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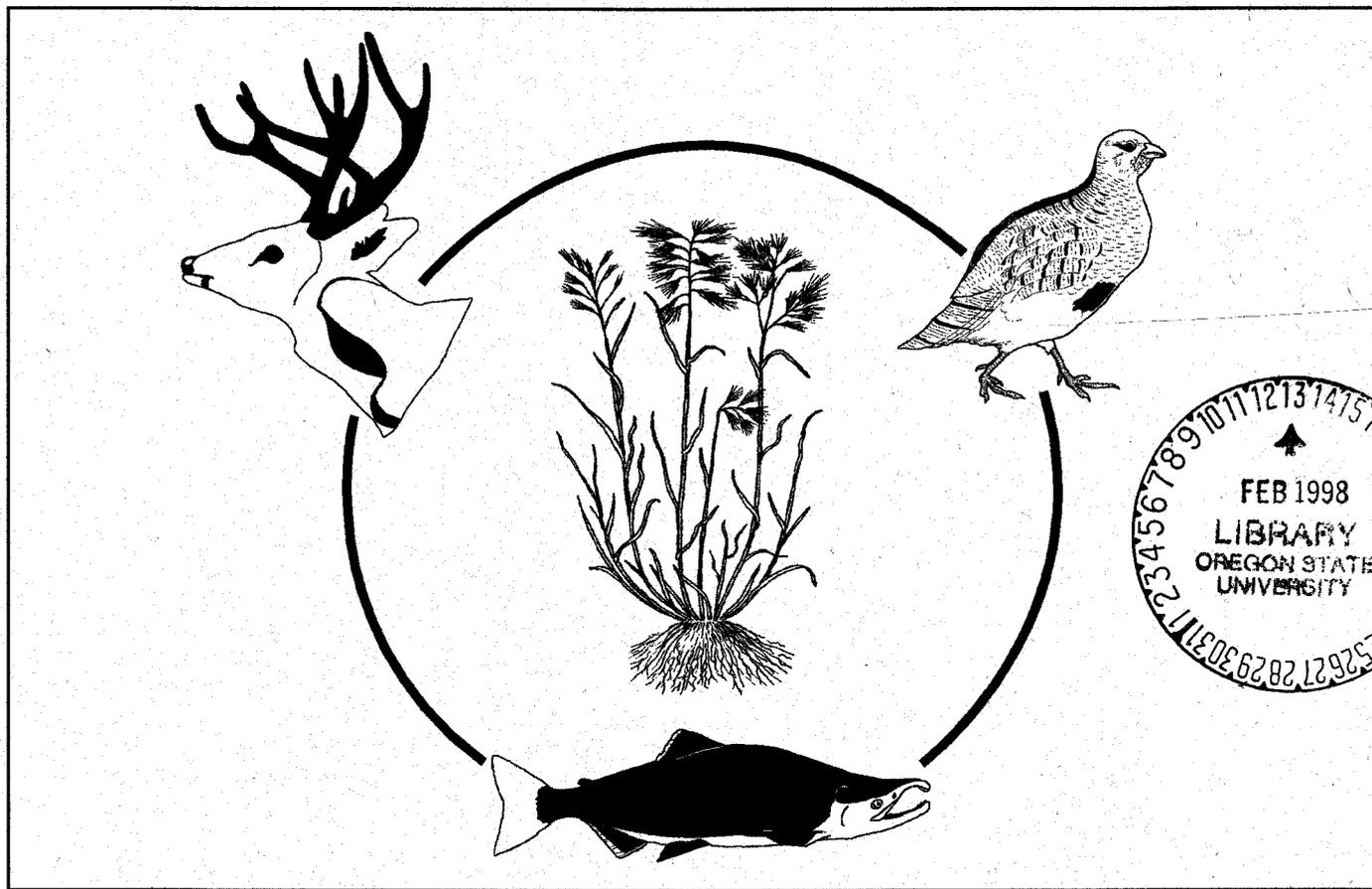
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Proceedings of the 8th National Extension Wildlife and Fisheries Specialists Workshop

Educational Challenges for the 21st Century

Western Washington University ♦ Bellingham, WA ♦

26-29 June 1996



OREGON STATE UNIVERSITY EXTENSION SERVICE

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Oregon State University Extension Service
Special Report 982
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26–29 June 1996

Edited by
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Plenary Session—Welcome and Opening Remarks

OPENING REMARKS

EDWARD J. DEPUIT¹, Department of Natural Resource Sciences, Washington State University, Pullman, WA 99164

I vastly appreciate the opportunity of being with you all today to help launch what, I am certain, will prove an extraordinary workshop. I bring you specific greetings and words of welcome from colleagues in eastern Washington and elsewhere in the interior Pacific Northwest and particularly from the organization that John Munn and I work for, the College of Agriculture and Home Economics and Cooperative Extension, Washington State University. We are delighted indeed to have this meeting in our corner of the world this year.

As our state's land grant university, Washington State University (WSU) has long supported wildlife biology and management as an area of emphasis. Wildlife is presently "housed" in the College of Agriculture's Department of Natural Resource Sciences (which I chair). We have what I believe is a vital, high quality and growing program. With regard to teaching, over 50% of our total student body of 450 is composed of wildlife majors (and enrollment in wildlife has roughly tripled since 1990). We have six faculty in wildlife with specializations in avian and mammalian ecology, habitat ecology, wildlife nutrition, population ecology, and animal damage management. Our research program, I believe, has achieved national and international reputation in several areas, such as nutritional ecology of large herbivores and predators—including moose, deer, elk, woodland caribou, and the only captive grizzly bear research facility in the country.

Having said all this, we remain hampered at WSU by lack of Extension Specialist support specifically in Wildlife. However, the strength (indeed, foundation) of our department lays in its interdisciplinary nature, whereby wildlife science is *integrated* with other natural resource fields. Consequently, wildlife concerns are incorporated within many (indeed, most) of the stewardship, continuing professional education, and youth extension programming conducted by forestry and range specialists and by our state extension faculty colleagues.

Now that you know a little about us, I'd like to impart a few personal perspectives on fish and wildlife extension needs and challenges in Washington. I will try to frame these opportunities within the theme of this week's meeting: Educational Challenges for the Next Century—Where Should We Be Going From Here.

In 1991, Jim Miller helped produce a National Guidance Statement for Extension Wildlife and Fisheries programs, a statement that clearly identified wildlife/fisheries as (I quote): "...*an integral* part of the total extension mission...." This underlying principle, while certainly accepted by folks like us, in my experience is often not fully recognized (institutionally) by the land-grant universities which employ us. I therefore believe our first challenge is an internal one, to do a better job of educating our own organizations on the essentiality of properly supported wildlife extension programs that are well-integrated with those in other related fields.

With regard to subject matter focus, we certainly are not hampered by a shortage of topics for extension programming. Selected subjects of particular importance here in Washington, for example, include such areas as conservation biology and biological diversity, management for both game and non-game species, integration of wildlife with land management practices (such as agriculture, grazing, forestry, etc.), wetland/aquatic habitat conservation—and the list goes on and on.

I'm not going to dwell upon these and other subject matter areas overmuch, except to state my belief that we (here in Washington at least) need to be increasingly focused upon types of wildlife habitat that have "traditionally" been afforded less attention than "wild" lands. I am talking here about urban/suburban areas, the "urban-rural" interface, and intensively managed landscapes such as cropland and managed forests. These areas do provide highly significant habitats for certain species of wildlife; and comprise a part of the overall matrix of habitats serving wildlife populations on a landscape scale. Perhaps most importantly, these types of "non-wild" lands in aggregate comprise the "type" of habitat (and support the wildlife) with which most of our state's population comes into most regular contact.

I believe we need to focus upon a truly (to use an overused term) "holistic" approach to understanding and managing wildlife populations and habitats, as inter-related to the matrix of other natural resources and resource values existing in our state's ecosystems. This approach is implicit within the emerging paradigm of ecosystem management, and reinforces the notion that to be successful in wildlife conservation one must do more than myopically focus upon wildlife alone.

We also, in my opinion, have some challenges related to the audiences/clientele we serve in wildlife extension programs. While continuing education programs targeted

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to practicing natural resource professionals remain important, my considered opinion is that in the future we must devote proportionately greater attention to non-professional audiences such as:

- Rural and, particularly, urban youth, who will be the public opinion and decision makers of the future,
- The general public (that is, the opinion/decision makers of today), many of whom may not have intimate, day-to-day contact with wildlife but who nonetheless feel an affinity for wildlife, and
- The small, but important, proportion of the public who depend upon natural resources for socioeconomic sustenance, such as farmers, loggers, fishermen, etc., since this is a segment of society that can directly influence wildlife through day-to-day activities.

These constituencies need accurate, objective and usable information—particularly in light of the deluge of “dis”-information they are often exposed to.

This brings me to some “philosophic” thoughts on needs from extension fish and wildlife programs in the future. As professionals and public servants, I believe we must take particular pains to separate “fact from fancy” in educational programs. We have a responsibility to remain objective and impartial in programs that are soundly based upon science. Wildlife issues often can be contentious and, again, our audiences certainly receive more than a fair share of “partiality” from the media and from interest groups on both sides of questions. Despite human temptations to the contrary, we must not fall into the trap of partisanship, for reasons related to both professional ethics and loss of credibility.

I further believe that we need to integrate the “science” of fish and wildlife with socioeconomic values and needs in extension programming. Most of us got into the fields of natural resources as scientists. We thus have a tendency to view and educate upon fish and wildlife from a rather narrow, purely scientific (or, to some, “eco-centric”) standpoint. Society, however, views and assigns values to wildlife and other natural resources from economic, cultural, and/or aesthetic perspectives that often are based upon other factors. We need to recognize and integrate these socioeconomic factors right along with scientific principles when we provide extension education.

John Munn asked that I conclude my remarks with a perceived “Chief Need” for fish and wildlife programs of the 21st Century. Where should we be going from here (and how should we get there)? I would sum up my

recommendations, in a global sense, with two words (and both begin with the letter “C”): *Coordination* and *Collaboration*. By *Coordination*, I am referring to the challenges of integrating fish and wildlife concerns, issues, and principles with those of other fields of science that may be relevant, and (as noted previously) with the needs and desires of society. By *Collaboration*, I am referring not only to teamwork of wildlife extension professionals with those in other relevant fields in program delivery, but also to partnerships with and among our various constituencies.

The risks of not rising to this challenge—of remaining insular in fish and wildlife extension programs—are great indeed. Can fish and wildlife extension professionals be truly effective working solely from the perspective of fish and wildlife, and/or in isolation from fellow professionals in other resource fields? Probably not. Let me pose some additional questions of a more positive nature:

Would chances of success in preserving old-growth-dependent wildlife be improved by coordinated, active, and willing involvement of wildlife biologists, foresters, loggers, environmentalists, etc., working together rather than at “loggerheads,” as so often in the past?

Would chances of preserving or restoring anadromous fish be enhanced by fisheries biologists working together with agriculturalists, engineers, ranchers, etc., rather than in isolation from or in opposition to each other?

Would an atmosphere of mutual understanding and respect, if not total agreement; and working forward to build upon points of mutual agreement help in moving disparate interest groups toward consensus in resolving problems—instead of today’s common recourse to litigation?

My answer to all these questions is a simple “Yes.”

In conclusion, I believe we have some real opportunities as fish and wildlife extension professionals as we progress toward the 21st Century. We are in a unique position to both impart coordination and collaboration in the programs we deliver (i.e., “lead by example”). We also are in a position to foster these mindsets of coordination and collaboration within the varied constituencies we serve. A number of models to achieve these goals have been around for some time as foci for extension efforts, such as Holistic Resource Management, Coordinated Resource Management Planning and, more recently, Collaborative Learning. These and other models all require a willingness of extension professionals to transcend traditional disciplinary boundaries; to work together with others in related fields; and to serve all concerned constituencies in progressing toward shared goals.

IMPORTANCE OF YOUTH—A CHALLENGE

HOLLY DAVIS, President, Snohomish County 4-H, Natural Resources, Snohomish County, 600 128th Street SE, Everett WA 98208

As I was looking through your program for the next few days, I noticed that several of the workshops had to do with the future—Perspectives on Natural Resources Extension for the 21st Century, A Perspective on the Past, Present, and Future Extension Wildlife and Fisheries Programs, Extension Technologies for the 21st Century, and on and on. But it is our youth with whom we should focus. It's the young generations now that are going to be doctors, pilots of major airlines, presidents, UN Peacekeepers, but most important of all—keepers of our planet earth. Our future is going to be built around the youth of today. What you teach and how you treat the youth now will have a great impact on tomorrow. These youth are looking to you as role models. My name is Holly Davis and I am 18 years old. I have been involved in Snohomish County 4-H Natural Resources for the past 9 years—a group in which a majority of the responsibility falls on our teen leaders, from selecting, to arranging, advertising, running, and participating in 25 to 30 outdoor events, community activities, and meetings a year. All open to the public.

I am here to give you an insight into how some children think through my story of youth leadership—a case history that applies to the youth in many of your states. I was a shy child and whenever I went anywhere I stayed right at my parent's side. In 1987 I joined 4-H dogs and natural resources. I had previously gone on several fishing trips with my father and still several more camping trips with my family, so this natural resources group sounded just perfect for me.

One of the first activities I participated in was the tours at the Skykomish Salmon Hatchery. At the age of 10, I was too young to give tours so they set me up with a booth to promote 4-H and it was my job to pass out pamphlets. Though it was a small job, it was important to me and I worked hard doing it—making sure that every single tour goer received one. I felt that I had to prove something—to show them that I was responsible enough to run tours the next year. In the years to follow at the hatchery I was able to give tours by myself, but that first time—when I held a salmon out to the children and saw both the amazement and wonder in their eyes and realized how I had made that come alive in them, I was proud knowing that I held the key to a child's curiosity.

In the following trips of my first year, I started to pull away from my parents and looked up to the teen leaders. They became my mentors and my friends and I couldn't wait to be them. I didn't start setting up my own trips for a few years but I helped the older members by making phone calls or running games—nothing very large, but just enough to learn responsibility. As the years went by, I

learned about mother nature, wildlife, the environment, and how to love planet earth through native American teachings.

In my junior year of high school I became involved in the 4-H Wildlife Habitat Evaluation contest at both a state and national level, from which I learned a great deal. I learned the habitat needs and diet of 68 different species of animals and how to alter the land to create the environment needed to produce a maximum population of that species. I felt I had to prove to myself and others that I could do well, so I studied for months and won first at the state level. I became a part of a four-person team to attend the nationals in North Carolina. I then had to learn about new species of animals, new practices, and how to apply them to the different environment that is found in North Carolina. When I arrived at the national contest, I had the chance to use my knowledge in a competition against several other teams from different states. I met and became friends with many other competitors and learned about their states and their lives.

My senior year started and I decided to run for the office of president of our club. I had never run for a position until this year but I had visions of what could be accomplished with this group of people so I decided to become president. I since have learned about problem solving, being a mediator, conflict resolution, communication between the leaders, teens, and public, and the management of a county-wide project. At the same time trying to integrate my ideas for the improvement of the group.

I have gained confidence in my leadership and speaking abilities and feel that I can deal with almost anyone. I know I can accomplish great things and have high expectations for my future mainly because of the leadership skills I have learned these past 9 years.

From the age of 13 I wanted to be a cardiac specialist but just within the past 6 months I have decided to create a career for myself in the field of fisheries and wildlife. I think that being a mentor to children and being fortunate enough to have a mentor like John Munn in my life has given me the courage to change direction. I think we are all out to prove our identity whether it be to others or just to ourselves. I think it is most prominent in childhood and in the teen years. These are the years we decide what type of adults we want to be. We challenge the system, we rebel against our families and school in the way we dress and the attitudes we have. We must make our own way and we must make good decisions. It's very hard being a child these days with so many expectations to fulfill. No generation yet has had as many choices as we do.

Children need guidance and the encouragement to take responsibility and you as Extension specialists are the ones to give it to them.

A week ago I graduated from high school and received an Associates of Arts and Science degree at the local community college through the Running Start program. I have only 3 months left in my 4-H career as a teen. I feel confident in attending Washington State University and in my career choice in environmental science. It is one of your compatriots that influenced me. But the question you should be asking yourselves is "How does this apply to me?"

Thank you.



WORKSHOP EXPECTATIONS AND GPRA EVALUATION AND ACCOUNTABILITY

RALPH OTTO, Deputy Administrator, Natural Resources and Environment Unit, USDA-CSREES, Washington, D.C.
20250-2210

Because of a health-related problem, Dr. Otto was unable to attend the workshop; therefore, an overview of his suggested comments was presented by Jim Miller as follows:

Our expectations for this Eighth National Extension Wildlife and Fisheries Specialists Workshop are that it will provide an opportunity for the professionals in attendance to assess current programs and capabilities; address changing audiences and their need for educational programs; evaluate changes in the land grant university system and in their agency; and proactively make needed changes to ensure that their educational programs continue to be relevant to Society's needs now and in the future. Among these expectations, of course, are that this workshop will serve a part of the requirement for continuing education that all of us need periodically. On behalf of USDA-Cooperative State Research, Education, and Extension Service and particularly our Natural Resources and Environment Unit (NREU), we congratulate your Planning Committee, your hosts John Munn and Dan Edge, and those of you participating for developing what appears to be an outstanding array of presentations, workshop activities, and programs. Your invited guests include some outstanding professionals I have had the pleasure of working with and a number of others I haven't met but have heard nothing but positive feedback about. I regret not being able to attend but certainly extend my best wishes for a successful workshop and hope possibly to be able to attend your ninth workshop.

In regard to GPRA evaluation and accountability, I'm not going to get into a lot of detail, but do want you to know some basics about what it is, why it is being required, and how it could affect all our programs in the future. Many of the details for how all federal agencies will respond to GPRA are still being worked out; therefore, the following will hopefully suffice to sensitize you about this effort for the present:

GPRA—THE GOVERNMENT PERFORMANCE AND RESULTS ACT OF 1993

GPRA by law requires that federally funded agencies develop and implement an accountability system based on performance measurement, i.e., setting goals and objectives and measuring progress toward achieving them.

Key provisions of GPRA require federally funded agencies to:

- (A) Develop GPRA Strategic Program Plans. Each agency is required to prepare a plan covering at least 5 years that sets forth its mission and long-term goals. Initial plans are to be submitted by the Chief Financial Officer, USDA, by March 1996 to the Office of Management and Budget (OMB) and to Congress sometime thereafter.
- (B) Prepare GPRA Annual Performance Plans. Each agency is required to prepare an annual program performance plan showing what program outcomes are to be achieved to meet the long-term goals of the strategic plan. The first annual program performance plans for Fiscal Years (FY) 1998 and 1999 are to be submitted to OMB by March 1997.
- (C) Prepare GPRA Annual Program Reports. Each agency will issue public reports on how well it has achieved its goals and, where they were not met, provide an explanation. The first of these reports are due to the President and Congress in March 2000.

The GPRA will require strategic plans to be updated once every 3 years. Performance plans and reports must be submitted annually. Plans and reports must reflect the joint activities conducted through the federal-state-county partnership in achieving selected high-priority outcomes. For CSREES, the 55 budget lines will be grouped into the 5 following goals based on the Joint Council's FY97 Priorities:

1. Achieve economically viable agricultural production systems that are compatible with environmental and social values;
2. Provide a safe, affordable, reliable, and nutritious food supply;
3. Educate agricultural scientists and professionals to meet future challenges;
4. Improve global competitiveness of U.S. food, agricultural, and forest products; and
5. Empower individuals, families, and communities to improve their quality of life.

For each goal, a GPRA strategic plan and performance framework will be prepared for System-wide review. Obviously, these five goals do not appear to directly relate to Extension wildlife and fisheries programs; however, it would be incorrect to assume that data on the outcome of your programs will not be required. I know Jim Miller requested voluntary accomplishment reports from you for FY94, and I assure you we have used the data you provided both internally and externally. I understand he has requested voluntary reports from you for FY96 accomplishments. I know we all hate doing such reports; however, I am confident that with your input of examples of accomplishments from programs in your states, we can continue to make a strong case for support of Extension wildlife and fisheries programs. I am also confident that this kind of information will be requested by both internal and external agencies, organizations, and support groups, now and in the future.

Therefore, I strongly encourage you to provide your voluntary accomplishment reports to Jim as requested for FY96. I think you know he has, and continues to be, a strong advocate for support of your programs; the information you provide in these accomplishment reports certainly helps him and our NREU make a stronger case for continued support. As GPRA further develops and is refined, we will do our best to keep you informed. My very best wishes to you all for an excellent workshop and the continued effectiveness of Extension wildlife and fisheries educational programs across the nation.

PERSPECTIVE ON NATURAL RESOURCES EXTENSION FOR THE 21ST CENTURY

MERRILL L. PETOSKEY, 2830 Cobb Road, Lewiston, MI 49756

Speaking to this group of fish, wildlife, and natural resources professionals is getting to be a habit with me, having talked at this workshop three times in the past 2 decades. This is the fourth.

The first time was in 1977, I was gainfully employed as Director of Wildlife Management for the U.S. Forest Service (USFS). I'm not quite sure why I was at your meeting. I expect my good friend, Jim Miller, trapped me because of some earlier discussions we had on grazing on the Ouachita National Forest in Arkansas. Regardless, at the time, I suggested that funding, in the Extension system, be specifically earmarked for natural resources programs. Also, that a Natural Resources unit be created in the Federal arm of the Extension Service to plan, develop, coordinate, and help implement natural resources programs at all three levels, local, state, and federal. That was exactly what was supposed to happen with the passage of the Renewable Resources Extension Act (RREA) of 1978.

This Act authorized \$15 million for a comprehensive and expanded program in natural resources management for the owners, managers, users, and processors of private forests and rangelands for a variety of renewable resources.

