
* The influence of agricultural technology and its practices on natural resources
* Historical perspectives on ecosystems management
* Earth history, plate tectonics, continental drift, volcanism, geothermal processes

**Government and Economic concepts,**

* Civic and political life
* Meaning of citizenship and roles of citizens in the United States
* Justice and equality
* Principles and values of American Democracy
* Relationship between limited government and a market economy
* The role and workings of special interest groups
* Influence of the media on public opinion and public policy
* Civil and constitutional rights
* Cost/Benefit Analysis
* Market and Government Failures
* External Costs and Benefits
* Property Rights and the Tragedy of the Commons
* Economic Role of Government
* Public Goods
* Regulation
* Public Choice Analysis, Special Interests, and Logrolling

**Appendix B**

**Selected Quotes from experts and advocates interviewed in Yellowstone National Park:**

**Buffalo Field Campaign Spokesperson (http://www.buffalofieldcampaign.org/):**

I call it the window of opportunity. When those buffalo are being slaughtered like this and mistreated it opens up what is considered newsworthy material by the press. It gives us an opening to talk about what’s happening. It’s a damn shame that has to happen for us to get that opportunity. What’s newsworthy; 500 buffalo being killed or 1,500 buffalo being killed? We try to move as fast and as quickly as we can when that window opens up, try to be their best advocates all year round.

 I think we need to give some economic incentives to cattle ranchers within the Greater Yellowstone area to give them a new opportunity to retire their grazing allotments permanently. At the same time to develop new sustainable forms of income to keep them on the land.

**National Park Service Bison Expert**

Bison, they move. Even if they have plenty of food in one area, they would move. They’re migratory. That’s one of the great things why they are very well suited to this habitat. They don’t stick in one place. They don’t overgraze it. They will typically move on. With increasing population, they tend to move out and spread out to new areas with more food, which helps sustain that population growth and that growth rate so they never really knock themselves back down because there’s still more food … The debate is what we’re trying to define risk. How much risk is there for brucellosis transmission? Different people have different ideas…. The bulls are pretty much a zero risk for transmission. They’re not going to be giving birth; it’s pretty hard for them to spread brucellosis. If they’re zero risk, why do they get shot down when they leave?

**Paradise Valley Rancher**

When the initial case of brucellosis happened in May of last year … they depopulated that entire herd so it brought it kind of close to home. The consequence from that, it became very political. The Governor wanted to invoke split state status, which would define an area around the park to be treated differently. … At this point, because of the second case of brucellosis that was found, Montana has lost its class free status and we’re downgraded to Class A. The other thing … we have got a vaccine that’s lousy. If you can only get 60-70% efficacy in a vaccine, that’s lousy and even adult vaccinating we were told that we can only hope to get a 5-10% increase in immunity…. I don’t understand why given modern medicine and all the research and development that we have that we cannot come up with a better vaccine. That’s a real problem.

**Select Post-Workshop Reflections of Teacher/Participants**

**A mid-career middle school teacher:**

The instructors brought to my attention how we humans use Yellowstone for economic gain. There economic gains are not always “green” or conducive to the ecosystem. I already knew that there had to be a balance between human survival and the survival of the ecosystem; however, they made me think more about the policies and institutions that govern the use of land and resources. This experience has given me so much knowledge on the controversial issues and the park that I will be able to create mini lessons throughout the school year. By interviewing the stakeholders personally, I was able to read their body language, facial expressions, and hear their voices. By feeling the emotions that are driving each side to make a stand, I will be able to relay those emotions to my students and make the stakeholders become real to them.

**An experienced middle school teacher:**

It was inspiring to see the passion and determination of the stakeholders. I think that kind of passion could really be ignited in a classroom. My goal is to find more ways to incorporate controversial topics in my classroom that relate to my curriculum. Controversial subjects tend to spark more emotion. It is from that emotion that I hope to challenge my students to find peaceful solutions. What a great way to teach the importance of activism and good citizenship.

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