As Chief of the Michigan Department of Natural Resource's (MDNR) Wildlife Division, prior to joining the USFS, I helped develop an Extension Fish and Wildlife program with the Cooperative Extension Service at Michigan State University. Possibly, as a result of this experience, I was asked to compete for the new position as Deputy Administrator for Natural Resources in Washington. I was interviewed and got the job as head of the unit, created on 12 March 1979, the same day I arrived in Washington.

It was then I began to realize the Cooperative Extension Service was not quite as cooperative as the name implies. The new unit was authorized eight professional positions, four of which were filled with transfers from the former Agriculture and Natural Resources (ANR) and the Community and Rural Development units. The four remaining positions were vacant. A secretary was also assigned from the former ANR unit. I called her permanent/intermittent because she was permanent on the payroll, intermittent in attendance. It was pretty obvious why three of the four professionals were transferred. My theory was and is "a good vacancy is better than a poor appointment." A few months later, the unit was down to one professional besides me, resulting from a separation, voluntary transfer, a retirement, and a heart attack. The one that remained, Don Nelson, a forester, is a fine person, hard worker, and is still there.

I got a little revenge in October 1979 by hiring Jim Miller. He was put into the position of Fish and Wildlife Program Leader, a position that, at the time, had been vacant 41 of the 43 years since its creation in 1936. Now, I expect Jim has the longest tenure of any Fish and Wildlife Extension specialist at any level in our nation. He is a candidate for Vice-President of the Wildlife Society. I hope he makes it. He got my vote and I expect he'll get yours. He also was recently honored by receiving a 1996 Secretary of Agriculture's Honor award. I was somewhat nonplussed to read the announcement letter which stated in part, "recognition to acknowledge outstanding contributions to agriculture, to the consumers of agriculture products, and to the ability of the Department to serve America." That's one of our problems, our leaders fail to recognize the ecological concepts of natural resources in general, and a by-product, fish and wildlife, in particular. Regardless, congratulations, Jim, you deserve this recognition.

As I remember, RREA called for a comprehensive plan for all resources, with updating at 5-year periods, with linkage to the plans required by the Resources Planning Act of the USFS and the Resources Conservation Act of the then Soil Conservation Service. We were required to work with both agencies at the same time. It reminded me of a mouse trying to mate with an elephant. We know what we were supposed to do but we weren't too well equipped to do it. The original 5-year plan called for about 40% forestry, 20% range, and 10% fish and wildlife, the rest in related programs. When I left in December 1984, the approximate breakdown was 58% forestry, 12% harvest and of forest product; 10-11% of fish and wildlife; 9-10% range management; 5-7% environmental programs; and 2-3% for outdoor recreation.

I learned very quickly in my stint with the Extension Service that authorization did not necessarily mean appropriation. One would expect with a grass roots system like the Extension Service, that program leaders and administration would be able to orchestrate \$15 million in a single budget year. By using a team approach, organized within the International Association of Fish and Wildlife Agencies, we were able to almost triple the appropriation for the Forest Service's fish and wildlife program in 2 years from \$10.9 million to \$27 million (1975-77). Now, it's well over \$100 million. But, this didn't happen in the Extension Service's cooperative system. There were and are too many jealously guarded programs, unwilling to recognize program priorities, other than their own. It reminded me of a loose federation of absolute monarchies.

However, an appropriation of \$2 million was first made in FY82 and has gradually increased to a little over \$3.3 million, annually. About \$32.6 million was appropriated to the renewable resources program between FY82 and FY94. FY95 improved to a little over \$3.2 million with FY96 and FY97 slightly higher at almost \$3.3 million. These past 2 years sound better, but considering inflation, etc., it is basically level funding. But, one should be optimistic and pleased that an increase, however slight, was recommended. On a brighter note, in one of my earlier talks to foresters of the Southern Region, I noted that the RREA allocation attracted an almost equal number of dollars from other sources. I expect that is true today.

But, the need for natural resources programs and, specifically, fish and wildlife has not diminished. In fact, the need is even greater now than it was in the early '80s when I supposedly retired. I say, supposedly, because a willing, local volunteer soon becomes extremely busy. The only thing missing from the full time job is the pay check. Regardless, if I didn't like it, I wouldn't do it. But, if you are thinking of retirement, practice saying "No" at least part of the time.

Enough of history, I am flattered to be asked to speak on perspectives for natural resources extension past the year 2000. That's quite a challenge for one that doesn't buy green bananas and is not too sure he'll outlive his dog. But, I'll give it a try anyway.

In preparing for this talk, I reviewed many, many items, beginning with Aldo Leopold's, *Sand County Almanac*, written about 50 years ago. Dr. Leopold had great foresight and told it the way it was. What he said in the '40s was true then and, unfortunately, most of it is still true today, except the problems are magnified by the pressure of people, resulting from a burgeoning human population caused by what the demographers call "momentum." The phenomenon of momentum is like a fast-moving train; an increasing population has a strong tendency to keep on increasing, even if every measure of population control is applied very hard. And, you know the emotionalism and politics of many types of population control.

On the first Earth Day in 1970, I spoke at the University of Michigan. I titled my talk "Our Environment Dilemma" and, subsequently, presented it 68 more times. In 1970, the population of the United States was 205 million. My opinion then was that the optimum population for the United States was about 160 million, which had been reached in the 1940s. In 1970, our population was 205 million, and the population of earth was estimated at 3.3 billion. On Earth Day in 1990, the U.S. population was 250 million; the earth's population was 5.3 billion. Today, our population is about 256 million, with the earth's closing in on 6 billion. And very little concern is expressed in this nation or elsewhere regarding this circumstance, except to provide the opportunity to open McDonald's restaurants at 10 times

the rate of 20 years ago. Better management of our fish and wildlife population might help people realize there are other forms of recreation than procreation.

Currently, it is calculated that the total net terrestrial primary production of the biosphere being appropriated for human consumption is around 40%. It is also predicted that human consumption will increase to about 80% by 2020. These numbers say nothing about carrying capacity but they do put the scale of the rapidly expanding human presence on the planet in perspective.

In my first Earth Day talk I suggested that this planet and its inhabitants, human and otherwise, were in great danger of irreversible catastrophe. Four basic threats pointed to this ominous possibility: overpopulation, pollution, resource depletion, nuclear war. Frankly, I see no real change in these threats during the past 2 decades, expect possibly for the latter, nuclear war. This threat has lessened, I believe, although there are some nations that regard terrorism as a viable option and they have access to nuclear bomb materials. I suggest that overpopulation constitutes the greatest single threat, simply because it's people who cause pollution, deplete resources, and make wars.

I'm not suggesting that fish and wildlife specialists go into the population control business, although we should be firmly aware that population is the root of the problem that magnifies our needs to do a better job of helping people understand their natural resources and their responsibility for them. But, are we and our administrators doing that? The need for good extension educational programs in natural resources is greater now than ever in the past. Most of us will agree that more and better programs, not less, will be needed in the future. Unfortunately, most agricultural administrators still look at fish, wildlife, and other natural resources education as adjunct to agriculture programs. This is reflected not only in funding levels but in filling vacant positions and in changing program priorities. I'll give you an example of the latter. When I was with Extension, I had an opportunity to visit one of the New England States to discuss forestry programs. During the '30s, the state was about 10% forested and 90% open, pasture land. At the time, there were 23 dairy specialists and one forester. When I visited there, about 50 years later, the state was 90% forested, and dairy was a dead and dying industry. What was the ratio of dairy specialists to foresters? You guessed it!!! Still 23 to one. We did succeed in getting the ratio changed a bit, but it was a bitter struggle.

I understand that many of you specialists now serve in split appointment positions, research, teaching, or both. This can be good or bad, but I'm certain it can lead to complex, difficult situations. Jim Miller says, and I agree with him, that an effective extension fish and wildlife specialist is the best outreach that a Department can have. Not only do you have direct ties to the county programs, but you can be effective translators of research information for implementation on the ground.

According to the Agriculture Fact Book for 1994, less than 2% of the U.S. population lived on a farm, and farm operators represent less than 1% of the total U.S. population. Yet, during two recent reviews of Land Grant Universities, where enrollment in natural resources was expanding, and declining in traditional agriculture, the inequity of the budgets for operating funds, teaching, and research was unbelievable. These inequities result in pressure from organized agricultural groups and support my dairy/ forestry story. Unfortunately, trees and rabbits aren't pressure groups and the people that enjoy them are often disorganized and disinclined to speak. Extension can help these kinds of people understand natural resources problems and enunciate support for them.

For many years of my professional life, I worked in two "headquarters" towns, Lansing, the capital of Michigan, and Washington, D.C., our nation's capital. One thing I learned was the thinking in a headquarters town is not necessarily the panacea for all problems. In Washington, where this thinking seems more prevalent, it's called "Potomac fever," and is defined as a softening of the brain. The symptoms are forgetting there is a United States west of the Potomac River, forgetting the perspective and needs of our constituencies, and thinking that only you know what is best for them and their resources. I expect symptoms of this disease may be present in some of our land grant universities. That's why I firmly believe one should start locally in solving our problems. I realize the problems of pollution in the Potomac River and Chesapeake Bay, but I feel more strongly that I should periodically pump out our septic tank to avoid polluting the lake on which we live.

I am Chair of our county's Soil and Water Conservation District in northeast Michigan. In southern Michigan, the MDNR Wildlife Division supports a biologist that works closely with the Soil Districts on wildlife extension activities. I understand a similar assignment is being considered for the area where I live. This will be a boon to us and the people we serve. We have an unusual Board of Directors, elected by members owning 3 or more acres within the County. Although many Boards, nationwide, are dominated by agricultural interests, we have no farmers on our Board. I wish we had one to represent agricultural interests, although our farming community is small, 18,000 acres out of about 350,000 acres in the county. Our Board is made up of a soil scientist, forester, two educators, and me. It is my feeling we better represent the diverse interests of the community than a board of five farmers, the way it was a few years ago.

We have been faced with funding problems ever since I can remember. Actually, this has been the story of my life, in state, federal and now, local scenes. Although we are not housed with a federal agency as many District are, we receive housing, etc. from the county. Our county commission has real concern for the natural resources of our county. During the past several years, they and we

have been faced with the exploitation of natural gas (Antrim formation) in our county and neighboring counties. There are over 3,000 wells in an adjacent county and more than 1,400 in our county, with many more permitted and planned. This Antrim exploitation is considered the largest environmental upheaval in North America today, and I doubt if any of you have ever heard of it. It is a gross example of Leopold's comment, "Economic provocation is no longer a satisfactory excuse for unsocial land use."

Our county commission led the way in a soil erosion control program, because of this gas development, which is a prototype for northeast Michigan. They are now providing leadership for a ballot millage proposed to fund natural resources programs in the county, with implementation the responsibility of the Conservation District. The vote is 6 August. I'm optimistic it will pass. Why am I telling you this? Because you and I have the tough job of helping people better understand the need for better stewardship of all natural resources in the face of economic provocation. Food for thought is in a paper by Robert Costanza and Carl Folke, presented in July 1994.

"To achieve sustainability, we need to incorporate ecosystem goods and services into economic accounting. The economic values we seek for ecosystem management are much broader than financial values or merely the cash flow generated by a resource. For any good or resource to have an economic value, it must meet two conditions: (1) provide some agents (but not necessarily all) with improved well being; (2) the resource is scarce in that agents desire more than is currently available. Fish, wildlife, recreation, wetlands, old growth forests, natural grasslands communities, etc. all meet this definition of having an economic value to society even if none of these resources or the services they provide are marketed. While old growth forests on public land can provide timber, timber will be provided by private lands due to the profit motive. But old growth forests also provide for recreation (a direct use) and habitat for unique species such as the spotted owl, something the private lands often underproduce.

The case of the spotted owl highlights the "passive use" or existence/bequest values that ecosystems provide to members of the general public who may never set foot in the forest. Existence value is the satisfaction gained from knowing that a particular species or entire ecosystem continues to exist and function. Bequest value is the satisfaction gained from knowing that protection today will provide future generations with a particular species or ecosystem. Randall and Stoll (1983) describe the recreation use, existence and bequest values as "Total Economic Value" as it captures many of the motivations people have for carrying about resources.

These motivations are quite broad and can arise from a variety of concerns and may partially include such important but overlooked sources of benefits as spiritual or cultural values....

Surveys..... have shown that these existence and bequest values can be 2-10 times larger than the direct on-site recreation use values.... This is not surprising. While per person visitors have much higher benefits than non-visiting members of the general public, the number of visitors is often limited to a few thousand and is never larger than a few million. The value per household may be small (\$5-40), but there are literally millions of households, depending on the geographic extent over which people care. This, of course, depends on the uniqueness of that ecosystem. The Grand Canyon has a geographic extent of North America and, perhaps, worldwide."

Makes one wonder about the value of Michigan's endangered Kirtland's Warbler and the young jackpine habitat it requires for breeding. These economic values support a suggestion I made when I was Chief of the Wildlife Division that our programs should receive an equivalent of \$5 for every man, woman, and child in Michigan because wildlife improved their quality of life. I didn't get far but I still think it was a good idea.

Last week, Secretary of the Interior, Bruce Babbitt visited our state. The purpose of his trip was to encourage outdoors people to take a leading role in the battle to protect the environment, as Teddy Roosevelt and other hunters and anglers did in establishing the movement 100 years ago. He divided the history of American environmental protection into three chapters. The first was with Teddy Roosevelt and the protection of national parks and wilderness areas. The second chapter was the Rachael Carson era when we began to understand toxins. We are now in the third chapter where we must begin to understand how the various systems affect one another. He believes that grassroots involvement is the key to environmental protection. I agree with him when he says the most effective counter to an assault on the environment is an informed, willing-to-be-involved electorate.

When I spoke to you in 1984, the situation for natural resources was critical. When you consider that during the 22 minutes that I have been visiting with you the population of the United States has increased by 147, and over 3,000 worldwide, the situation becomes catastrophic.

Some will say that developing technology will come to our rescue. This may be true, but there is a quality to our lives that is lessened with human population irruption and the increasing demands on the earth's resources and its finite space.

That is our challenge, to provide such an electorate with the knowledge and skills to ensure the future of natural resources.

A PERSPECTIVE OF PAST, PRESENT, AND FUTURE EXTENSION WILDLIFE AND FISHERIES PROGRAMS

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PAST

One of the most significant early references to the need for state and federal extension wildlife and fisheries programs was made by Smith (1936). Dr. C. B. Smith was the Assistant Director of Extension Service who spoke at the First North American Wildlife Conference. If you can locate a copy of the transactions from this conference, I encourage you to spend some time reviewing this and numerous other papers presented by some of our predecessors at this great conference. Other early references of extension wildlife and fisheries programs prior to 1950 included papers by Hill (1938), Gabrielson (1941 and 1945), and Callender (1947).

This Eighth National Extension Wildlife and Fisheries Specialists Workshop is taking place 60 years after the first extension wildlife specialist position at the Federal Extension Service and the first State Extension Service wildlife specialist position at the Texas Agricultural Extension Service were established in 1936. For a more in-depth study of this very early history of extension wildlife and fisheries work, I suggest you examine papers by Bode (1937) and Callender (1937) in the Transactions of the Second North American Wildlife Conference. It is noteworthy, as reported by Meine (1987), that among Aldo Leopold's responsibilities when he was appointed Chair of Game Management at the University of Wisconsin in 1933 was serving as a wildlife extension specialist.

From these early references, it is obvious that there was significant interest in wildlife and fisheries extension programs by some of the pioneers in the wildlife and fisheries profession. Severy and Pengelly (1956) described Montana's venture in wildlife extension, and Berryman (1959) described Utah's new wildlife management extension program as the work of wildlife extension expanded in the various states. Smith and Berryman (1962) examined wildlife extension programs—past, present, and future; and Cornwell (1967) examined the potential contributions of wildlife extension education. Many others contributed to the professional literature about extension wildlife and fisheries programs prior to 1970, including Almand et al. (1969) in the Proceedings of the 1969 Wildlife Extension Specialists Meeting at the 34th North American Wildlife and Natural Resources Conference, published by the Texas Agricultural Extension Service.

In December 1972, the First National Extension Wildlife and Fisheries Specialists Workshop was held in Estes Park, Colorado, and was attended by 46 people, 33 of whom were extension wildlife and fisheries specialists.

Several of us who attended that workshop are still involved with extension; and others like Mr. Jack Berryman, who has been a strong and effective advocate for extension wildlife and fisheries programs for over 40 years, are here with us for this workshop. For those of you who may not have found a copy of these proceedings in your university's library or in other reference sources, there were 24 papers presented in sessions; and I think there are 8 of us still associated with extension who attended that first national workshop. The majority of the others have either retired, changed five employers, or passed on.

Without going into a lot of detail about the attendees and the various sessions or papers presented at this workshop, let me note that the idea for conducting a national workshop was conceived at an extension wildlife specialists meeting held in conjunction with the North American Wildlife and Natural Resources Conference in Portland, Oregon, on 9 May 1971. A committee was formed to coordinate and develop a planning committee for organizing the program, selecting a site, and finding chairmen to host the workshop. The co-chairs selected for this workshop were the late Dick Marks, extension forester, USDA-Extension Service, and John Schmidt, extension wildlife specialist at the time at Colorado State University. A post-workshop questionnaire indicated that 97% felt the workshop subject matter was appropriate to their needs; and all participants requested another workshop in the future, with the majority suggesting that a 2- to 3-year interval between workshops would be most desirable. Unfortunately, the second of these workshops could not be conducted for almost 5 years.

In March, 1977, a special session held at the 42nd North American Wildlife and Natural Resources Conference, chaired by Harlan Brumsted and co-chaired by the late Bill Wick, was titled "Resource Management Information for Decision Makers and Users." Shortly after this landmark session, in April 1977 in San Antonio, Texas, the Second National Extension Wildlife and Fisheries Workshop was conducted, which was the first opportunity for many of us to meet Merrill L. "Pete" Petoskey, later to become the first Deputy Administrator for the Natural Resources Unit of USDA, Extension Service. Obviously, at this time, some 5 years after the first National Workshop, most of us who served as state specialists were conducting programs directed at state-specific needs; some of us were quite involved in the development of a national planning effort called the Renewable Resources Extension Act (RREA). We all had

great hopes that such a plan could be legislatively authorized with appropriations at the \$15 million level annually to expand extension natural resource educational programs in five resource areas. These were:

(1) forestland management, (2) rangeland management, (3) fish and wildlife management, (4) outdoor recreation, and (5) environmental management and public policy. Clearly, the impetus for this legislation had its roots with our colleagues in forestry but, at this point, had gathered badly needed support and momentum from a broader natural resource constituency. For more specifics on the groundswell of support for expanding extension natural resources programs, I encourage you to examine several of the papers from the previously mentioned Special Session conducted at the 42nd North American Wildlife and Natural Resource Conference. Two papers particularly called for a stronger national program in wildlife and fisheries, one by Gus Swanson (1977) titled "Imperatives for Action" and the other by Jack Berryman (1977) titled "A National Approach to Fish and Wildlife Extension Education." One of the actions that Jack Berryman defined as needed in this presentation that he personally followed through to fruition was establishment of an Office of Extension Programs in the U.S. Fish and Wildlife Service (FWS). In fact, as most of you older heads know, he became the first chief of that office in 1978 prior to his retirement. He also stimulated development of a Memorandum of Understanding (MOU) between the FWS, U.S. Department of the Interior, and what was then called the Federal Extension Service of the U.S. Department of Agriculture. This MOU has served both agencies and state Cooperative Extension Services well and has been revised, updated, and supported by several different Directors/Administrators of the FWS and Extension Service since then, with the most recent version signed in 1995.

Among my regrets about past National Extension Wildlife and Fisheries Specialists Workshops is that, for whatever reasons, the proceedings of that second workshop were never published. There were many excellent papers presented and a great deal of support and enthusiasm generated from this workshop that significantly influenced future direction and programs. Among those who played significant roles and who are with us today are Jack Berryman and Pete Petoskey.

Since I consider both these great professionals as mentors, friends, and heroes, I am going to try not to duplicate some of the same history or perspective that I anticipate they will address. However, clearly, they have both contributed significantly to the past and present status of extension wildlife and fisheries programs and to many other areas of the natural resources profession. I salute them and numerous others who have preceded us in our profession for their vision, proactiveness, dedication, tenacity, hard work, and their many positive and lasting contributions.

PRESENT

Let me emphasize at this point that I acknowledge this effort to provide a perspective on present programs will be woefully inadequate. Unfortunately, it is impossible to comprehensively describe the diversity, magnitude of impact, and benefits of the contributions made by extension wildlife and fisheries education programs nationwide. Even if we had the resources, willpower, and your personal interest in reporting all of the annual impacts and accomplishments, direct and indirect, we still would not be able to document the majority of the benefits your programs make to people and the resources they care about and manage. However, to attempt to provide some perspective of present programs, we still must look back to about 1978 when RREA was authorized, which created some increased national attention and interest for extension natural resource programs both within and outside of extension. Some of what happened over the next few years has been alluded to in many references such as the RREA five-year plans; papers presented in previous National Extension Wildlife and Fisheries Specialists Workshops, particularly the Third, Fourth, and Fifth of these; and in papers presented at a variety of conferences and workshops. Some examples of these include Miller (1981), Decker and Miller (1988), and Miller and Craven (1993), as well as papers many of you have presented at various regional and national conferences and workshops.

I suggest to you, however, that in 1979, with the establishment of the Natural Resources Unit (NRU) in what was then USDA-Science and Education Administration (SEA)-Extension Service, for the first time, there was increased recognition by the Cooperative Extension System and USDA that natural resource programs were expected to become an integral, not adjunct, part of the System. Merrill L. "Pete" Petoskey was selected to head up that unit as the Deputy Administrator by the Administrator of SEA-Extension. We were extremely fortunate to have his strong leadership during the next several years as RREA was further developed and finally provided with some meager appropriations in 1982. After establishment of the NRU in 1979, the first professional position filled under Pete's leadership was the fish and wildlife position which had been filled previously in 1936 for less than 1 year and again in 1969 for less than 1 year. Having previously served as an extension wildlife specialist in Arkansas from 1967 through 1978, I was recruited by Pete for this position from the U.S. Fish and Wildlife Service, where I had been employed as a management biologist in the Office of Wildlife Assistance after leaving the specialist position in Arkansas. With the encouragement of numerous state specialists and other agency professionals, I moved into the position in October 1979; and, as they say, the rest is history. For better or worse, I have enjoyed working in this position during the good times as well as

during the budget cuts, downsizing, changes in leadership, reinvention, reorganization, and different political administrations that have moved in, reorganized, and moved on since 1979.

I will avoid trying to review my work in this position over the past 17 years and leave that to you folks and those who will follow us to judge. Generally speaking, regardless of my efforts, good or bad, the increased recognition of extension natural resource program impacts nationwide has occurred because the educational programs you and others conduct in your state, and elsewhere, benefit people and the natural resources people care about. I have enjoyed working for you, and with you, in trying to improve communications, liaison, coordination, funding opportunities, awareness and visibility, and the national and international credibility of extension educational programs in wildlife and fisheries.

As indicated earlier, there are numerous published references in a variety of professional proceedings, journals, bulletins, and other documents highlighting some of the contributions of extension wildlife and fisheries programs over the past 20 years to both adult and youth audiences, in urban and rural communities. Most of you know full well that even with these references, many of your professional contributions and those resulting from programs you have developed have never been extensively evaluated or documented. This is partially because of the diversity of your work and partially because of the lack of time, resources, and interest by our agencies and institutions. And, admittedly, much of what you do is a cooperative effort with other partners and may not always be well defined as one of your major responsibilities.

Speaking of partnerships and cooperation, the direct and indirect impact of cooperative programs with the FWS, Office of Extension Education, since 1978-79, to the expansion of extension wildlife and fisheries educational programs across the nation is unlikely to ever be adequately recognized and quantified. Many of you individually have not only participated, but have utilized the cooperative support of FWS to leverage additional funds and develop educational programs, materials, and products that without such support would have probably been impossible to attain. The FWS support for starting up such programs as the National 4-H Wildlife Habitat Evaluation Program and their support for the development of numerous handbooks, videotapes, etc., has been instrumental in making such programs and products possible. In fact, based on some recent figures provided from Dan Stiles and Duncan MacDonald (Stiles 1996), since 1979 some 290 different extension wildlife and fisheries projects have been supported by FWS at a cost of \$3,057,410, matched by in-kind extension support or leveraged funds to the amount of \$2,216,050. This totals \$5,273,460 that has been spent on direct extension wildlife and fisheries educational projects. Without this cooperation and sharing of resources, many exemplary educational program and products that have been

developed since 1979 simply would not have been possible. The indirect benefits/impacts of this cooperation and other cooperative efforts it has helped generate, as noted earlier, are impossible to estimate. For example, most of you are aware of the National 4-H Wildlife and Fisheries Volunteer Leader Recognition Program conducted at the North American Wildlife and Natural Resources Conference each year. You might not be aware that the FWS has provided funding for that program since 1982. This past year made the 16th consecutive year for this cooperative support, which goes far beyond just providing funding. Extension wildlife and fisheries educational programs nationwide have benefitted from this partnership, cooperative funding, and support. I want to take this opportunity to thank my colleagues in the FWS who are present for their strong and continued support and cooperation over the years. I can honestly say they have been great cooperators and collaborators, respected professional colleagues, and honored friends through the years. The FWS, however, is also being reorganized; and hopefully Duncan will share more about this with us later.

In November 1981, our Third National Workshop was very capably hosted in Baton Rouge, Louisiana, by Jim Fowler and the late Larry de la Bretonne. For those of you who never had the pleasure of meeting and working with Larry, he was a respected professional colleague and good friend. This workshop was a crossroads event. It was the first of these since establishment of the NRU in the USDA-Extension Service (effective on 17 June 1981, USDA had announced a reorganization which eliminated the SEA), and was the first attended by >100 natural resource professionals. It was also the first of these workshops where we had participation of the Chairman of the Extension Committee on Organization and Policy (ECOP) Sub-Committee on Agriculture and Natural Resources, numerous representatives from FWS and the International Association of Fish and Wildlife Agencies (IAFWA), and where it appeared there was a glimmer of real hope of some appropriations for RREA. I can't speak for those of you who attended, but I remember leaving this workshop with more confidence than in the past that extension natural resource programs had a bright future, and that ECOP and the System were becoming more aware of the need to support strong natural resource educational programs.

The 4th National Workshop, hosted by Bob Ruff and Scott Craven in October 1984, will always be one of my favorites for a variety of reasons. Clearly, having the Administrator of ES-USDA and the Director of the U.S. FWS speaking to the group and other honored guests participating, plus having finally achieved some funding for RREA, was of special interest. For those who couldn't attend, or could have but didn't, you missed a great workshop. I can't speak for others; however, I have some incredible memories indelibly etched in my mind. For example, the afternoon gathering at Leopold's "Shack," the professionalism and sense of urgency in the

presentations, and the professional bonding to move forward with increased cooperation, support, and enthusiasm. I left this workshop with a stronger sense of professional pride and commitment that we must continue to find ways to support extension wildlife and fisheries educational programs, regardless of what happened with budget cuts, downsizing, and changing administrations.

Our Fifth National Extension Wildlife and Fisheries Workshop at Jekyll Island, Georgia, was conducted in October 1987. The theme of this workshop was "Extension Natural Resource Programs in Changing Times." Admittedly, if you looked back to the origin of extension in 1914 with passage of the Smith-Lever Act and examined the diversity of programs and their focus until the present time, you would find that the manner in which extension programs have been conducted and delivered has changed significantly, with periodic shifts in emphasis and delivery techniques. I doubt that any of us would suggest that they shouldn't have changed as society has changed, technology has advanced, and our customers have expanded and become more diverse and better educated. Realistically, I think we all recognize that change is essential. Note, I didn't say it was always easy, but it is essential for survival and for progress. Our capability to identify needed changes and to effect those changes in a timely and efficient manner to better address present and future educational needs will be a significant determinant as to our programs' long-term survival and sustainability.

How well have we adapted, or proactively made the necessary changes, to take advantage of the opportunities to ensure that our programs are relevant, beneficial to society, and likely to continue to be needed? You be the judge at the state and local level. Nationally, I believe extension wildlife and fisheries educational programs are needed more today than ever before; yet, admittedly, this program area at the national level, with an emphasis on helping private landowners and managers, does not currently seem to be perceived as a very high priority with the present administration.

As to the present status of extension wildlife and fisheries programs nationwide, we currently have fewer states with extension wildlife and fisheries programs today than we did in 1987. According to my count, today we have 33 states with wildlife and fisheries programs whereas in 1987, 35 states had programs. Obviously some state CES's have added or refilled positions, while others have lost programs as a result of budget cuts, retirements, and apparent loss of interest or clientele support. Currently, there are unfilled positions and programs in Arizona, Arkansas, New Mexico, North Dakota, Ohio, and South Dakota where previously strong extension wildlife and fisheries educational programs existed. In other states, there either is no recent history of a viable program effort in wildlife or fisheries nor seemingly any strong interest or organized support for such programs.

Unfortunately, even though I continue to try to provide as much programmatic effort and support as possible, my responsibilities have been expanded to include oversight for research programs as well as extension. The reinvention of government and reorganization of Extension Service and the Cooperative State Research Service into the Cooperative State Research, Education, and Extension Service (CSREES) has reduced the available time National Program Leaders in our currently defined Natural Resources and Environment Unit can devote specifically to extension education programs. This is not a complaint but is merely a statement of fact. In essence, my position has become a joint appointment with a 50/50% research and extension split.

Some of you may have wondered last fall about the reason for the Resolution adopted by the IAFWA in support of maintaining strong natural resource education program capabilities in the CES and in the FWS. For your information, the development of this resolution was encouraged by interested parties and people outside of the Extension System. Obviously, although I was deeply concerned about what I saw happening to extension and attempted to alert the System, there seemed to be only minimal support at either the State CES or ES administrative level for maintaining strong natural resource educational programs. The fact is that they were all appropriately concerned about the survival of all extension programs with major budget cuts proposed along with the administration mandates to reinvent government and reorganize agencies and departments.

As most of you know, I expended a lot of effort and took some fairly significant risks personally and professionally to fight for and support keeping the name extension in the title of our reorganized agency. I mention this only because during the throes of reinvention and reorganization, some of the proposed changes seemed to lack both intellectual integrity and loyalty to a tried and proven educational delivery system that is the envy of other nations as well as other agencies. During these deliberations, I had some members of ECOP tell me they didn't think it was worth fighting for to keep extension in the name of the Agency. We can argue the point later; but, fortunately, at least for the present, there is still a viable extension presence in the reorganized agency.

I want to emphasize that I am not opposed to change when it is in the best interest of the people being served, the resources being managed, or for improved effectiveness or efficiency. I am, however, adamantly opposed to changes made only for the purpose of helping some political appointee make points with the administration, regardless of how they impact or eliminate effective and efficient programs. Unfortunately, these battles are not over and done with. Extension budgets at the county, state, and national levels will be under attack again and again as well as justification for its continued existence. For what it is worth, in my opinion, the only

effective way to combat this is to proactively take the offensive with a long-term plan. To do this, however, will require stronger administrative leadership than we have had in the past, a commitment to become proactive rather than reactive, and a commitment to better evaluation and quantification of the impacts of extension educational programs that are relevant to society's needs. I am firmly convinced that extension educational programs related to natural resources and environmental issues are extremely significant to the needs of society, now and in the future.

Stepping down off my soapbox and returning to the present status of extension wildlife and fisheries programs, what are our measurements of success? How can we determine if the programs we conduct are more productive than they were in the past? I have already mentioned that our clientele have changed; our total FTE commitment to extension education has changed; like many of you, we now have split appointments at the CSREES level. We need to do some self-evaluation and ask ourselves some questions such as: Are our programs still needed or are we merely duplicating services provided by other agricultural and natural resource agencies? Are the educational programs we conduct relevant to the needs of society? Have we really examined and identified the primary audiences we need to be reaching? Have we periodically reevaluated our priorities and changed our focus and the way we conduct our programs? These are questions we have addressed in the past and will have to address in the future if the programs we believe in are to survive.

Recognizing fully that no two state CES wildlife and fisheries programs are exactly the same and that some programs do not fully utilize nor serve the County Extension System, I still submit that no other agency or organization has the delivery system that extension does. No other agency or organization has the capability to access and translate research into useful and practical educational programs that can be delivered efficiently, understood, and implemented by private landowners that extension does. And, in my opinion, no other agency or organization has the commitment to help people help themselves and improve the management of natural resources on private lands through educational programs that extension has. What about our credibility? To be perfectly honest, I'm afraid the overall credibility of the Extension System and the Land Grant University System has taken a beating in recent years for a variety of reasons that we don't have time to go into here today. In a nutshell, however, part of this is because they have continued to focus most of their resources and commitment toward production agriculture and have dragged their feet in addressing environmental concerns, therefore, becoming more reactive and less proactive.

On the positive side, however, professionally I think there is clear evidence that extension wildlife and fisheries programs and the people who conduct them are held in high esteem by cooperating agricultural and natural resource agencies, organizations, and professional

societies. Some examples include: the support by the IAFWA which passed the Resolution of support unanimously last September; the strong support demonstrated by the National Association of University Fish and Wildlife Programs (NAUFWP) over the past several years; the acceptance by the Program Committee of the Wildlife Management Institute for a Special Session on Extension/Outreach at the 1997 North American Wildlife and Natural Resources Conference; the cooperative programs we conduct with USDA Animal Plant Health Inspection Service-Animal Damage Control and other federal and state agencies; the increased leadership, participation, and visibility in continuing education conferences, workshops, and training sessions by extension wildlife and fisheries specialists; and the increasing participation of extension wildlife and fisheries professionals in professional societies. Obviously, these examples are noteworthy and have occurred because your programs are solid, urgently needed, beneficial, and you have been proactive.

I would be remiss, however, if I failed to give credit to some great leaders who believed in what you do and have continued to provide needed support over the years. Fortunately, some new leaders with different management styles and backgrounds, who are recognizing the benefits of these programs, are stepping forward. We must acknowledge their support and be responsive when they ask hard questions and request impact data. These are some of the reasons I requested the Voluntary Accomplishment Reports in Fiscal Year 1994 (FY) and have asked you to provide this information again for FY96. I think we have demonstrated that it will be used in a positive and effective manner; and I assure you we will make it available not only to you and to your administrators, but also to support groups and to Congress when requested. We want the information gathered to be useful to you as well as to the agency and institution that supports you. The justification for collection of this information is to highlight some examples of the accomplishments of your state programs. If we don't collect it in this manner, it is not possible to obtain it in any other way. However, I cannot and will not attempt to create evidence of your accomplishments without your help and input. So this is an urgent request for your submission of Voluntary Accomplishment Reports for FY96.

FUTURE

Like most of you, I don't consider myself much of a prognosticator or futurist; therefore, you may wish to take this for what it costs you. However, clearly, some of the things I've already said have implications for the future. I will attempt to delineate in bullet format some of the things I think are needed for extension wildlife and fisheries educational programs of the future. However, since many of you had input into the development and/or

review of what began as a National Program Policy document for Extension Wildlife and Fisheries but evolved into a National Program Guidance Statement (Miller 1991), I encourage you to go back and review this document which clearly highlights some of our future goals, some vision statements, and recommendations. If some of you do not have a copy in your files or have misplaced copies sent to you earlier, I still have some copies that I will be willing to share with you at your request. I encourage you if you haven't examined it lately to do so after you return from this workshop and let me have any feedback you are willing to share positively or negatively. Maybe it is time to update and revise this for future use.

Now to my bullets on future extension wildlife and fisheries programs and needs in response to past and recent changes:

- We must improve the research/extension interface, both the identification of research needed to address emerging issues and the translation and implementation of research to end users for implementation of useful technologies.
- We must utilize new technologies such as e-mail, distance education, and interactive videos to reach some audiences, yet retain the capability to continue to address clientele needs through proven education and demonstration methods.
- We must prioritize our program efforts, do a better job of evaluating program effectiveness, and make needed changes in a timely manner to improve program efficiency.
- We must recognize and proactively use our capabilities to be effective in an outreach capacity as well as being effective educators (e.g., representing our agency and institutions, becoming the grass roots voice for your department to help people understand and find practical uses for research being conducted, etc).
- We must recognize the importance of providing research-based, educational programs to a changing, more diverse, and expanding clientele, in urban and rural environments.
- We must improve and maintain strong cooperation and coordination with other natural resource and related organizations and agencies.
- We must become better at providing effective public issues educational programs and determine our most efficient role in assisting this process.
- We must expand our capabilities to leverage limited resources and to train and support volunteers to assist in delivery of educational programs to some clientele.
- We must maintain our credibility as a nonregulatory, nonadvocacy, educational system committed to help people help themselves through research-based education.
- We must maintain a strong extension education presence, even though we may have split appointments and multiple responsibilities within our institution or agency.
- We must maintain a strong commitment of continuing education for ourselves and our agency to maintain high professional standards.
- We must participate actively in professional societies and work cooperatively with advisory and support groups.
- We must participate in and contribute to the development of multidisciplinary research and extension approaches to address some of the emerging complex environmental issues facing urban and rural communities and individual private landowners.
- We must interact with and utilize the full capabilities of our institution and our agencies' delivery system, while concurrently recognizing and taking advantage of the opportunities to use the delivery systems available to cooperators.
- We must be adaptable and flexible to change the way we do business to meet the changing needs of society, the resource base, and our institution and/or agencies' mission, and ensure that our programs are addressing a defined need, yet are not duplicative of other agencies' or organizations' principal responsibilities.
- We must build improved liaison and coordination with nontraditional agencies, organizations, and communities to leverage limited resources, address changing needs, and serve nontraditional clientele.
- We must be willing to adapt new technologies to accomplish needed work; we must be committed to phasing out nonessential, comfortable, traditional programs that have outlived their effectiveness or require too much of our time and resources, yet result in minimal impacts.
- I question our capability to do all these things without a significant administrative commitment by both State CES's and the Land Grant University System to make needed changes. For example, let me share with you

some thoughts that were voiced by Neil Sampson in an address to the Futures Task Force of ECOP on 5 June 1987 (Sampson 1987). I should caution you that some people may consider these thoughts as heresy, and I'm confident many of the people in the audience he was speaking to did in 1987. I share them with you for your consideration now and in the future. Note, these examples have been combined; I have paraphrased some of what Neil said to condense and focus on his statements relating to natural resource interests and programs.

- Instead of needing extension to teach ignorant people how to farm, we need extension programs geared to teach educated farmers how to survive, remain profitable, and effectively address environmental concerns. How to live with the natural world instead of constantly fighting it. How to benefit from Farm Bill conservation programs and how to improve conservation practices to meet their stewardship/landowner objectives.
- Extension needs to expand and strengthen its focus on natural resource programs and their proper protection under human use and management. Extension cannot maintain its past credibility by teaching primarily production technology with farmers as its only audience/clientele.
- Extension needs to focus more attention on nontraditional crops and services. It needs to focus more of its educational efforts on total resource management systems and teach people how to relate their management choices to all of the soil/water/crop/livestock/forest/wildlife factors that might be affected.
- There has been too much promotion of monoculture and single-crop systems. We need strong, public educational voices pointing out that complex ecosystems are more stable than simple ones; mixtures of crops, pastures, woods, brush patches, and odd areas are not only more consistent with the physical needs of the land, they create more complex ecosystems that are resilient under the stresses of weather and pest population cycles. Extension could lead those voices if it chooses to do so.
- Extension needs to be teaching farmers, ranchers, and landowners that a barren landscape is a liability, and that diversity and an abundance of living things on the land is a sign of health.
- At the national level, extension should become more aggressive in seeking resources to do its job. The current natural resource commitment by extension of total FTEs and funding is grossly inadequate.

- At the state level, you must build natural resource capability. You need to develop your role as a source of research-based, natural resources information that is available to, and used by, policymakers. This is made harder when extension specialists are so tied to their university departments that their perspective is not broad enough on policy matters.
- At the local level, extension must strengthen its capability to deliver conservation and natural resource information with its entire staff, not just specialists. It is a matter of priority, training, and culture within the agency.
- If extension is to have a strong future, it must increase significantly its support and credibility among nonfarm Americans. The numbers and demographics are simply overwhelming. You have the skills, the delivery, and outreach capability and could develop the capacity. But nonfarm Americans don't need advice on controlling downy brome in winter wheat. They need to know about lawn and tree care; the basic principles of good land management; of ecosystem thinking; how to manage their woodlot or weekend property so that wildlife will thrive and an improved forest can be grown. They need to know how to prevent chemicals from getting into their drinking water, how to manage their fish pond, or how to make their 40-100 acre weekend retreat/investment pay its taxes and maybe help get the kids through college.

To do this will not be easy, it will demand change; and change demands strong leadership and commitment.

I could provide you with more of Neil's concerns, but I'm sure you recognize where he was coming from, whether you agree or not with his thoughts and concerns. I can only hope that we continue to hear the concerns expressed by professional leaders like Neil who care enough about what it is we do or should be doing to challenge our leaders and the administration. It is important that we have people who care enough to advise, rebuke when necessary, and provide counsel and support when needed. I am extremely fortunate to have the opportunity to work with professionals like yourselves, with university faculties, and with the leaders of a number of cooperating natural resource agencies, organizations, and professional societies who care deeply about the work we do.

For those of you wondering about when this old man is going to retire, on 1 October 1996, I will have worked 29 years for the federal government; and I am now 55 years old. However, God willing, I hope to be able to continue to work with colleagues and friends whom I respect and admire for at least 3 or 4 more years. If this is possible, I plan to continue to strive to contribute in an effective and honorable manner to our mission; to the

people of this great nation; to the sustainability of a strong and viable natural resource base; and to a sustainable, profitable, and environmentally responsible agricultural system for present and future generations of Americans.

I will close these comments with a rarely referenced quote from Aldo Leopold in *A Sand County Almanac*, "We shall never achieve harmony with land, any more than we shall achieve absolute justice or liberty for people. In these higher aspirations, the important thing is not to achieve, but to strive."

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Panel—What are Cooperators' and Customers' Expectations of Extension Wildlife and Fisheries Programs, and What are the Future Opportunities?

PERSPECTIVES FROM USDA-APHIS-ANIMAL DAMAGE CONTROL

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I am pleased that you have asked me to be part of this panel. The ADC program depends a great deal on Extension Wildlife and Fisheries Programs, and your success is very important to us. Thus, I am delighted to have the opportunity to discuss ADC's expectations and share our thoughts about the future. I should also point out that we in ADC are honored that you view us as a customer. Based on our experience, if you don't have a customer service focus, there is no future to worry about.

To establish a context for my discussion, I want to review some of our current efforts in the Animal Damage Control (ADC) program and relate them to what I believe are the future opportunities for extension wildlife and fisheries programs. You should view each of these efforts in ADC also as applicable to extension programs.

ADC developed a bad habit of being too short range in program planning. Our actions were focused on immediate results, and we made no attempt to create opportunities for the future. Over the past 4 years, we have been involved in strategic planning. More importantly, we have tried to create among our employees a culture of thinking and acting strategically. We wanted our employees and leaders to be proactive rather than reactive, to look at each activity from all points of view, and to look for opportunities beyond what is immediately obvious.

Our first strategic effort was to broaden our customer base. We had largely ignored the changes in agriculture, the growing concern over wildlife impacts on public health and safety, and the increasing demand for our assistance in conservation of other natural resources. Over the years, we had been focused too narrowly on livestock protection.

The second phase of our new strategic direction was to develop a communications plan. We needed to take a more proactive approach in public communications and focus more attention on the media. We developed materials such as fact sheets, videos, and posters to get our message out. This effort ultimately led to a public affairs campaign entitled, "Living With Wildlife."

In the third phase, we committed ourselves to exemplary customer service. A customer satisfaction survey was completed for customers of our direct control program and technical assistance. The results were shockingly high for both categories. Any private enterprise

engaged in service delivery would be envious of our numbers. The results certainly were not reflective of the antigovernment rhetoric reported in the media. Maintaining and improving on our customer satisfaction will be a difficult challenge. However, the customer feedback has been a real motivator for our employees, and they appear to be committed to doing an even better job.

It was also apparent that other kinds of information would be needed for strategic decision making. Focus group meetings were held with constituent and stakeholder organizations to learn more about their expectations. These meetings included organizations such as the American Sheep Industry, The Wildlife Society, the Humane Society of the United States, and the International Association of Fish and Wildlife Agencies. We wanted to know if there was any common ground and how perceptions about our program might be improved. Finally, it was important to understand the public's attitude about wildlife damage through an unbiased survey. The Berryman Institute at Utah State was contracted to conduct such a survey. While we aren't trying to manage by public opinion, it is important to understand how the public feels so we may know where to expect adverse reaction to our activities.

In summary, our focus has been on strategic planning, communications, customer service, and gathering information about others' perception of our program. I hasten to point out that this is an overly simplified review of all these efforts.

Throughout this process of reshaping the future of ADC, we have considered the Wildlife and Fisheries extension specialists to be our partners. Many of you have provided advice, participated in our focus groups, and demonstrated your support in countless ways. Perhaps the most important contribution is what the extension programs do best; you have helped us get the information out!

What are ADC's expectations for Wildlife and Fisheries Programs and extension specialists? Ideally, more of the same! We have cooperative arrangements with 31 extension service programs throughout the country. More importantly, ADC and extension have had very close working relationships over the years—relationships which I believe continue to strengthen both programs. While we

have been a repository of technical information about wildlife damage management, we have not always been able to disseminate that information with efficiency. On the other hand, extension has always had the communications network necessary to reach large audiences. Together, we have been able to develop educational tools to provide necessary information to those clients and customers which we both serve.

To illustrate my point, I polled our State Directors to seek their input for my remarks to this group. Their biggest concern was the loss of extension wildlife positions and what they see as a gradual erosion of extension capability. Frankly, I had the feeling they had lost a member of their own staff, a person they could work closely with, rely on, and trust. That is good news in terms of our cooperative efforts and signifies a healthy relationship between our agencies. It also indicates that we share equally in your future.

The current climate of downsizing, streamlining, and efficiency in service delivery should be a catalyst for greater cooperation between our programs. There is an absolute guarantee that there is more work than we can individually handle due to the increasing incidence and diversity of wildlife damage problems. Working together, we have a better chance of meeting our customers' needs. So, in the short term, I would challenge this group and the employees of ADC to revisit our cooperative arrangements in each State. A fresh look frequently produces new ideas.

Looking at the future can give one a simultaneous sense of panic and optimism. I think the biggest challenge to the future of extension programs is overcoming your own success. There is a perception among some policymakers, and especially budget cutters, that the mission has been accomplished. In many respects, we can say that the mission is accomplished if we use abundance and diversity of wildlife species as a measure. This success can be attributed to the traditional wildlife and fisheries management programs for which you can claim a large share of the credit. The budget cutters theorize that your customer base now is sophisticated enough to be serviced through technology in information systems, and people can be replaced. I strongly disagree!

In my view, the need for extension wildlife and fisheries programs and specialists is greater than it has ever been. Extension programs have been successful purveyors of objective, scientific information to those traditional users such as landowners, states, and rural publics. And, as mentioned earlier, wildlife populations, our environment, and ultimately the public have been the beneficiaries.

There are increasing numbers of organizations which are also successful purveyors of information. Members of these organizations are passionate, hard-working, and committed to getting their message out. However, their information is philosophical and emotional, antimangement, and based on what I would term "unnatural" science. Their peer review process is based on different standards than those of the scientific community

which supports extension wildlife programs. Their refereed journals are frequently their own magazines or the media.

Are extension wildlife and fisheries programs in competition with these organizations? The answer is definitely yes; we all are! Just consider for a moment the ecological consequences of who wins this competition.

What does this suggest about future opportunities for Extension Wildlife and Fisheries Programs? First, there must be a redefinition of your customer base. The urban audience presents the greatest future opportunity and also has the most serious need for information and education programs in the natural resources arena. I believe the demographic changes in the United States have produced the largest factual information deficit we have ever had in this country in the public's understanding of natural resource issues and particularly wildlife.

The consequences of allowing this to continue are rather severe. Even though the public is not well informed, they are taking an increasing interest in natural resource and environmental issues. They are voting on referenda that set policies for wildlife management and electing politicians who share their beliefs and values. The natural resource decision makers such as members of Congress and policy officials at the federal and state level are increasingly from urban backgrounds. They haven't had the same exposure to natural resources as did their predecessors.

Given the extension programs' success with traditional audiences, I can't think of any organization better equipped to address what, in my view, is our most serious challenge to effective natural resource management. One approach to this problem is for extension programs to become an active consultant to the state, county, and municipal school systems. You should review curricula, text books, and teaching methods to make sure they are based on sound, objective science. The most significant opportunity we have to influence future generations is to teach the teachers! Other methods for interacting with large segments of the urban public must be devised. We need to think outside the box! The communications technology of today provides another great opportunity, but someone has to be the originator. Extension programs are ideally qualified to take on this task.

I would also suggest that you market extension programs more aggressively to the nontraditional customers. The demand for your programs is out there, but many who would be customers don't know you.

We also need to make the case more strongly that the need for extension programs has shifted from rural to urban audiences and that the need has reached the critical level.

Finally, I would suggest you become more involved in strategic planning and the culture of strategic thinking. It has worked for us in ADC, and I think it can pay dividends for you as well.

I appreciate the opportunity to be here and share my views from a customer's perspective.

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WHO ARE OUR CLIENTELE?

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The title of this session asks us to address what our clientele want, but I think we first need to address a more basic issue—who are our clientele, or at least who might they be in the future? We've given this a lot of thought in Texas in the past year or so, as we find that we have one of the most rapidly growing and changing states in the nation. In my position as department head in Texas, it is imperative that I be aware of those changes, and that I provide leadership as to how our extension program adapts to that change. When I wear my North American University Fish and Wildlife Programs president hat, I find my perspective changes to those of national issues, such as our changing demographics, public attitudes towards higher education and extension, and the ever-changing structure and influence of our national governmental institutions.

Before I discuss who "our" clientele are, I need to mention a bit about the demographics of Texas and of America. Our country is becoming quite different than the one you and I grew up in, or the one we were trained and educated to serve. Some knowledge about our changing society will help us understand who our clientele are and what their needs might be.

Although the U.S. population continues to increase, the rate of population growth is slowing, except in states like Texas, California, and Florida. There the growth rate is increasing, largely due to migration from other states, legal immigrants, and the high birth rate of the latter population. In fact, the population of Texas is expected to double in the next 30 years. The middle class white or Anglo population is aging, as the baby boomers hit their 50s. Thus the fastest growing segments of our population are age groups 25–44 and 65+ (Murdock 1996). We are becoming a population of younger minorities and older white folks. Nationally, 1/3 of Americans under 35 belong to minority groups, whereas only 1/5 of those over 35 do (Edmondson 1994). In Texas, 40% of the population are currently ethnic minorities, and within the next 15 years, no single group will hold an ethnic majority in the state.

Another phenomenon is urbanization. In Texas, 80% of the population lives in cities, and about 60% of those people live in just four cities (Murdock 1996). Cities are growing faster than other locations, and the largest cities are growing the fastest. Surprisingly, however, in some areas of the U.S. where retirement and recreation offer opportunities, small communities are growing as well (Edmondson 1994).

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In Texas, 28% of households are non-family units, and 15% are single parent units, of which 77% are headed by women. In fact, nationally, 61% of children will spend part of their lives in a single parent household before age 18. Nearly half of the children of single parent households headed by women live in poverty (Edmondson 1994). Nationally, about 25% of children are born out of wedlock, although that rate is as high as 40% in some southern states.

Unfortunately, this shift to a more urbanized, highly concentrated, predominately ethnic population with limited economic resources may not portend well for those interested in natural resources. In Texas, although fishing license sales have been stable, hunting license sales have been declining 3% per year since 1987 (Texas Parks and Wildl. Dep. 1992). Less than 11% of anglers and 6% of hunters in Texas are minorities. Twenty-seven percent of Hispanic and 58% of black Texans have never visited a state park. In fact, the profile of a person least likely to visit a state park, hunt or fish is a female single parent (Texas Parks and Wildl. Dep. 1992). I would also argue that natural resource issues are not high on the agenda of most urban minority people. Larger issues, such as education, employment, health care, and crime dominate the political agenda.

Nonetheless, this climate in Texas and the U.S. offers both a challenge and an opportunity. Some rural areas are on a rebound, due to phenomena I'll explain shortly. Likewise, our traditional clientele face new challenges for which we can offer guidance. And finally, the growing urban population beckons us to provide services as well.

For a frame of reference, I define our clientele in four categories, based on where they used to live, work and recreate, and where they do now:

Rural People Living In Rural Areas—These are our traditional clientele, the farming and ranching landowners. These are the people who brought us to the dance—our traditional clientele. Two dramatic trends affect how we now approach this group. We know that this group has been declining—to about 1.2% of the U.S. population. In Texas and some other states, most of these people are small producers—1/2 of all Texas farms have sales of less than \$5,000 per year (Albrecht, 1990). Only 1.5% of farms have total gross incomes of over \$100,000, and they produce 32.7% of total agricultural sales. However, both small and large landowners need a new type of information than what we've provided in the past. The Golden Cheeked Warbler episode in Texas, the Spotted Owl conflict in the Pacific Northwest, and similar issues remind us that these clientele need help to deal with the Endangered Species Act, the Clean Water Act, and other

regulations. They specifically need help with community-based approaches to dealing with these regulations, such as conservation easements, local Habitat Conservation Plans, and Safe Harbor agreements. In addition, as commodity supports dwindle over the next 7 years, due to the 1996 Farm Bill, these clientele will need to be advised on alternative income opportunities to help them keep their land. Income from hunting and fishing, birding, nature-tourism, bed-and-breakfasts, and conservation easements will not save all of rural America from economic decline, but we must provide assistance for these clientele to avail themselves of these opportunities if they can. As a sidebar, demographers speak of a "widow belt" stretching through Texas north through the plains states - a high population of the widows of farmers and ranchers, who still live on their family land. I doubt if any of our agencies have addressed the specialized needs of this clientele group of rural people who still live on the land.

Rural People Living in Urban Areas—

Demographers also tell us that 2/3 of farmers and ranchers do not actually live on their land. They live in towns where they or their spouses have full or part-time jobs and they commute to their farms or ranches. They too need the information about coping with a regulatory environment, and means of diversifying their options for utilization of natural resources. The trick, of course, is to provide that information at a time and place convenient for these clientele. Some of these clientele hold two or three jobs so that they can continue this lifestyle, and sociological help is no doubt needed as well.

Urban People Living in Rural Areas—This group is probably the fastest growing, and makes up the "rural rebound" I mentioned earlier. It accounts for the statement that most people living on farms and ranches do not farm or ranch (Edmondson 1994). It includes commuters, who live on ranchettes but work in larger communities or cities; retirees, also attracted to "country living;" and "loan eagles"—people who can work via a computer and fax machine and who can live literally anywhere. These clientele know little if anything about agriculture or natural resource management. They often have unrealistic expectations as to what their land can sustain. These groups of people tend to be fairly affluent, well educated, and willing to learn, but they need the basics in natural resource education. Their communities desperately need advice to keep from ruining the aspects of rural areas that attracted them in the first place (McDonald 1996).

Urban People Living in Urban Areas—We cannot ignore the majority of our population. The urban populations vote and pay taxes, and it is they who will view the other three groups as "special interest groups"

when it comes to governmental funding for our activities. Some urban people own or lease rural land for recreation, others simply desire natural resource recreation, while some are "green couch potatoes" who watch the Discovery Channel and send money to environmental organizations, but who do not personally get outdoors much. Unfortunately, the majority of the urban public are none of these, but are people fairly disinterested in natural resource issues. Here is where we need input into the primary and secondary educational system, with a balanced approach to natural resource conservation education. This can come through 4-H school enrichment programs, Project WILD, input through Boys Clubs or Boy Scouts, and primary and secondary teacher education programs.

I offer these four groups and their differing educational needs as a matrix for consideration of our future wildlife and fisheries educational planning. Due to the varying levels of extension personnel and operational support available in different states, and the varying needs of the states, the level to which we can provide these services will vary. Into that matrix we should figure other service providers—such as state biologists, game wardens, Natural Resources Conservation Service personnel, Sea Grant Marine Advisory Agents, teachers, and volunteers from Audubon and other organizations. In addition, we need to better interact with the teaching and research components of our institutions (Meyer 1993). We cannot cover all of the bases ourselves. We must make difficult decisions about which needs are the greatest, where our strengths lie, and how and where we can be most effective. Therein lies the extension challenge of the 90s.

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EXPECTATIONS AND FUTURE OPPORTUNITIES FOR FISH AND WILDLIFE EXTENSION PROGRAMS

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The charge to the panel was really in the form of a question: What do customers and cooperators expect and what are the future opportunities for fish and wildlife extension programs?

It's a pretty risky subject. Each state is different; each has different problems and opportunities. And, most of the practitioners—those who know most about it—are here in this audience.

Pete Petoskey and Jim Miller have already presented some historical background and a perspective for the future. And, the fact of these workshops and a glance at the program is clear evidence of the progress being made. The professionalism, the wide range of subjects, and the attendance are most impressive. It is a privilege to be a participant. In the early '60s a few of us could get together once a year for a half day—or less—in connection with the North American Wildlife and Natural Resources Conference. Quite a difference!

From the early days of extension when the emphasis and the measure of success was the number of farm and home visits, there have been profound changes. Phenomenal increases in the population, changes in demography, new or improved cooperating organizations and agencies, increased urbanization, fabulous advances in technology and communications—and an unparalleled public awareness and interest in fish and wildlife and the environment generally.

As the face of America has changed drastically, so too have the customers and cooperators and the expectations and opportunities for all extension, including fish and wildlife programs. And, extension must adapt to change to survive.

But, one thing has remained constant since the founding of the extension program in 1914—that the purpose of extension is to extend knowledge to the people. And, the need for accurate, objective information has never been greater than in this day of emotional environmentalism—to better inform voters and improve responsible decision making.

There are really at least three levels of extension—local or county, state and national—each with somewhat different problems or challenges and opportunities and expectations; and, each requiring different approaches.

As far as customers or cooperators are concerned, I am most familiar with the state and federal fish and wildlife management agencies and their expectations. So, I would like to comment on that aspect, and along the way I

want to stress cooperation and partnership—not in the rhetorical, faddish sense, but real working cooperation and partnerships.

Before getting into that, let me make an observation. I can assure you that the Berryman Institute for Wildlife Damage Management at Utah State University has extension as one of its program elements, under Terry Messmer. It is and will continue to make use of extension to distribute information to professionals as well as the public.

Efforts to achieve a partnership between wildlife agencies and extension began in 1936. By 1962 there was a wildlife specialist in 23 states. In 1970 a memorandum of understanding was signed between the Federal Extension Service and the Bureau of Sport Fisheries and Wildlife (now the U.S. Fish and Wildlife Service [FWS]). By 1976 about half of the states had a program of sorts. Finally, the Renewable Resources Extension Act was passed in 1978; the Natural Resources Unit established in the Extension Service in 1979; and \$15 million was authorized. I stress authorized, not appropriated. Today 32 states have wildlife specialists and programs.

In those states having fish and wildlife extension programs and where there is a good working relationship between the management agencies and extension, the expectations are similar.

The fish and wildlife agencies would like to have extension address issues that confront the states. As a non-regulatory educational agency, extension has credibility and can reach audiences not normally reached by the state and provide information and analysis free of pressures and political interference.

The ideal, of course, is when the state and federal fish and wildlife agencies participate in the development of extension's annual plan of work, helping to identify priorities. Where this occurs and where all of extension, including the county agents, are committed, there is added incentive for the wildlife agency to contribute financially to extension. This approach is also useful in identifying public concerns. Usually, the issues confronting the management agency are also the ones of broad public concern. The public—or that portion of the public that is even aware of extension, expects accurate, objective data and analysis to assist in forming an opinion on very basic and fundamental issues. This may be the most important opportunity and challenge. The protectionist forces have been very successful in making use of the most advanced and sophisticated means of reaching the public. And, they are served by a sympathetic protectionist oriented media. That public makes decisions and votes. They need a source of accurate, reliable information and analysis.

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For the most part, fish and wildlife extension is working well in those states where it exists and which are represented here. But, what about the states where it does not exist? Obviously the first priority must be one's own state. But, I think we must also be concerned about where it does not exist. I suppose the expectations are not as high as we think or hope—at least they are not translated into appropriations and full participation. I don't think we can take a bow on total program participation. We must all ask why, after 60 years of effort and 18 years since passage of the Act, there are still only 32 states with a program and the highest appropriation was \$3.2 million? And that the FWS budget for cooperative work for 1996 is uncertain and unlikely to be near the level of previous years. Consider that the President's budget request for 1997 for EPA, which didn't come into being until 1970, is \$7 billion. Quite a contrast.

There are three basic elements involved in successful fish and wildlife programs: the Federal extension education system; the FWS as the repository for information; and the state agencies with a major responsibility for fish and wildlife resource management. All three must have a firm commitment to fish and wildlife extension; and, all three must be adequately funded. And, there must be a working partnership. But, we better understand that the present fiscal austerity climate will not end. Lean budgets will be the norm and fish and wildlife education will, as usual, be very vulnerable. As urbanization increases, political support for extension decreases, we must learn to be more competitive in obtaining funds; and, to use the money we do get more wisely.

We can't leave program expansion to Jim Miller, the International Association and supportive members of the Congress. Recognition of the need for and the opportunities must begin with the States' existing Extension Service and the participating fish and wildlife agencies. We will all have to help in that effort.

We need to remind ourselves again and again that we are part of the most extensive and effective education system in the world. It is a uniquely American system. It

has the advantage of being non-regulatory. And, as the name implies, it is a mechanism for cooperation; it has an unparalleled delivery system. Cooperative extension is not old hat, as some believe; it is not outdated; it has not outlived its usefulness. Far from it! It needs some updating and it's happening.

I haven't done a survey lately, but I have the impression that some of the state fish and wildlife agencies have reservations about academia. Some view extension programs as potential antagonists. Some view wildlife extension as hobby oriented or superficial. Others are fearful they will lose much needed credit if they work through extension. Frankly, I think we all suffer from a hangover of some antagonisms that existed some years ago.

Some extension officials, on the other hand, view the wildlife agencies as political, non-professional organizations—they can't afford the association. And, that wildlife does not have sufficient priority and importance to compete with agri-business for time or short dollars.

We all have a responsibility for the Nation as a whole. We need to assure the non-participating state agencies that extension can be an ally; that there is enough credit for all; that through extension they have the facilities of an entire university available; that there are unparalleled press, radio, and TV opportunities. And, we need to assure the non-participating state extension services that without fish and wildlife extension, they do not have a full program, that they are missing a large segment of the public—that they may indeed be old hat.

Obviously, any specialist must give first priority to his or her own state program and make certain that it is on solid ground. But we all need also to do some missionary work in the national interest. We cannot afford misunderstanding or friction. Frankly, I don't think a state wildlife agency can afford not to participate in wildlife extension; and no land grant university can afford not to include wildlife in its program. The opportunities are greater than ever before—locally, state, and nationally.

Thank you.

EXPECTATIONS AND OPPORTUNITIES—VIEW FROM THE PROFESSION

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Extension Specialists are in a unique position to address what may become the most significant issue in professional fisheries and wildlife management in the last 50 years—the erosion of public support and confidence in government agencies to manage natural resources.

The fisheries and wildlife fields comprise a diverse community of professionals—biologists, managers, decision-makers, consultants, researchers, educators, and others. In this country, the foundation of our field is based upon the Public Trust responsibilities for wild animals. State and federal governments share the role of trustees.

Rural America faces a crisis in natural resource management. Natural resource-based economies have suffered with increasing costs and shrinking demand relative to their ability to produce commodities. Increasingly large numbers of agricultural producers are having a difficult time making the kind of living we have come to expect in contemporary America. Rural communities and cultures face extinction as local businesses struggle to compete with the “big boys.” Expectations from government also have changed. New regulations and less support have helped change the one-time partnership between private landowner and government into an adversarial relationship. Now enter the fisheries and wildlife **professional**—representing the “common interest” in the fish and wildlife using private land or otherwise affecting private enterprise interests.

We generally all came to the profession with common interests in working with, and for, wild animals in a reasonably natural world with human beings as an integral part. We identified with Leopold who began *A Sand County Almanac* with the statement, “There are some who can live without wild things, and some who cannot.” We tend to conduct our activities in such a way to develop his land ethic among the people we serve. Although there are some who work at their job strictly for its paycheck, by-and-large we consider our profession to be a “calling.” The Extension Specialists I have known exemplify this perspective about their work.

Because we have all been educated in the ecological sciences, I’ll use an ecological metaphor to continue. The fisheries and wildlife community comprises a diverse set of professional “species”. It is a reasonably stable community, and most populations have steady growth rates. Over the decades, some new “species” have arisen

and occupy new niches—as both the ecological and the social environment have changed. Other “species” have been around for decades pretty much doing what they always have done. The Extension Specialist is an interesting species indeed. It has been a member of the community since the beginning; it has always been relatively rare in its biome; and its function within the ecosystem is unique.

Visualize this species’ niche in terms of Hutchinson’s “n-dimensional hypervolume”—a limitless set of curves each expressing a relationship between the organism and some component of its environment. Let’s consider 2 of its niche dimensions—its employment dimension and its intellectual (or subject area) dimension. Future challenges relate to both.

The employment niche dimension of the Fisheries and Wildlife Extension Specialist is shared with all the other employees of USDA Cooperative Extension. Fisheries and Wildlife Specialists and their programs, however, are a very small part of this curve—probably <1%. The other individuals may be competitors, or may have symbiotic relationships with Specialists. I suspect that many of the competitors feeding off the same limited prey base might think that extinction of Fisheries and Wildlife Specialists would help the curve better conform to their environment. And the symbionts recognize mutualism doesn’t have to be that weird. Regardless of the relationship to others, Cooperative Extension remains an institution that is responsive to the interests of the clients. Despite occasional rhetoric to the contrary, most of Cooperative Extension seeks to help agriculturists make money. By and large, success in the Employment niche has been measured by profitability of agricultural enterprises—dollars in the client’s pockets. Fish and wildlife have been considered amenities to tolerate, pests to eliminate, or products to sell (at least indirectly). Such a notion is not necessarily bad—just narrow-minded.

The Intellectual niche dimension is shared with all the other fish and wildlife professionals around the world. Extension Specialists are also a very small part of this curve. In general, Specialists are cooperators with others who function in this dimension, often faculty or agency staff. Fish and Wildlife Extension tends to draw its sustenance from a different prey base than do other fish and wildlife professionals; thus the interrelationships within this dimension are not competitive. Success is typically assessed by the health of fish and wildlife populations and the environments in which they live, and it embraces the multiple values of the clientele. In this

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country—where wild animals are a public trust resource—dollars do not provide a satisfactory measurement unit. The clientele are not particularly interested in whether or not a particular agricultural producer makes money—nor for that matter stays in business. This too is a narrow-minded view.

Flexibility is one of your greatest assets.

I believe that the foundation of our system of fish and wildlife management may be threatened by recent antigovernment sentiments in rural America. The Wise Use Movement, the Montana Freeman, the Oklahoma City bombing, and many others, organized and unorganized, are indicators of frustration with changing times. **The profession must reaffirm its integrity in the eyes of the public. Extension Specialists are in a unique position to contribute and lead.** The intersection of the two “niche dimensions” described above provide just the kind of framework needed to facilitate relationships between the public and the trustees of fish and wildlife resources. By virtue of your position within the Extension infrastructure and your credentials as fish and wildlife biologists, you have both trust and credibility among the players.

What are the opportunities to facilitate trust in the professional trustees of fish and wildlife?

- Become involved in Public Issues Education, such as those being discussed later in this workshop.
- Facilitate connections between County Extension staff and agency professionals.
- Involve local agency staff in educational programming—coach them how to be educators and not advocates of agency policy.
- Develop continuing education programming in “public relations” for fish and wildlife professionals.
- Involvement in AFS/TWS as a means for other professionals to find out what you do.

I believe that the fisheries and wildlife professions must take proactive measures to address the erosion of public confidence in their ability serve as resource stewards. We will need to rely more on education and less on regulation. At this time, there is no institution than Cooperative Extension better positioned to take the lead in that effort.

THE AMERICAN FARM BUREAU FEDERATION'S PERSPECTIVE

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A fledgling Extension Service learned a lesson early in this century; a lesson that is perhaps more valid today than when it was learned, and a lesson that may be particularly useful to professionals in wildlife and fisheries.

As improvements in agricultural production techniques and procedures were developed by the university agricultural experiment stations, there was an obvious gap between those who possessed the new information and those who needed to adopt it. To meet that need, programs were developed that resulted in professional change agents residing among farmers and ranchers in order to extend the universities' influence by one-on-one, face-to-face communication and actual demonstration.

But, as I remember the story, these initial efforts to cause individual members of the agricultural community to adopt innovation were not an overwhelming success. Then, whether by accident or design, Extension agents began to work with people in small groups instead of individually. And that clicked! Students of the adoption process noted that farmers and ranchers were more receptive to new ideas when they were able to work together and observe neighbors trying and successfully employing them.

This experience undoubtedly gave impetus and reinforcement to the concepts that adults, because of their life experiences and maturity, can learn from each other, and they can often learn best when working in a group. Individuals working with each other in small groups over time often evolve common values, standards, and goals as well.

Examples of descriptive names we currently give to work groups are task forces or teams. Of historic note, the small groups of farmers and ranchers with whom pioneer Extension agents worked were called Farm Bureaus. This accounted for the long relationship that Extension has had with the Farm Bureau, and the fact that many Extension agents ultimately became Farm Bureau employees.

Why do I say that those lessons are possibly more critical today than in the past? Because I have noted for some time that while specialized scientific knowledge is necessary for sound natural resource decisions, the best decisions are made when all affected parties have voluntarily worked with each other over a period of time to craft mutually satisfactory solutions to natural resource problems. So-called solutions that are made in partisan fashion by legislative bodies, "solutions" rendered by judges in hotly contested court cases, and "solutions" dispensed by politically vulnerable agencies usually all have the same characteristic: they are win-lose!

Thus, as cooperators and customers of Extension Wildlife and Fisheries Programs, the farmers and ranchers I represent would probably expect you to continue as agents of change; i.e., to help provide better options. They would probably want you to find opportunity initiating the process for people to achieve consensus and work together voluntarily on wildlife and fisheries related challenges as they relate to agriculture. They would want you to work with them on a win/win basis.

Let me describe how that is being done at this very moment. What I am going to relate has potential for adoption across the United States. And it was Extension driven!

For some time, the Endangered Species Act has provided disincentives for landowners. A Texas wildlife official, Sam Hamilton, said it best: "The incentives are wrong here. If I have a rare metal on my property, its value goes up. But if a rare bird occupies the land, its value disappears."

In an attempt to reduce some of this tension, Interior Secretary Bruce Babbitt has successfully worked out habitat conservation agreements with large timber companies so that logging and protection of endangered species could occur simultaneously on timber company-owned properties. Secretary Babbitt has also proposed that landowners having 5 acres or less be exempted from enforcement provisions of the Act.

While these initiatives have merit, where does it leave the hundreds of thousands of landowners who have 5 acres or less, but fewer than the major timber companies? With about 960 species on the endangered species list and hundreds more being proposed for listing, it leaves them vulnerable!

Recognizing the concerns of tree farmers due to the listing of the Red-cockaded Woodpecker (*Picoides borealis*) as an endangered species, Charles Hammond, Extension Agent in Moore County, North Carolina, assembled a task force of interested parties including landowners, the Environmental Defense Fund, Fish and Wildlife Service, Farm Bureau, and others. They were ultimately able to develop a safe harbor contract under which the Fish and Wildlife Service inventories Red-cockaded Woodpecker colonies on area tree farms, the landowner agrees to maintain those numbers, and the Fish and Wildlife Service agrees to not encumber the landowner with additional constraints should bird numbers increase and colonies develop on other parts of the farm.

It was innovative, it is the only such program that I know about in the United States, it was designed to be win-win, it appears to be working, and it was initiated by

Extension. Mr. Hammond simply explained that Extension's role was "pulling them together, and serving as facilitator." My observation is that this is a superb example of applied behavioral science more than it was avian science or silvicultural science. It was a shining model of adult education leadership, an Extension educator's finest moment.

Yes, there are many other opportunities. Extension Wildlife and Fisheries professionals can be the catalyst and facilitator in successfully addressing resource needs through the active, voluntary participation of affected persons in a democratic process. You can conduct educational programs in which it is recognized that education is a process of behavioral change with behaviors being recognized as knowledge, attitudes, and skills.

You have asked the panelists about ideas for future opportunities. Let me mention some personal thoughts on topics offering potential opportunity for behavioral change. These are not presented in any particular order:

- How market mechanisms can protect species and preserve habitat.
- Why animal damage management is needed.
- Why farmers and ranchers need to be ready to adopt the most humane and most environment-friendly animal damage management tools as they become available.
- Whether human traits can and should be attributed to animals; i.e., anthropomorphism, and what status wildlife and fish should enjoy compared to humans.
- How wildlife and fisheries can be perceived as a desirable and/or profitable asset by farmers and ranchers.

- Appropriate business organization and procedures farmers and ranchers might consider if they wish to financially capitalize on the wildlife and fish and habitat they provide.
- How competition between species, or competition between species and other resources can be resolved; e.g., between predators and game birds, or between waterfowl and grain fields, or between white-tailed deer and rare plants, or between livestock and salmon.
- Whether continued high tech agricultural production methods can ensure the availability of wildlife habitat.
- How to develop conflict resolution demonstration projects involving wildlife and fisheries and farming and ranching.
- What biological diversity is, why it is important, and how best to manage for it.
- What ecosystem management is, why it is important, and how best to conduct it.
- How farmers and ranchers can be appropriately recognized for outstanding contributions to wildlife and fisheries.

In closing, my expectations and predictions for future opportunities relate to your abilities to work successfully as "people" persons. As professionals presumably with wildlife and fisheries academic backgrounds and technical training, if you merely provide the technical "answers" to wildlife and fisheries related questions, then these answers become "your" solution. If you can successfully bring others into the process, answers become "our" solution. The latter are usually much more satisfactory!

THE FISH AND WILDLIFE SERVICE—EXTENSION CONNECTION

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We go back a long, long way! When the U.S. Fish and Wildlife Service (FWS) first established an office to cooperate directly with the Extension System's fish and wildlife component, I was a mere lad of 49. I became involved 4 years later, still a very young man! Now that the program and I have matured it's a good time to reflect on past accomplishments and associations and to look ahead to a continuing productive relationship.

It a real pleasure to be here with the progenitor of the Service's effort, Jack Berryman, whose wisdom and support we have all benefited from over the years. Likewise our long, congenial, and productive relationship with Jim Miller has provided the grease to keep it all going. Throughout my tenure as the Service Extension Czar, I have been ably and loyally assisted by Dan Stiles, whose impact on our cooperative effort cannot be over-emphasized. Likewise so many of you Specialists have been there from the outset, albeit some in different states, that I truly feel that I am in a roomful of good friends, not just productive cooperators.

Our collaborative history is one of which we can all be proud. The more than \$6 million that has gone into our products and programs has generated, I believe, some of the most cost-effective and influential communications efforts going in the wildlife and fisheries fields. You people are so good at packaging and distributing sound and balanced information, and in targeting specific audiences, that overseeing this effort has been remarkably easy. I like to cite the small stream management brochure produced by Virginia Cooperative Extension back in 1984. It was attractive, full of practical information, and was carefully distributed to farmers and landowners who had small streams on their property. **THE FWS COULDN'T DO THAT!** We have also gotten a huge amount of mileage from the companion pieces on biodiversity produced by Kentucky in 1994, one to a non-technical audience and one for more knowledgeable folks. What could be more timely in terms of resource priorities! I'd be remiss in not mentioning the Wildlife Habitat Judging program. So many of you have worked tirelessly to expand and improve this great educational tool. It's been a privilege to be associated with this effort and we are all pleased to be able to continue our support.

Basking in reflected glory feels good, but we need also to address the future. Dan and I now toil in the Education Division of the National Education and Training Center (NETC). Note no mention of Extension in the Division name. Our incoming Division Chief is Mike Smith, who is "one of the good guys," and also one who knows and appreciates the potentials of Extension. Dan has perhaps 7 or 8 months to go until retirement, and I will

most likely exit gracefully (?) about a year later. We have with us Regional Extension Coordinators from the Service who will retain some institutional memory about this program. The Director of NETC, Rick Lemon, is concerned about developing a transition capability in the Division, but personnel slots and funds are scarce these days. I hope and believe that there will be a knowledgeable "body" at NETC to carry on after Dan and I have retired, but this is not fully assured. Likewise, there is the black cloud of downsizing and funding cut-backs hanging over us. This is by no means unique to the FWS or to NETC, but **IT IS THERE!** We have been able to maintain close to \$100,000 in our extension budget for projects until this year. We **STILL** are not sure how much we will have for the rest of this fiscal year, and I would be pleasantly surprised if we come up with anything more than \$50,000 in the next fiscal year. This is our precious "seed money" with which we attempt to cost-share your proposals with other Service entities. What this means, pure and simple, is that your proposals **MUST** be attractive to FWS managers or few of them will be funded.

On the bright side, the entire FWS seems hell-bent to correct past neglect of what we currently term "outreach." There's a high-profile Refuge Outreach Program, a parallel Endangered Species Outreach Program, a Wetlands Outreach Program, etc. etc. Our "Ecosystems Approach" effort also recognizes the imperative of working with partners outside our special jurisdictions. I believe that the Extension System is uniquely equipped to provide some of the most vital communications links that will enable us to accomplish our mutual resource objectives. The challenge is there. We need only to be alert for opportunities, to keep personal communications lines open, particularly between Specialists and the Regional Extension Coordinators, to propose and seek innovative funding schemes and multiple partners for appropriate projects. I believe that, on the whole, we have neglected the potential of working with our state natural resources agencies in cooperative efforts and should work to increase such opportunities.

While year-end funding is still likely to be available for projects, I think we should be putting resource-oriented proposals in front of managers early in their planning cycle. (Hopefully we'll have funding in FY97 earlier than halfway through the year!) Dollars will be short, but if the Service is truly committed to "Outreach," and I think that it is, then good proposals will be funded.

You folks don't do "fluff," you do the "good stuff." I think my colleagues in the Service have now begun to realize that extension is often the very best place to enlist help to solve resource management problems that require

communication with the public. Some of them may need to be led by the nose—but you're pretty good at that, too! Have at 'em, and we'll do all we can to help.

As always, this workshop has been a pleasure and an inspiration. Dan and I don't expect to be at the next one in person, but we'll be there in spirit!



Extension Technologies for the 21st Century

DISTANCE EDUCATION: REACHING THE MASSES

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Abstract: There are a variety of different distance learning technologies available to Extension educators including the use of compressed video on fiber optics, television courses, and satellite conferences and university courses. In this presentation we describe the use of satellite for presenting an introductory wildlife conservation course to advanced placement high school students in the commonwealth of Kentucky. The course was designed after the oncampus course: FOR 101: Introduction To Wildlife Conservation, and was offered for 3 semester hours of college credit. The course was developed as a cooperative venture by the University of Kentucky and The Kentucky Educational Television Station (KET). KET provided the studio, equipment, and satellite uplink time, and the University of Kentucky provided the primary instructor, assistant, and producer. The course aired from 12:00 (noon) until 12:50 on Monday, Wednesday, and Friday. Six hundred students from 28 high schools took the course at their local high school. Three hundred fifty six students took the course for university credit (all students received high school credit), and 119 of those students passed with a letter grade of A, B, or C. Over half the students taking the course were seniors (55%), and 35% were juniors. Sixty six percent of the students were male, and 77% of the students indicated they planned on attending college. The primary reason for taking the course was an interest in wildlife conservation (37%), exposure to a college course (19%), college credit but not for a major (18%), and used for major requirements (15%). These data indicate the course is providing advanced placement students not planning on a career in wildlife conservation an opportunity to learn more about wildlife conservation. More than 65% of the students lived on <15 acres of land, indicating the primary audience was urban dwellers. Other topics discussed in the presentation included pros and cons of this type of distance education and other data related to students' opinions about learning with the use of this technology. A plea was made for video footage on management practices, ecosystems or habitat types, and wildlife from all specialists.

EDUCATION OVER THE INTERNET

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The global network of computers, called the Internet, offers special challenges and opportunities to educators for delivering educational programs. The opportunity of education over the Internet has been recognized almost since an interconnected network of computers was conceived. However, access to the Internet by the general public has been low; in 1995 only 4–6% of the people in the U.S. have access. Nevertheless, access has been expanding rapidly, and with the advent of the \$500 network computer, is expected to increase substantially over the next few years. Information available over the Internet is also expanding rapidly. In March 1996, the Megellan search engine returned just over 13,000 hits for the keyword “wildlife.” Just 3 months later, in June 1996, the same search returned almost 19,000 hits—a 46% increase. The same search engine returned approximately 32,000 hits for the keywords “endangered species.” Thus, there is lots of information already available on the Internet concerning fisheries and wildlife. The Internet may be particularly relevant to extension education because people searching for information or educational programs over the Internet fit the model of helping people help themselves. The purpose of this paper is to examine (1) some of the forms of Internet education, and (2) some of the issues related to educating over the Internet. I would like to acknowledge Ken Kingsley for several of the ideas presented in this paper. I would also like to point out that I am far from an expert on this topic; I would characterize myself as a user who could not find anyone appropriate to put these thoughts together.

FORMS OF INTERNET EDUCATION

Education over the Internet can take many forms from simple email correspondence to formally structured, for-credit courses. Although related in many aspects, some forms may be better suited for different audiences, and each present different issues that need addressing. I recognize six somewhat overlapping forms of Internet education: email information responses, newsgroups, discussion groups, file or information transfer, formal classes, and virtual educational environments.

Email Information Requests

Email is the most basic form of Internet access, and is typically the form that most users are first exposed to. As such, it is probably the most widespread form of Internet access. With this form of access, users can communicate with anyone else who has similar access and capabilities. Mail is usually delivered within a few hours, often

instantaneously. Messages more appropriate for someone else can be routed to that person. Documents and graphics can be attached to a response.

I suggest that responding to email requests for information is or will become a very time-consuming proposition for extension specialists unless you develop strategies to deal with it. Although I have not collected hard data, my recollection suggests an exponential increase in the number of information requests that come to me via email. I have had an email account for 8 years and began to receive my first requests for information in 1991. From 1991 to 1994 all email requests for information were from other colleagues at the university or at other universities. Beginning in 1994, other specialists within extension began forwarding questions they had received. Many of these were questions passed from our Agricultural Communications Department. In 1995 I began to receive information requests from clientele directly. The only possible reasons for the increase in these latter requests are my department's and OSU's extension home pages on the world wide web (WWW) and my email address on my business card (I do not give a lot of these out). I know that many of you who are more easily identifiable as the local expert because of home pages, or because of promoting your programs, must receive many more requests for information than I do. Perhaps upwards of 100/week.

Because of the increasing demand for information from this source, specialists will need to develop strategies for coping with the influx of requests. I offer the following suggestions for ways to handle these requests. Because information requests get combined with other email, you might consider a separate address for your extension information requests, or even separate addresses for different types of information (i.e., fish ponds, animal damage control). These addresses might be posted on WWW sites, or identified on your business card. Although this will not reduce the number of requests, it would likely increase your efficiency by allowing you to partition your time into extension and nonextension communications. I find for example that I will get several very similar queries in response to a news article (e.g., hanta virus and deer mice) or a presentation that I gave. If these were collected for a few days, you could respond to all of them with a single 1–2 paragraph response. Another way of dealing with these requests is by developing a list of standard answers that can be copied into your response. Questions like, “Where can I buy fish for stocking my pond?” which are asked repeatedly can be answered from a list of stock answers (no pun intended). I often simply respond with send me a mailing address so I can send you a publication.

Another way of dealing with email requests is the autoresponder. An autoresponder sends a return message to the sender. The autoresponse could say we received your information request and will respond as soon as possible. In the meantime, the following is a list of sources for information that might be helpful to you in the future. Although this autoresponse will not prevent you from having to respond to the information request, I believe that the information sources it provides could reduce the number of times that that person may come back with other questions.

One final thought concerning email requests has to do with what is an appropriate question or information request to be handled via this form of communication. By its very nature, email is best suited for rapid, short responses. Email users expect rapid communications, so it is best not to let these things wait for several days before you respond. Also, the responses should be short and concise, 1–3 paragraphs at the most. Many of the questions that specialists deal with on a day-to-day basis require site-specific information that can only be obtained by asking several, often in-series, questions. This type of dialogue should be avoided via email unless you just love to type and communicate back and forth over a few hours or days. I find that these types of information requests are better handled over the phone and respond with a request for a phone number as soon as I find myself thinking of a series of questions to ask the client. Thus, if you do not have a standard or almost standard answer available, you will likely be better off making a phone call.

Newsgroups

Newsgroups are lists of Internet clients that all have a common interest (e.g., animal damage control, farm ponds, butterfly gardens, etc.), and as such provide an opportunity to reach a target audience with a tailored message. People with common interests are notified of the lists' existence via conventional means (newsletter, word of mouth) or they can find them by searching the Internet. A person becomes a member by subscribing to the list, usually by sending a message to the list manager. The list manager has the option of making the list an open list or he/she can supervise the list and accept or reject subscribers. Everyone on the list receives, via email, any message that is sent to the list. Because of the relatively narrow interest of the list members, a specific message or announcement can be tailored to the audience, and will likely be broadly read. The major advantage of newsgroups is they allow and encourage dialogue among list members.

You will only want to create a newsgroup if you anticipate regular (every few days) postings. Members unsubscribe to inactive lists, and developing a successful dialogue among list members requires some practice, which can only happen on an active list. Thus, before creating a newsgroup you want to be sure that you have a relatively large (> 100) audience, and that there will be

regular postings to the list. This means that for many, perhaps most of us, creating our own lists will not be feasible or effective. However, thousands of lists are now active and you may be able to reach a captive audience simply by identifying the list and targeting it with your message. Certainly, I would consider announcing any new publications or videos that may be of interest to the list members.

Websites and File Transfer

Homepages on the WWW have become almost as common as an identification card—everyone has one. There are currently 1000's of websites that provide fish and wildlife related information, available to Internet users. Information on these sites comes in two forms, text at the site and files or documents that can be downloaded from the site. About 70% of the state Extension Services in the country have homepages and are beginning to make short (< 12 pages) publications available. Clients must use a file transfer protocol (FTP) to download the publication or use a publication distiller such as Adobe Acrobat® to view or print the publication. This information source is expanding rapidly, and I suspect that by the turn of the century many or most of our clients will be receiving information by contacting websites. Within 2 years there will be a national webhouse of extension publications that will be a source of all extension publications in the country, or at least those that are published electronically. Information regarding fisheries and wildlife resources available at websites varies from strict advertisements for products and publications to factual information of the type that the Extension Service has traditionally brokered. Many sites contain links to other sites with similar or related information. There are many issues related to providing information on websites that I will discuss in the last section of this paper.

Formal Classes

Formal classes offered over the Internet have been growing in number over the past couple of years and in general, you might say that educators are cautiously optimistic about the opportunities this form of education provides. Offering formal classes over the Internet is consistent with the objectives of many universities of expanding access to programs and in providing nontraditional educational opportunities. Internet education offers the capability of formal classwork off campus and at times (anytime of day) and over time-periods (several hours to a few weeks) that do not fit in the format of most university-based courses. However, formal classes over the Internet are not for everyone or for every course. Students that do best in these educational settings tend to be highly motivated self-learners. Students who need group-learning experiences, the regimentation of regularly scheduled assignments, or greater access to teaching staff to resolve questions and enhance

understanding will, in general, do poorly with Internet education. Fortunately, the profile of the successful Internet learner is consistent with that of Extension's traditional clientele. Courses that require hands-on laboratory exercises or field trips will be less easy to adapt to an Internet mode of education.

Formal classes over the Internet can be classified into 4 categories, fully developed, dependent, supplemental, and informational. Each of these provide opportunities for extension education.

Fully Developed Courses—Fully developed courses are classes that are completely taught via Internet. Fully developed classes generally have course notes posted on the Internet, and typically these are embedded with self-learning exercises and hot-key access to terms and definitions. For example, a course that contained a discussion of population growth would link to a glossary for any terms that the student might not recognize. More importantly, the "lecture" might contain a graphics module where the students could visualize the effect on population growth of changing litter size, interbirth interval, age at first reproduction, or other parameters directly related to population growth rates. Fully developed classes typically contain assignments that are completed at the terminal or submitted for grading and returned via email. Finally, these courses typically have examinations that are completed over the Internet. Security, or student verification, still is problematic for testing situations, but will likely be resolved in the near future. Extension programs that have well-defined content and that do not require field or laboratory experiences could be presented state- or nation-wide as a fully developed course.

Dependent Courses—Dependent courses, like fully developed courses, rely heavily on Internet capabilities. Typically, these courses are taught via traditional lecture or video, but have a component that can only be accomplished via Internet. Email submission of class projects is the simplest example, but directed learning tasks such as crossword puzzles that develop terminology, or graphics representation of timber harvest schedules and habitat components could also be incorporated. Dependent courses often contain a component that teaches students how to use the WWW to find additional information on a topic. Dependent courses could also contain all course components except for a field or laboratory component. Several currently existing Extension programs, such as the 4-H Habitat Judging or Master Gardeners, could be adapted as dependent courses.

Supplemental Courses—Supplemental courses are the most likely to be adapted to current extension education programs. These are courses where the Internet provides a source of supplemental course material. Course notebooks or handout materials may be made available via the

Internet, as might extension publications. The vast amount of information on the WWW provides additional information that self-learners could use to supplement lectures, seminars or other traditional teaching methodologies.

Informational Courses—Informational courses are traditionally taught courses for which optional information sources on the WWW are identified for students. As extension publications become more widely available on the WWW or as we identify websites that provide factual information, just about any extension program could be considered informational. Many of you probably already have informational Internet courses and did not even know it.

Veets and Moos

Virtual Educational Environments (VEE) or Multi-user, Object-Oriented programs (MOO) are online worlds (we might call them ecosystems) that are created by computer commands and are explored and manipulated via online conferencing. Participating in a VEE has been described as being something like being part of an interactive novel. Participants in this environment are designated by characters that are displayed on all "player's" screens. They talk to one another via the keyboard, and use commands to move around the environment and to manipulate objects within the environment. Creation and support of a VEE requires the development of sophisticated programs and linked databases. However, I do not doubt that an ecosystem VEE will be online in the near future. The participation in a VEE has great educational potential. For example, a wetland VEE might be created that linked lists of plants and animals to different environmental parameters such as water depth, pH, temperature, and many others. Participants in such a wetland VEE could learn what might happen to the fauna and flora if the water level was decreased by 50% or temperatures were increased by 5°C. To learn more about VEEs and MOOs, I suggest you view the following sites on the WWW ("<http://web.syr.edu/~salsbery/dumoo.html>," or "<http://www.athena.edu/vee.html>").

ISSUES WITH INTERNET EDUCATIONS

Education over the Internet involves a number of issues that educators and administrators need to recognize and address. Some of these issues fall in the category of awareness, while others will require substantial investments before meaningful advances can be made in Internet education at a particular site.

Quality Control

The issue of quality control is critical for extension educators because of their role in providing objective, scientifically based educational programs. There are at least two levels of quality control that education over the Internet should address: (1) review of materials posted on Internet servers by extension educators, and (2) review of sites that are linked to webpages. Review of materials posted on the Internet by extension educators is of particular importance because long-term credibility of the organizations will depend on this level of quality control. Because almost anyone who has access to a server and who has some computer skills can begin posting ("publishing") educational information on the WWW, many states have begun to develop policies concerning posting of materials; see your extension administrators to determine if such policies have been developed for your organization. These policies should contain provisions for peer-review of materials in a manner consistent with any other extension publication. Because you can write it today and have it available to the world this afternoon does not mean it will be scientifically credible or even attractive to readers. Another standard policy concerning quality control is single server posting. Many academic or administrative units, from university departments to county extension offices, within most state extension organizations have or likely will have servers providing access to the Internet on which materials could be posted. Multiple servers within an organization increase the likelihood that a particular "publication" will be posted more than once, and worst yet, that multiple editions of a publication will be posted. Thus, extension "publications" posted on the WWW should only be posted from a single server.

The second level of quality control for Internet education concerns the common practice of homepages or websites linking to other websites with similar information. It appears to be a very in-vogue and valuable thing to do; it is hard to find a website that does not offer such links. A well-designed page of resource links is a gold mine for people searching for information on a particular topic. Although many Internet educators may disagree with me, I suggest that such links from extension homepages could be construed as recommended reading. As purveyors of objective, scientifically credible information, I believe we should be concerned about our reading lists. There is lots of information concerning fish and wildlife resources available on the WWW, but the objectivity and level of peer-review is likely to vary considerably when it is available from organizations ranging from the U.S. Fish and Wildlife Service to Greenpeace.

I offer the following suggestions for extension educators who wish to provide resource links on their websites. First, avoid establishing such links unless you have reviewed the materials at the site you are linking to,

and have some plan for periodic review. Second, consider using a standard disclaimer to the effect that the links are provided as a service and do not imply an endorsement by your organization with respect to objectivity or factual basis of the information. Another possibility is to develop a rating system based on some combination of criteria related to objectivity, bias, factual basis, and peer review. Links to sites might range from Not Rated (NG—see disclaimer above) to Peer-Reviewed publications (PR) to Factual but Biased (FB) or other combinations of review. Because websites change continually, any rating system should also contain periodic review and a date indicating when the site was last reviewed.

Security

There are many things that can be said about computer security with respect to Internet education. However, I am only going to focus on the single topic of ensuring integrity of educational materials that are unbiased and objective presentations of scientific knowledge. This is the foundation of extension's credibility. If computer hackers can gain access to National Security Council and Department of Defense computers, the possibility that someone could access and change extension educational materials posted on the Internet is not far-fetched at all. Imagine for a moment what an animal-rights advocate might be able to do to some of the many animal damage management publications that extension produces. The addition of a sentence or only a word or 2 could drastically change the meaning or intent of a publication. And, subtle changes could be very difficult to detect. How soon might you find out that the word "not" had been added in a few places to one of your publications? Probably not before many 100s or even 1,000s of copies had been downloaded. Integrity of materials can be ensured by never posting documents in a form that can be modified. Most extension publications will only be accessible in a Portable Document Format (PDF) as is the CD-ROM version of the Animal Damage Control Handbook (Hyngstrom et al. 1994). PDF files can be downloaded, viewed, and printed from several different platforms with the original page layout and typography. More importantly, PDF files cannot be altered.

Training of Staff

Training of staff is another issue that extension's administrators need to focus on. The rapidly changing technology associated with computers and Internet communications will require that extension personnel receive training to effectively use these educational opportunities. Training needs will range from simple and effective use of email to website editing depending upon the needs of extension personnel. In most cases, short seminars can be effective for explaining the basics of much of the software that Internet users need to be familiar with.

Funding and Technology Support

The final area of concern to all administrators is funding for the technology and supporting the electronic infrastructure. By its very nature, equipment and software purchased this year will be obsolete or much less effective compared to new technologies next year. Most universities now assess students some technology enhancement fee that helps upgrade computer labs and support services. However, in most cases that I am familiar with, upgrades of hardware and software for non-student users (i.e., extension personnel) comes much more slowly. Extension personnel will not be able to unleash the power of the Internet education without regular hardware and software upgrades. Technology support will be needed to ensure that the hardware is functioning properly. Furthermore, effective Internet education will require webpage designers and other software specialists in much the same way that extension videos require electronic media specialists.

CONCLUSIONS

Education over the Internet provides extension educators a vast opportunity for expanding and motivating audiences. Several different modes of education are now possible, and undoubtedly many more will arise in the near future. I suspect that within the next 10 to 20 years, education over the Internet will be the primary means of extension education. Thus, extension personnel and administrators need to begin strategic planning in order that extension services are well positioned for education in the next century. This planning will need to address funding and technology support, quality control, security, and training.

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MULTIMEDIA PROGRAMS AND NEW COMPUTER TECHNOLOGIES: A LOOK AT TEXAS 4-H WILDLIFE SCHOOL ENRICHMENT PROGRAMS

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Abstract: 4-H multimedia school enrichment modules offer excellent wildlife educational opportunities for elementary students as we near the 21st century. Modules consisting of hands-on displays, interactive computer programs, videos, lesson plan activities, and pre/post-test components serve to reinforce information relative to topical issues in the wildlife arena. In Texas, modules have been developed entitled "The White-tailed Deer," "Wildlife Success Stories and Endangered Species," and "Something's Fishy." These modules and their duplicates are used as components of county 4-H programs and serve to deliver wildlife information to an ethnically and socio-economically diverse audience of third and fourth graders. Teacher committees are instrumental in developing and approving module content. Developmental and funding support for these modules and their duplicates has come from a wide variety of state and federal agencies as well as non-governmental organizations. Pre- and post-test methodology has indicated an approximate 50% increase in knowledge gained as a result of student exposure to these modules. Data collection/analyses/interpretation has provided a high degree of accountability documenting program successes. Results are published in county result demonstration handbooks and provided to sponsors in the form of annual reports. On-going efforts are being made to expand module availability within Texas as well as nationwide.

INTRODUCTION

Public and private school classrooms offer Extension a tremendous opportunity to reach youth with factual information about the conservation and management of our wildlife and fisheries resources. We in the wildlife and fisheries arena are especially fortunate because elementary-age children are naturally drawn to animal life of all shapes and sizes.

In public schools, the ethnic makeup of student populations closely mirrors the demographics of the community's population. This often allows us access to some "difficult to reach" audiences and exposes a greater number of youth to the 4-H program, which may serve as a mechanism to recruit new 4-H members.

4-H school enrichment programs also offer opportunities to network. First, we as wildlife and fisheries specialists can network with each other in the developmental phases of these modules, as well as with other Extension specialists (i.e., 4-H and Communications), county Extension agents, state, federal and non-governmental organization biologists, state education agencies, and local teachers. These individuals can be instrumental in helping to develop module themes, provide necessary resources, and/or review products to make sure they are on target.

In numerous discussions with elementary school faculty and administrators, it appears that modules should target students at the third or fourth grade level. It is in these grade levels that students learn much of the information that will provide a basis for their future attitudes/opinions. However, regardless of the grade level targeted, all are in agreement that these students must be reached before they leave the elementary school campus or it becomes increasingly difficult to affect their opinions/attitudes.

Most important of all is the establishment of a teacher committee to review and comment on module content. If you allow this group to guide you through the mazes and nuances of your state's mandated curriculum requirements, then the program will be a success. Quite simply, teachers will embrace and use a product that they have ownership in, and word-of-mouth advertising from one school to another will be a great asset in selling the idea of your module to schools.

A second type of networking is necessary to make module development a reality. Funding of any new program is a cause for concern among all Extension wildlife and fisheries specialists as budgets continue to tighten. Unless your state is the exception, development of these programs cannot be accomplished using hard dollars; therefore, grant funding must be sought to achieve module development. In my case, I have found it easier to raise funds and hire expertise to conduct certain activities (rather than do them myself) such as computer programming, data entry/analyses, and display layouts. In many cases, this expertise can be found within your own university.

A number of local, state, and federal agencies as well as nongovernmental organizations and conservation groups are interested in financially supporting successful educational opportunities for two reasons: 1) they have a vested interest in the conservation of wildlife in this country; and/or 2) they have a vested interest in the education of youth relative to natural resources conservation and management. Nothing breeds support (the financial kind) like success; therefore, statistically valid results made available to sponsors in the form of annual reports substantiate the fact that their dollars were truly well invested. Invite sponsors/potential sponsors on-site to see students interacting with the modules to witness wildlife management information being taught and

absorbed in a formal school setting. This approach is far superior to making awareness presentations using slides or other visuals. Chances are good that if you can get them to the school, your efforts may result in an additional sponsor or supporter.

OBJECTIVE

Our objective in providing 4-H wildlife school enrichment modules to elementary schools is very simple: To make factual, research-based information on topical issues surrounding wildlife and fisheries resources available to elementary school students. To accomplish this objective, we hope to continue creating modules depicting various scenarios as well as duplicate existing modules to make this information available to every school system in the state via the county Extension 4-H program.

PROGRAM PROMOTION

Another important aspect of conducting successful school enrichment programs includes promotion and marketing. First and foremost, never miss an opportunity to credit sponsors and partners for their developmental/financial support. Computer menu screens and trailer/display signs should give credit to other individuals, agencies, and groups as well as serve to advertise the module to the public.

Probably the best promotion of a new module is to conduct a kick-off event at its debut. Mini-tours can be set up to demonstrate teachers and students interacting with the various module components. Print and news media should also be invited to cover the module debut. Special guests that should be invited to such events include university (Extension) administrators, school district administrators, state and local elected officials, and sponsors/partners that were involved in developing/funding the module. Once the module is scheduled and on its rounds to various participating counties, county Extension agents are encouraged to invite local media to cover the module's presence in local schools. This approach can gain considerable publicity for the program and enhance the existing county 4-H program's visibility.

A great by-product of television coverage is a half-inch VHS version of the interview. Copies can be made and sent to agents/schools requesting information about the program. These 3- to 5-minute TV interviews show the essence of the module and are a tremendous marketing tool.

Once a module has finished its pilot stage (usually 1 school year), a nice four-color summary publication should be developed detailing program protocol and results. This is also another opportunity to acknowledge partners and sponsors.

PROGRAM PROTOCOL/SEQUENCE

The program protocol consists of several steps including: 1) module development, 2) contact with and advertisement via county Extension faculty, 3) module scheduling and coordination, 4) program delivery, 5) program evaluation and 6) reporting.

A commonly asked question by volunteers and county Extension agents is the time commitment required to conduct the program. My standard reply is "probably less time than you spend on almost any other result demonstration." The time invested includes module setup and breakdown and delivery of the 60-day post test (if utilized). While it would be nice as specialists or agents to have time to follow and teach the module at each participating school, it is also impractical. If the module design does not allow it to stand on its own and be taught comfortably by teachers normally lacking a strong science background, then the module is a complete and utter failure!

The program sequence on individual campuses may vary, but typically consists of: 1) a brief orientation and delivery of teacher resource materials 1 to 2 weeks prior to the scheduled starting date; 2) pre-testing before the module arrives; 3) participation in the various module components (display, video, lesson activities, and/or interactive computer); and 4) immediate and/or delayed post-testing. We recommend that modules without the computer component reside on participating campuses for 1 full week. If the module contains an interactive computer component, the stay should be increased to 2 weeks per campus.

MODULE PORTABILITY

As a 4-H school enrichment module is developed, portability and mechanisms for transport should be in the back of your mind. Modules can become elaborate, but the more fragile the components (especially display items), the more difficult the setup and takedown. Remember, the idea is to provide a brief orientation, then have county faculty or volunteers capable of setting up the module without your supervision. In Texas, agents pick up the module directly from another county or from the district Extension office where the module resides, whichever is closer.

The use of small enclosed trailers has been very helpful in facilitating module transport from school to school. Almost everyone has access to a vehicle with a trailer hitch, while fewer have access to a suburban, van, or pickup with a camper top to move the module. Under no circumstances should the module be transported in the open bed of a pickup—one good thunderstorm can wreck a \$15,000 investment!

MODULE COMPONENTS

The hands-on display is the centerpiece of the 4-H wildlife school enrichment modules. The pictures and text blocks should be clear and concise with each designed to convey a specific message. However, the display should consist of more than just pictures and words. Deer antlers and jawbones, mounted wood ducks, turkey beards, and fiberglass fish replicas help bring the display to life and encourage participation by students. As one teacher stated, "If all you provide is pictures and text, you might as well just give the students a book!" The key is to encourage hands-on participation. Wear and tear will require some maintenance and replacement. However, we have been surprised by the resiliency and life of module components after 4 full years of almost continuous use.

The display should be set up in a focal or high use area on each campus. A foyer, stage, library, or other centrally located area makes a good location. Remember, although modules should target specific grade levels, there is nothing wrong with other grades viewing various module components. The more exposure, the better.

Of all the module components, it should not come as a surprise to anyone that the interactive computer programs receive the highest ratings from teachers and students alike. This fact was reinforced when one teacher stated that, "The reason for the success of the interactive computers is that they put children in charge of their own learning." This includes enhancing their computer skills by allowing them to make decisions within each menu using a mouse. Few school administrators and teachers will miss an opportunity to increase student exposure to computers. We very nearly opted to go with touch screen technology when the computer programs were initially developed, which in hindsight would have been a big mistake.

Computers can be set up in individual classrooms or in a central location such as a computer lab or library. The inclusion of listening posts and headphones allows for student use individually or in small groups. Our preference is to locate computers in individual classrooms so students can access the programs when other work is completed.

A real asset of the computer program development occurred quite by accident. We were lucky to have access to students themselves (as opposed to adults) to narrate the text in the computer program menus. One student served as narrator for all menus of the "Wildlife Success Stories and Endangered Species" program, while eight different youth were used to narrate the eight menus on the "Something's Fishy" program. We are convinced that this greatly enhanced the effectiveness of the computer programs.

The development of the interactive computer program is determined largely by your own programming skills and services you have available to you such as by a Department of Agricultural Communications. Personally,

I have no skill at programming. I have found it much more efficient to raise the funds necessary to hire the expertise to complete the interactive computer program. My participation in these facets of the programs is limited to developing the scripts and providing the slides/video clips necessary for completion. As with the display, computer program text/visuals were reviewed by the teacher grade level committee to determine subject matter appropriateness.

With the tremendous upgrade in hardware capabilities found on elementary campuses in just the past 3 or 4 years, the use of CD-ROM may soon eliminate the need to provide computer hardware with each module. This will also reduce the cost of program delivery. However, if this approach is pursued, a hybrid CD-ROM format is recommended that includes both Macintosh and Windows versions because on-site computer hardware varies greatly from campus to campus.

We are now in the process of making our interactive computer programs available for distance learning via the Internet. Starting in the fall of 1996, students as well as adults will be able to access these programs by providing a brief demographic database and participating in a pre-test. Once the program is completed by the user, they will have an opportunity to participate in a post-test to see if they improved their knowledge as a result of program exposure. Results will be downloaded by the Extension Data Center-Texas A&M University for data analyses.

The videos included with each module serve to reinforce teaching points included in display, computer program, and lesson plan components. Brief (< 30 minutes) videos are best at holding students' attention. Videos may be developed specifically for use with a given module, but that takes time, money, and (in particular) skills that I do not possess. In many cases, videos are commercially available that reinforce major teaching points without having to develop one specifically for the module. However, if time, resources, and technical support exist, a tailored video can greatly enhance the effectiveness of the entire module. In either case, multiple copies of videos should be provided to minimize time lost due to video sharing between classes.

Lesson plan activities cannot successfully be completed without substantial input from your teacher committee. Each state has mandated curriculum that must be taught in every subject. If these mandates are not only met but are also easily recognizable, you won't get your foot in the school door!

In Texas, we concentrate on meeting as many of the "essential elements" required for the science curriculum at the targeted grade-level as possible. This is the major reason why you should not shotgun your program toward multiple grade levels. Be specific in the grade level you target and write lesson plans to that grade level.

In addition, all students in Texas schools are tested using grade-level specific tests called Texas Assessment of Academic Skills (TAAS) to measure performance.

Students in grades three to five are tested annually using TAAS. Therefore, it makes sense to couch lesson activities in the same format as these state-mandated tests. Teachers in Texas instantly recognize lesson activities developed in the TAAS format and welcome the opportunity to provide additional "practice" for their students. We simply meet their format standards and plug in our wildlife subject matter information.

A number of additional activities are placed in the teacher resource guide beyond the TAAS activities. These include "fun" activities including word finds and crossword puzzles developed to reinforce key teaching points. In addition, we include several Project Wild activities (written permission required). In many cases, 4-H student guides and other 4-H materials are valuable information resources.

Teacher resource guides are provided in three-ring binders with indexed categories that include hard copies, transparency copies, and, whenever appropriate, student copies of each activity. It is very important to provide all copies (including pre- and post-tests) to the teachers. The idea is for teachers to do what they do best, which is to teach—not use their classroom time and budget trying to prepare for something we would like for them to teach. As an additional incentive for their participation, teachers keep the resource guides for future use.

PLEASANT SURPRISES

A number of unforeseen yet pleasant off-shoots have occurred as a result of 4-H module use in classroom settings. These are spontaneous activities that resulted because of student and teacher initiatives to explore wildlife beyond the materials provided. For example, on one campus a class of students with learning disabilities studied "The White-tailed Deer" module, then proceeded to team-teach the module themselves to all other classes on campus. It was an inspiration to watch these young people's self esteem increase over the course of a week. They were clearly the resident experts and enjoyed teaching other students about the white-tailed deer.

Additional activities that have been conducted included a bulletin board project detailing the history and importance of white-tailed deer in Texas ("White-tailed Deer—Then and Now). Other highlights include team poster presentations as well as individual book reports on species, many of which were not featured in the modules.

Finally, one of the biggest surprises was the pride in each participant's eyes upon receiving a "certificate of completion" signed by their county Extension agent upon completion of the course of study. There is no doubt that to a third or fourth grader, a nice certificate complete with their name is highly prized and appreciated.

ADDITIONAL ACTIVITIES

On occasion, experts have made themselves available to guest teach portions of the modules. These have included state game and fish agency biologists as well as game wardens. These discussions almost always result in requests for how to become a biologist or a game warden. It never hurts to plant the seed early to encourage a career in natural resources!

Although this could certainly fall under the previous category entitled "Pleasant Surprises," one of the most important additional activities has been the supplemental use of the modules independent of school environments. Rather than being "moth-balled" on weekends and during the summer months, the modules have remained in constant demand for youth field days, summer camp programs, and even adult-oriented field days/events. If you were unaware of this fact, please note that a module developed to target today's third or fourth grader is also just about right for the average adult!

PROGRAM EVALUATION

Perhaps the strength of these 4-H wildlife school enrichment programs lies in their strong evaluation component. In this day of increased accountability at both the state and federal levels, it is incumbent upon each of us as Extension faculty to make sure our program efforts are measurably successful.

Students are pre-tested (attitude) before each module arrives, post-tested (knowledge gained) at the end of the module's stay on campus, then post-tested again (retention) 60 days after initial exposure. Tests are in a true/false and multiple choice format that are carefully reviewed by teacher committees as well as Extension Data Center personnel. The same test instrument is used for all tests; however, test copies are clearly labeled as to the testing period and color coded to avoid confusion.

Teachers are also requested to fill out a demographic sheet that lists each student's name, gender, and ethnicity. This information is completely confidential but vital in assessing the program's impact. Pre-tests, immediate post-tests, and the demographic data sheets are picked up when the module is moved. The county Extension agent returns to each participating campus 60 days following initial exposure to provide the final post-test copies to teachers.

Data comparisons include number of correct answers by testing period, comparisons of scores by testing periods, by student gender, by student ethnicity, and rural versus urban school performance (if applicable). All data is forwarded to the Extension Data Center-Texas A&M University for data entry and analyses. Data analysis is summarized and returned to the Extension Wildlife and Fisheries Specialist, who prepares and forwards individual 4-H result demonstration reports for inclusion in participating county Extension agents' result

demonstration handbooks. These results are also provided to networking partners and financial sponsors to share program results.

During the pilot phase of a new module, it is also recommended that a teacher evaluation instrument be administered to gain feedback on module utility and performance. If the teacher committee's advice has been followed and the module developed is truly "teacher friendly," these evaluations will come back overwhelmingly positive. In any event, this feedback can be critical in making necessary adjustments to ensure future program success.

REPORTING

As indicated, the primary outlet for 4-H wildlife school enrichment program results is the county result demonstration handbook. However, once data is computer-logged, summary reports for a particular module used in numerous counties can be developed as needed to satisfy state and federal reporting requirements. Following the pilot study phase, a nice four-color summary publication of the project results serves as an excellent supplemental marketing tool. It also provides financial sponsors and network partners with documentation of a project's success that makes them proud of their involvement.

BUDGET

A frequently asked question regarding these 4-H wildlife school enrichment modules is "How much does it cost?" Certainly this is a question that should be answered before potential sponsors are approached with funding requests. We have been very fortunate in Texas to benefit from tremendous financial and in-kind support within both the 1890 and 1862 Extension programs. This inter-unit/departmental support has been invaluable at holding down development costs incurred primarily through interactive computer programming, display layout, and data entry/analyses. In addition, funding and developmental support from external agencies and organizations has been instrumental in program success.

Bank on the fact that there are a number of groups clamoring to get their messages into school systems. As a result, there is considerable competition for the limited time available. Modules must be well-designed and appear professional in order to effectively compete. While corners may be cut to save money, investments in equipment that will demonstrate longevity and represent Extension and 4-H in a positive light will pay dividends over the long haul. Well-designed and maintained modules should have a life of 5 or more years, which should drive down the cost of program delivery to no more than \$1.00-1.50/student.

An example budget for 1 module includes:

Display w/carrying cases	\$2,500
Computers (4 @ \$1,500)	\$6,000
Enclosed trailer (5' x 8')	\$2,200
Display items (2 copies of pictures/text)	\$1,500
Videos (25 copies)	\$ 300
Teacher Resource Guides (100 @ \$30)	\$3,000
Supplies (i.e., headphones, listening posts)	\$1,000
Data entry/analyses	\$1,000
	<hr/>
TOTAL	\$17,500

Please note that this budget was developed based on what it would cost to duplicate an existing module. An annual maintenance or contingency fund should be available for repairs, etc. Initial developmental and/or assimilation costs of display materials, interactive computer programs, videos, and teacher resource guides could double the cost, not including any indirect costs assigned by the university/agency.

RECOMMENDATIONS

The following recommendations are provided for those interested in developing 4-H wildlife school enrichment modules:

1. Identify/network with partners/sponsors
2. Establish a teacher committee to review materials
3. Target a specific grade level
4. Meet/address state-mandated curriculum requirements
5. Use a multi-media approach
6. Provide all materials, including teaching resources
7. Pre- and post-test to determine program impact
8. Schedule through county Extension faculty
9. Publish results via county and annual reports
10. Explore alternative uses of modules

It's not always easy to spot who the future hunters and anglers will be in a formal classroom setting. Hopefully, the use of 4-H wildlife school enrichment modules will serve to encourage participation in these pursuits by some of these students. However, much more important is the exposure of these students to factual, research-based information that provides a clear understanding of wildlife conservation and management and the roles landowners, anglers, and hunters play in maintaining wildlife and fisheries resources for future generations. After all, the elementary students of today are the policy-makers of tomorrow!

Ecosystem Management—Interdisciplinary Research and Extension Program Opportunities

Editor's Note: The following panel presented federal government and industry approaches to ecosystem management, and private landowners' perceptions and concerns regarding participation in ecosystem management. Only one abstract was received for publication in the proceedings. The panel was composed of the following people:

Nancy Gloman—U. S. Fish and Wildlife Service
Max Bennett—Oregon State University, Forestry Extension Program
Jim Rochelle—Weyerhaeuser Company
Elbert Moore—U. S. Environmental Protection Agency

HABITAT MANAGEMENT PLANNING: BLENDING COMMERCIAL FOREST MANAGEMENT AND THE PROTECTION OF FOREST ECOSYSTEMS, INCLUDING THEIR WILDLIFE COMMUNITIES

JAMES A. ROCHELLE, Weyerhaeuser Company, Tacoma, WA 98477

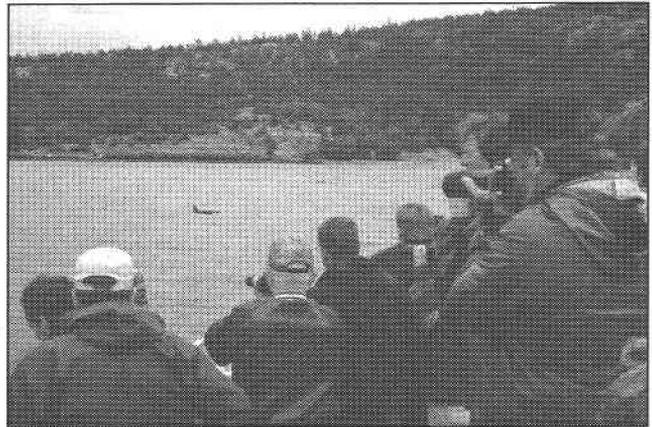
Abstract: The purpose of a Habitat Management Plan is to use the best available science, within an adaptive framework, to provide habitat for a wide variety of native forest wildlife species while profitably managing private land for wood production. This process is currently under development by Weyerhaeuser Company in Washington State. The process starts with a Watershed Analysis conducted under the forest practices laws of the state. In this analysis, technical experts of the appropriate disciplines identify the causal mechanisms behind those processes (mass wasting, surface erosion, temperature regulation, etc.) which are related to fish habitat and water quality. With knowledge of these mechanisms, and the guidance of the technicians, foresters derive prescriptions to protect these public resources in future management activities. Habitat Management Planning itself then proceeds by setting broad resource goals appropriate to private commercial forestland. Extensive assessments of vegetative characteristics, unique habitat features, and wildlife populations are then performed to provide the initial data on which the plan will be based. A Geographic Information System is an essential tool in this process, providing a means of analyzing field data and displaying current and future habitat conditions. These data are used to evaluate and improve a series of wildlife/habitat models which are initially based primarily on relations developed from the scientific literature. This process of adaptive model improvement is fundamental to the plan. Specific management plans including harvest scheduling and silvicultural prescriptions are then derived in an integrated model which simulates forest development, identifies predicted suitable habitat, and evaluates the outcome in an economic context. Through a series of such simulations a management plan is developed which meets the broad resource goals for wildlife within acceptable economic constraints. Such a process cannot be done without a sophisticated spatial analysis which accounts for wildlife home range size, areas required for minimum viable populations, and such forest management considerations as limits on harvest area size and "green-up" rules. Monitoring of the results of plan implementation is an integral part of the adaptive process, providing a measure of plan effectiveness in meeting objectives, and guiding plan improvements over time.

This process is being developed and pilot tested on a 40,000 hectare block of commercial forestland in coastal Washington State. This presentation provides an overview of the habitat management planning process, describes the technical approaches being used to evaluate and model wildlife and habitat relationships, and displays some of the field data being collected in support of model validation.

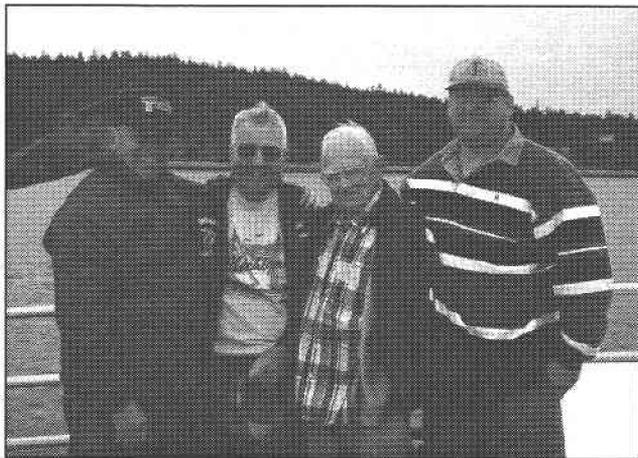
Images of the 8th Extension Wildlife and Fisheries Specialists Workshop



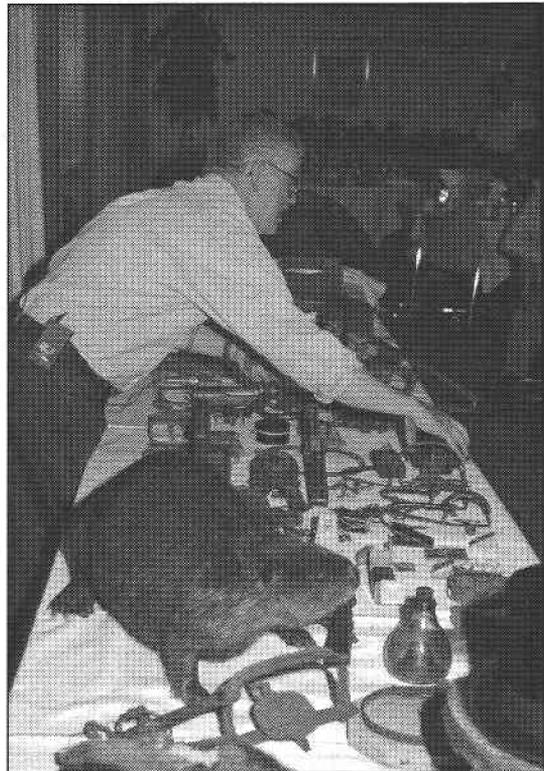
Several people participated in the pre-workshop field trip to Olympic National Park and the San Juan kayak overnight (above).



The workshop field trip was a whale watching cruise in the San Juan Islands—the tour, led by Captain Trivia, encountered several pods of Orca.



Workshop participants John Munn (left) and Tom Barnes (right), try to pick up some additional pointers from some old pros, Pete Petoskey (center left) and Jack Berryman (center right).



Trap collector Ron Munro explained the history of traps and how trapping influenced the westward development of North America after the banquet on Thursday, 27 June 1996.



Our leader, Jim Miller (right) contemplates future job opportunities, while Duncan MacDonald (left) and John Munn (center) gauge the likely public response.



The ecosystem management panel included Elbert Moore of EPA, Max Bennett of OSU, Nancy Gloman of the Fish and Wildlife Service, and Jim Rochelle of Weyerhaeuser Company.

Public Issues Education in Natural Resources

SPEAKING AS A PROFESSIONAL¹

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One certainty these days is that public policy will continue to shape the future of forestry. We foresters seem to take what's served up, wishing we had more influence on the ingredients and how they are prepared. We need to assert more leadership in providing forestry knowledge to citizens and decisionmakers. However, information delivery is not enough; we need to be involved in the process of policy as well as its content. Technical information and good science will not prevail on their own. We don't have to push a particular option to be effective. We can use our skills and enthusiasm to present a perspective, a process, or the issue itself.

Our technical skills and science are important, but we must interpret them to the public and decisionmakers. If we don't do a good job of providing "knowledge services," citizens and decisionmakers will develop judgments without us, and perhaps without the necessary technical or scientific information. Here are some tips for making the most of our communication efforts.

Understand the Issues

Today's forestry issues are numerous, complex, and difficult for even the most astute individual. Read professional publications, talk to specialists, attend seminars, take field tours. Seek out a variety of perspectives, even if you don't agree with them.

Realize How Opinions Are Shaped

Be aware of how the media portrays and the public perceives the issues. How do policymakers and decisionmakers find out the facts? What opportunities exist for helping various groups better understand the issues?

Know Your Listeners

What is their background? Do they understand forestry concepts and jargon? Do they represent an organization? Where do they stand on forestry issues? What questions might they ask?

¹Reprinted from the *Journal of Forestry* 91(7):25 published by the Society of American Foresters, 5400 Grosvenor Lane, Bethesda, MD 20814-2198. Not for further reproduction.

Describe Yourself

Give your name and any groups that you belong to or represent. Call attention to training or experience that relates to the issue at hand. Don't apologize for not having a Ph.D. or for not being a senior executive.

State Your Concern for Natural Resources

Foresters nearly always have a strong and compelling interest in sound stewardship of natural resources. When dealing with contentious issues, this concern may not be readily apparent and then your message may be less effective.

Be Specific

Detail brings life to written or spoken comments. Illustrate your points with examples, statistics, photos, drawings, and maps.

Have a Clear Purpose and Strategy

If you agree with something you have seen or heard, voice your support and offer examples or ideas that provide confirmation. If you disagree, carefully assemble a case to substantiate your points.

Be Calm

Let your story tell itself. Don't fire random emotional shots at individuals, institutions, or interest groups. Don't deny your emotions; rather, direct them toward collecting and articulating the facts that support your views.

Don't Blame

You weaken your message by blaming individuals, society, institutions, or interest groups for problems related to forestry. Concentrate on flaws in concepts or arguments, not people or organizations; then suggest positive ways to improve the situation.

Offer a Perspective

Don't be shy even if you are not a journalist, scientist, or upper-level manager. Your thoughts about an issue are no less valid, and your experience with on-the-ground forest management may be impressive.

Focus on the Facts, but Identify Opinions and Values

As a professional you should focus on providing accurate and useful facts. Your informed opinion also can be important as long as it is clearly distinguished from established fact. Current forestry issues also encompass a wide range of personal or organizational values. You should identify your values if they shape your interpretation.

Raise Questions

Even if you are not an expert in biology or economics, it is important to raise questions about key information gaps or poorly supported arguments. And if it appears that opinions are mixed with facts or that values are shaping how information is used or interpreted, ask for clarification.

Be Brief

Whoever your audience is, time and attention may be short. Your objectives are to deliver a compact bundle of facts and views and to be remembered in a positive way. Organize your material and write it out ahead of time. When speaking, allow time to answer questions.

Practice

When preparing oral remarks, write them just as you expect to say them. Practice aloud. Think through questions you might be asked and rehearse your responses. If you are reluctant to speak up verbally, send a carefully written letter or commentary.

Follow Up

Provide a written copy of your remarks or other material supporting your points. Note any questions that you did not answer well and provide a more complete response in a follow-up letter. Let people know if you are available to discuss the issue further. Ask people for candid feedback.

Keep at it

Forestry issues are not resolved overnight. New issues will emerge and old ones will be revisited. Use these as opportunities to develop your knowledge, skills, and potential influence as a professional. Remember: no one can listen if you don't speak up!

INTERDISCIPLINARY AND MULTIDISCIPLINARY PUBLIC EDUCATION BY COMBINING CONSENSUS-BASED PLANNING AND ENVIRONMENTAL ANALYSIS

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In extension, we educate people to improve their lives. In natural resources extension, we educate people to improve life. Resolving issues often does this. In natural resources extension we also resolve issues to educate people.

As educators we steer clear of some issues to avoid the hazards. We may refrain from choosing sides. When we choose sides, we often tarnish the perceived objectivity of our University. Yet issues provide the need for knowledge, the teachable moments, and the set and focus that translates knowledge exposure into learning. When issues involve common resources, shared or conflicting interests, complications from complex or partially understood biology and ecology, significant economic ramifications, and intense emotions, the opportunity for education increases or decreases depending on the means chosen for issue resolution.

Politics often polarizes and leaves people more entrenched with partially or misunderstood, but firmly held, convictions supported by catchy phrases crystallizing half truths. As educators, we've come to realize that once learned wrong, people must relearn 32 times to retain correct knowledge. We'll all need help in the coming disinformation season.

Legal means provide a great opportunity for learning, but often for only the lawyers. Unfortunately lawyers and courts are notoriously poor at teaching and sometimes seem to have an interest in keeping issues unresolved. When courts resolve issues, their precedents often overextend the domain of reasonableness.

Although agencies sometimes milk issues too, their greater impact seems to come from creating mistrust. They set themselves up by gathering public input and then going off to their own corner or behind closed doors for plan creation and decision making. Worse yet is simple adoption of prior plans or secretly held new plans. Environmental analyses that are voluminous but partial, skewed, and inadvertently subjective provide little reassurance to the skeptical. They also provide too much reassurance to most of the public who never become involved enough to either learn nor contribute much.

Having discussed these absolutely necessary and yet insufficient forms of issue resolution, let me suggest an alternative role for extension educators. Alternative dispute resolution in its many forms, such as Coordinated Resource Management, meeting facilitation, and mediation, provide the opportunity for learning by many people, agencies, professions, and interests. All these

should play appropriate roles. Educators are no exception. When educators provide the needed neutrality, others get beyond multidisciplinary planning to interdisciplinary optimization. They grow beyond defending a position or contributing input to creating the understanding for integrating knowledge from several perspectives into solutions that meet the needs of many parties.

We used to say in our Manager of Learning Leadership Competency that it's not what the teacher teaches but what the learner learns that's important. When educators become skilled in helping people resolve issues with all interests working together, learners must apply knowledge to create new solutions. When participants get past trading concessions to meeting mutual needs by inventing integrated, sustainable, optimizing, ecosystem and landscape scale, decisions that build on and build in temporal change, you will recognize that education has happened. When people become committed to these plans and work to carry them out, you will recognize that people have improved their lives and life.

The successful Coordinated Resource Management (CRM) project in White Pine County began 3 years ago and recently concluded a plan for the controversial Duck Creek Drainage of the Schell Creek Range. The CRM Steering Committee has recently expanded to include Lincoln County to cooperatively address the Schell/Mount Wilson elk herd and will address other resource management opportunities with concurrent technical review teams (TRTs). Cooperative extension sees education opportunities in conflict management, negotiation skills, natural resource needs assessment, rangeland and watershed evaluation procedures, livestock grazing practices and grazing effects, wildlife grazing practices and management, and vegetation manipulation such as landscape vegetation management and fire ecology.

Through collaborative conflict management, Steering Committee members from four federal and five state or local agencies and interests including elk, County Commission, family recreation, farming, sportsmen, local control, mining, and wild horses overcame mutual distrust and positioning. Training for collaborative decision making and team building developed negotiation skills. Decisions made by consensus ensure that all interests become understood and satisfied. While difficult at times, the use of consensus among all interests forces the group to create solutions that all are motivated to implement and make work.

At the Nevada Society for Range Management 1996 winter meeting in Ely, participants addressed needs and opportunities for increased range vegetation management for increased forage for livestock, elk, and other wildlife. Such vegetation management could also keep or reestablish the natural variety of plant and animal community types across the landscape. By pursuing these ends, many misunderstood concepts about range condition and the concept of static climax vegetation can be replaced by public awareness of dramatic but slow vegetation changes with great significance to the local economy and the structure and function of these ecosystems. By using the concepts of constant change of alternative steady states, people should improve current management based on the notion that range condition is driven primarily by utilization.

A number of vegetation manipulation tools can produce a mosaic of diverse plant communities across a rangeland landscape: prescribed fire (undoubtedly in combination with unnatural fire suppression); livestock grazing techniques including high-impact grazing, time controlled grazing, rest rotation and others, rather than long seasons of continual use; pasture and water development for improving animal distribution; and direct vegetation manipulation. Each tool will be evaluated for its own merits in each situation before selecting the best combination for achieving the desired landscape mosaic of diverse plant communities and vegetation structures.

The procedure will use CRM and environmental analysis as required by the National Environmental Policy Act (NEPA) (Swanson 1994a and b). A TRT that includes the technical expertise and on-the-ground practitioners who care and know most about these specific lands will develop plan specifics. Their strategies will be considered by the larger and more diverse Steering Committee before final environmental analysis by the lead agency(ies). Because this form of decision making provides an intense opportunity for public involvement, education, and commitment, it will not meet the needs of those who will

not or cannot participate. In addition, the legal and practical need for thorough but practical environmental analysis provides for additional scoping and documentation of environmental analysis before agency responsible officials select the final alternative for a record of decision. Although responsibility for final decisions cannot be shared by the responsible officials, they can share the process. If they continue to meet with diverse public interests together and make decisions by consensus whenever possible, they can maintain public trust.

As Cooperative Extension works with others to select a pilot project area for rangeland vegetation management, we will seek a place with multiple ownerships and agency responsibilities, affected permittees who are willing to cooperate and become change agents through successful implementation, and a landscape that combines the best opportunity for vegetation manipulation inherent throughout the county.

To further the process and public education, workshops are likely for topics like riparian management, fire, and different grazing techniques to achieve desired vegetation changes on different site types. However, the best and most intense learning will likely come from negotiating with people having differing technical expertise, interests, and needs as they together create plans for complex landscapes that constantly change in response to multiple interacting natural and management factors.

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THE PERSONAL APPROACH TO PUT THEORY INTO PRACTICE

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Personal traits and techniques of facilitators enable theory to affect practice. Facilitators are guides working within the ethos of the situation to reduce stresses, open the minds of participants, and clear the paths of communication to find what can be accomplished instead of preserving the status quo of what cannot be accomplished. Facilitators should leave their biases at the door and help others to do the same, except for upholding two considerations: 1) the integrity of resources in question; and 2) the dignity of persons who question. Abilities to do the right job are as important as doing the job right, and the two considerations should not be confused.

Issues are sources of conflicts, and conflicts are based on fears, facts, emotions, insights, motivations (hierarchy of needs from physiology to self esteem), and diverse perceptions and perspectives by participants. The stakeholders and publics associated with issues come to the table with different personal and cultural histories, goals and objectives, coping and defense mechanisms, abilities to learn and communicate, and willingness to participate (Table 1).

Facilitators must be compassionate and provide the proper physical and intellectual environment to deal with issues. Techniques exist to bring persons together, to plan ahead, to record inputs, to analyze issues, and to avoid

conflicts or to seek resolution to conflicts. Facilitators should learn the various techniques and when to apply them effectively. Caution! Techniques can be acceptable mechanistic rubrics that support intellectual theory, yet ineffective in application if not facilitated with a personal approach. Acceptable personal traits of facilitators (Table 2) are based on theory and practice, and they can be learned, but much of the success of working with people comes from the art of applying principles in ways that the techniques are not evident and the place of the facilitator is not dominant. Perhaps good personal traits for facilitation demonstrate wisdom not knowledge, reality not theory, helper rather than expert, and catalyst as opposed to teacher.

CONCLUSION

Facilitation starts with a belief in all participants and trust in their power to resolve conflicts. Facilitators demonstrate, through their personal skills, the needs to have empathy for each other, to listen, to use words appropriately, to question, and to be questioned. Participants must reach resolution! Facilitators create the safe atmosphere that enables the process to proceed with dignity.

Table 1. Common personality traits and thinking styles that lead to communication barriers.

- Optimists** see the good, the possible, the light.
- Pessimists** see the bad, the failures, and the darkness.
- Random thinkers** can get thoughts from everywhere and still integrate them.
- Linear thinkers** get ideas that must come one after the other like fence posts.
- Abstract thinking** allows thoughts to reach beyond what is seen, heard, touched, and smelled.
- Concrete thinking** needs the actual objects, events, or testimonials to be convinced.
- Introverts** are often alone going through life with self interests.
- Extroverts** mingle and discuss.
- Fatalists** are the "victims" who can't, and won't!
- Exasperators** are the center of attention and want control.
- Appraisers** seek facts and more facts, but still may not make decisions.
- Relators** are concerned with what others think and change their minds.
- Piece thinkers** see the smallest parts of issues or the universe.
- System thinkers** see the whole.

Table 2. The following personal traits help facilitators to implement the process smoothly.

- Create a safe place to build common bonds through good communication.
- Listen—the only way to know what is needed for success!
- Rubrics of facilitation are not the goal—outcomes are!
- Skillfully apply techniques without fanfare.
- Listen—how is the process developing?
- Know when to change techniques by “reading the audience.”
- Words are the manifestations of thoughts—positive and negative—seek clarification and understanding.
- Use simple rather than complex words.
- Be silent to promote communications.
- Don’t always feel the need to direct, control, and intervene.
- Encourage listening—not listening invalidates the feelings—the existence—of other persons.
- Instill empathy for identification with participants’ thoughts.
- Provide common experiences and frame of reference.
- Use clear communications.
- Clarify abstractions.
- Help to transfer experiences from one situation to another.
- Get participants into the field where the questions and answers can be found!

Wetland Management

LANDOWNERS' PERCEPTIONS RELATED TO WETLAND REGULATORY POLICY IN COASTAL LOUISIANA

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Abstract: Coastal wetlands in Louisiana are over 75% privately owned. Activities conducted in wetlands are primarily regulated through both the Clean Water Act (Section 404) and the Coastal Zone Management Act (CZMA). The purpose of this study was to investigate coastal landowners' perceptions related to wetland regulatory policy and use the results in the development of future, more workable wetland regulatory policy in Louisiana and the United States (see recommendations section). Regulatory program concerns most often listed by private landowners include: 1) acceptable definition of a wetland remains unsettled; 2) inconsistencies caused when two or more government agencies or programs issue conflicting wetland determinations on the same tract of land; 3) delays in obtaining a wetland determination; 4) delays in obtaining a wetland permit decision; 5) cost of permit and/or permit requirements too high; 6) loss of private property rights due to protection of public wetland benefits; and 7) the issue of regulatory "takings" without just compensation (under the 5th Amendment of the Constitution).

INTRODUCTION

Coastal wetlands in Louisiana are over 75% privately owned. Activities conducted in wetlands are primarily regulated through both the Clean Water Act (Section 404) and the Coastal Zone Management Act (CZMA). In an effort to learn more about landowners' perceptions related to the above issues and wetland regulatory policy issues in particular, a descriptive research study was conducted in early 1995. The purpose of this study was to investigate coastal landowners' perceptions related to wetland regulatory policy and use the results in the development of future, more workable wetland regulatory policy in Louisiana and the United States (see recommendations section). Specific objectives included:

- 1) Determine coastal landowners' perceptions related to wetland regulatory policy, economic outlook of wetland ownership, and key wetland landowner issues/concerns.
- 2) Determine if quality or condition of wetlands influences landowners' regulatory policy perceptions.
- 3) Compare the regulatory policy perceptions of small coastal landowners (owning 100-500 acres) and large coastal landowners (owning 2,500 acres or more).
- 4) Compare the regulatory policy perceptions of landowners from Cameron Parish, Terrebonne Parish, and St. Bernard Parish, Louisiana.

METHODS

The survey instrument (mailed questionnaire) developed for this study was intended to obtain specific landowner perceptions related to (1) wetland regulatory policy, (2) current and future natural resource-related economic perspectives, and (3) important issues and

concerns facing wetland owners. Content validity of the questionnaire was assured through pretesting. This field test allowed investigators to make necessary improvements to the questionnaire prior to initial mailing.

Coastal wetland landowners in three Louisiana parishes were queried to allow for parish comparisons. Parishes incorporated in the study were Cameron, Terrebonne, and St. Bernard, located strategically in the western, central, and eastern regions of Louisiana. The wetland landowner population within these parishes was stratified into two subgroups according to acreage owned. Landowners with coastal wetland landholdings between 100 and 500 acres were classified as small landowners, and those with 2,500 acres or more were classified as large landowners. Stratified sampling according to land holdings allowed for comparison of the perspectives of small and large coastal landowners.

To determine an appropriate sample size within each parish, the investigator obtained a list of all coastal wetland landowners from each parish tax assessor. Landowners were categorized, according to the amount of landholdings, into the two stratified subgroups listed above. The small population sample estimating formula was used to determine the appropriate small landowner size sample to be randomly selected from each parish. The lower number of large landowners in all three parishes required that a complete frame be used for this landowner size category.

A cover letter that introduced the landowner to the objectives of the study accompanied the questionnaire. Clear instructions (including return mailing procedures) were included both in the cover letter and on the questionnaire. The questionnaire was designed to allow for direct mailing without the use of an envelope. Return postage and a complete return mailing address were included on the back of the questionnaire "booklet."

In order to maximize response rate, the following follow-up steps were taken:

1) If the questionnaire was not returned in 7 to 10 days after the initial mailing, a postcard was sent to non-respondents as a friendly reminder. An offer was also made to send another questionnaire if one was needed.

2) A second follow-up packet was sent to non-respondents about 3 weeks after the original mailing. Included in this follow-up was a second letter explaining importance of response and another copy of the self-addressed, postage-paid questionnaire.

3) A final follow-up was sent to non-respondents approximately 6 to 7 weeks after the mailing of the original questionnaire. This mailing also included a letter explaining the importance of a response and a replacement questionnaire.

To determine if there were differences between the respondents and the non-respondents, a 10% random telephone sample of non-respondents was conducted. Seventeen non-respondents (weighted according to individual parish and landowner size responses) were selected. The wetland regulatory policy-related responses of the respondents and non-respondents were compared to see if the two groups differed significantly. Even though some significant differences were found, it should be noted that similar patterns of response frequencies within each variable were evident.

Each study objective was evaluated through the data analysis procedure summarized below:

Objective One—Using descriptive statistics, this objective was accomplished by reporting overall questionnaire findings, findings by parish groups, and findings by landowner wetland acreage category (small and large).

Objective Two—This objective was accomplished by asking respondents to rate the quality or condition of the wetlands they currently own based on a five-point Likert-type scale. The independent variable in this objective was the wetland quality/condition rating and the dependent variable was landowner wetland regulatory policy perceptions. Three statistical tests used to accomplish this objective, depending on the type of data collected and the number of categories, included: 1) The Pearson Product Moment correlation coefficient analysis (items treated as interval data), 2) the t-test (items measured on a dichotomous categorical scale), and 3) a one-way analysis of variance (ANOVA) with a Tukey's post hoc follow-up test (items with more than two categories).

Objective Three—For this objective the independent variable was landowner size category and the dependent variable was landowner wetland regulatory policy perceptions. A t-test was used for the items measured on a dichotomous categorical scale. A Pearson chi-square test was used to compare categorical wetland regulatory policy items in terms of their relationship to the variable land

size. For significant chi-square values, cross-tabulation tables were used to determine where differences existed between categorical frequencies.

Objective Four—The combination of each parish's small landowner random sample and the census sample of large landowners made up each parish study sample. The independent variable was landowner parish of wetland ownership and the dependent variable was landowner regulatory policy perceptions. For items where group means were compared, a one-way ANOVA and a Tukey's post hoc follow-up test were used to determine significant differences. The Pearson chi-square test was used to compare the frequencies of categorical wetland regulatory policy items. Cross-tabulation tables were also used to determine where significant differences existed.

Description of Sample

The overall response rate for the study was approximately 60% (209 overall mail survey respondents). This held true for landowners from both small and large land size categories. Cameron Parish landowners had the highest rate of response (68% or 85 respondents), and those in Terrebonne Parish had the lowest (52% or 58 respondents). The response rate in St. Bernard Parish was 61% (66 respondents).

Almost 60% of the overall respondents reported that they reside in the parish where they own wetlands. This was also true of both small and large landowners. Almost 50% of the St. Bernard landowners, however, reported that they resided in a parish other than the one where they own wetlands.

Over 80% of the overall respondents reported that they reside in Louisiana. Louisiana residency for large landowners (91%) was greater than that for small landowners (79%). All three parishes reported a Louisiana residency rate of approximately 80%.

The most common wetland type reportedly owned by study respondents was brackish marsh. The second most common type was fresh marsh. This held true in all wetland land size categories and parishes.

RESULTS

Objective One Findings (Perceptions regarding regulatory policy, economic outlook, and key issues/concerns)

A. *Questions related to wetland permitting*

Perceptions regarding federal Section 404 permit program.—On a scale ranging from 1 = very poor to 5 = excellent, the overall mean landowner rating for the federal Section 404 program was 2.09 (SD = 0.94) (less than adequate). Additionally, 29% indicated that they were not familiar with the program.

Perceptions regarding state Coastal Use Permit (CUP) program.—On a similar scale, the overall mean landowner rating for the state CUP program was 2.23 (SD = 0.93) (less than adequate). Approximately 34% also indicated that they were not familiar with the program.

Section 404 permit application.—Overall, more than 60% of the respondents indicated that they had never applied for a federal wetland permit. The majority of the large landowners, however, reported that they had applied for a permit in the past.

Section 404 permit denial.—Of the respondents that indicated that they had applied for a 404 permit, approximately 40% reported having a permit denied. The highest denial rate was reported by Cameron landowners (53%), and the lowest denial rate was reported by St. Bernard landowners (8%).

CUP application.—Overall, 63% of the respondents reported that they never applied for a CUP. Over 70% of the small landowners also reported never applying. Only 35% of the large landowners, however, reported never applying.

CUP denial.—Of the respondents who indicated they had applied for a CUP, almost 80% indicated that they never had a permit denied.

Section 404 permit problems.—Overall, landowners reported “other” as the most important problem associated with obtaining a Section 404 permit. The most frequent “other” response was “don’t know.” The second most important problem identified by respondents was “delays in obtaining a decision.”

CUP problems—The most important identified problem associated with obtaining a CUP reported by coastal landowners was “other.” Here also the most frequent “other” response was “don’t know.” The second most important problem identified by respondents was “delays in obtaining a decision.”

Preferred federal wetland permit agency.—Overall, SCS (NRCS) received the highest percentage response when landowners were asked to indicate which federal agency should be responsible for wetland permitting in Louisiana.

State Section 404 assumption.—Almost 60% of all respondents indicated that they felt the state should assume Section 404 permitting authority from the federal government.

Preferred state Section 404 assumption agency.—Overall, the Louisiana Department of Natural Resources (DNR) received the highest percentage responses when landowners were asked to indicate which state agency should assume Section 404 permit authority.

B. Questions related to wetland definition

Preferred federal wetland determination agency.—SCS (NRCS) received the highest overall percentage responses when landowners were asked to identify the preferred federal wetland determination agency.

Wetland characteristics ranking.—Of the three primary physical wetland characteristics (hydric soil, hydrophytic vegetation, and wetland hydrology), wetland hydrology was perceived most important by all respondents. Hydric soil was perceived to be the least important.

C. Questions pertaining to landowner perceptions of wetland regulatory agencies

Federal agencies’ receptiveness ranking.—On a scale ranging from 1 = most receptive down to 5 = least receptive, respondents perceived SCS (NRCS) as being most receptive towards private landowners’ goals and objectives (mean = 1.92; SD = 1.30).

State agencies’ receptiveness ranking.—On a similar scale, respondents perceived the Louisiana Department of Agriculture and Forestry (LDAF) as being most receptive towards private landowners’ goals and objectives (mean = 2.33; SD = 1.23).

D. Questions related to wetland functions

Wetland function rankings.—When asked to rank nine wetland functions according to their importance to landowners or land managers on a scale of 1 = most important to 9 = least important, erosion control (mean = 3.41; SD = 2.21), flood control (mean = 3.51; SD = 2.20), and storm surge buffer (mean = 3.51; SD = 2.40) were perceived as being most important. Non-consumptive tourism related activities were perceived as being least important (mean = 7.73; SD = 2.01).

Wetland use harm rankings.—When asked to rank 10 wetland uses according to their potential for harming wetlands on a scale of 1 = most harmful down to 10 = least harmful, oil and gas exploration and production was perceived as the most potentially harmful (mean = 3.60; SD = 3.06). Waterfowl hunting was perceived as the least potentially harmful (mean = 7.09; SD = 2.43).

E. Questions related to coastal wetland-related economic decisions

Wetland revenue source rankings today.—When asked to rank 10 wetland-related revenue sources regarding their importance **today**, with 1 = most important to 10 = least important, oil and gas exploration and production was perceived as being most important (mean = 1.94; SD = 2.01). The least important revenue source today was non-consumptive tourism-related business enterprises (mean = 8.32; SD = 2.36) followed closely by mariculture (mean = 8.06; SD = 1.76).

Wetland revenue source rankings in the future.—When asked to rank 10 wetland related revenue sources as to their importance in the **future** using the same ranking scale as above, again, oil and gas exploration and production was perceived as being most important (mean

= 2.05; SD = 2.37). Additionally, non-consumptive tourism-related business enterprises were also perceived as being the least important future revenue source.

Per acre annual gross surface revenue.—The highest proportion of respondents (38%) reported receiving no annual revenue off the surface of their wetlands, followed closely by respondents reporting less than \$10 per acre (34%).

Government assistance program rankings.—When asked to rank five potential landowner-oriented government assistance programs with 1 = most preferred down to 5 = least preferred, “tax breaks” were most preferred by all respondents (mean = 2.30; SD = 1.42). The least preferred landowner assistance program was “outright government purchase” (mean = 3.80; SD = 1.64).

Attitudes on permanent government conservation easements.—Overall, the majority of the respondents (60%) indicated that they opposed permanent easements. Large landowners and St. Bernard landowners, however, reported a higher percentage of responses favoring permanent easements.

Future plans for wetland acreage.—Almost 80% of the overall respondents indicated that they planned to maintain ownership of their coastal wetlands in the future.

Future wetland use ratings.—When asked to rate the economic importance of six wetland uses in the future on a rating scale ranging from 1 = extremely important to 5 = not important, oil and gas exploration received the highest rating (mean = 2.90; SD = 1.29). The wetland use perceived as being the least important was non-consumptive tourism-related uses (mean = 4.11; SD = 1.06).

Wetland regulatory policy and “takings”.—Over 60% of all respondents indicated that they believed current wetland regulatory policy in the U.S. may be approaching a “takings” under the 5th Amendment of the Constitution.

F. Questions related to wetland quality

Wetland acreage loss due to erosion.—Overall, respondents reported that they lost approximately 14% of their wetland holdings due to erosion or other wetland loss causes. St. Bernard landowners, however, reported a higher wetland loss percentage (36%) than both the Terrebonne (15%) and Cameron (7%) landowners.

Landowners’ wetland quality classification.—Overall, respondents rated the overall quality or condition of their wetlands as being between “somewhat poor” and “good” (mean rating of 2.61; SD = 1.01) on a rating scale where 1 = very poor and 5 = excellent.

G. Questions pertaining to issues of concern

Wildlife refuge location perceptions.—The majority of the respondents indicated that they were in favor of both the location of a wildlife refuge in the parish where they own wetlands (59% in favor) and adjacent to their property

(55% in favor). A higher proportion of the Terrebonne respondents, however, reported not favoring the location of a refuge adjacent to their property.

Important issues and/or needs facing landowners.—Through an open-ended question, respondents were asked to reveal what they perceived to be the most important issues and/or needs facing private landowners in Louisiana. Overall, the two most frequently listed issues of concern reported were 1) private property rights (29% of responses) and 2) coastal erosion (25% of responses).

Objective Two Findings (Influence of wetland quality on regulatory policy perceptions)

Three Pearson Product Moment correlation coefficients were found to be significant: (1) Higher perceived quality of wetlands tended to be associated with lower preference perceptions regarding permanent easements $\rho = 0.21, P = 0.01$; (2) higher perceived quality of wetlands tended to be associated with higher preference perceptions regarding tax breaks $\rho = -.17, P = 0.04$; and (3) higher perceived quality of wetlands tended to be associated with lower preference perceptions regarding long-term easements. Using Davis’ descriptors, all three significant correlation coefficients were described as a low association.

One item was also found to have significant differences in perceived overall quality of wetlands among its categories. Respondents who indicated that they had applied for a CUP had a higher wetland quality perception than those that had not applied ($t = 2.14, df = 156, P = .03$).

Objective Three Findings (Landsize category regulatory policy perception comparisons)

Nine comparisons of wetland regulatory policy and landsize were found to be significant. The five significant t-test values included the following items: (1) Small landowners expressed a higher receptiveness ranking for EPA than did large landowners ($t = -3.0, df = 151, P = 0.003$); (2) small landowners indicated a lower CUP program rating than did large landowners ($t = -2.51, df = 131, P = 0.01$); and (3–5) small landowners expressed lower receptiveness rankings for LDAF, SCS (NRCS), and DHH than did large landowners ($t = 2.50, df = 152, P = .02$); ($t = 2.32, df = 153, P = 0.02$); and ($t = 2.25, df = 144, P = 0.03$), respectively).

Objective 4 Findings (Parish regulatory policy perception comparisons)

Six items were found to be significantly different when the three geographic regions were compared via an ANOVA test: (1) Cameron respondents reported significantly lower preference rankings for the “outright government purchase” government assistance program

option for coastal landowners than both Terrebonne and St. Bernard respondents ($F = 11.50, P = .001$); (2) Cameron respondents reported significantly higher preference rankings for the "tax break" government assistance program option than St. Bernard landowners ($F = 5.95, P = 0.003$); (3) Cameron landowners reported significantly lower receptiveness rankings for DNR than did St. Bernard landowners ($F = 3.96, P = 0.02$); (4) Cameron and Terrebonne landowners reported significantly higher receptiveness rankings for SCS (NRCS) than did St. Bernard landowners ($F = 3.27, P = 0.04$); (5) Terrebonne landowners reported significantly lower receptiveness rankings for EPA than did St. Bernard landowners ($F = 3.08, P = 0.05$); and (6) Cameron landowners reported significantly lower ratings for the state Coastal Zone Management wetland permitting program than did St. Bernard landowners ($F = 3.12, P = 0.05$).

CONCLUSIONS

Based on the findings of this study, the following conclusions were drawn by the researcher. It should be noted, however, that these conclusions may only be applicable to landowners in the specified land size categories in Cameron, Terrebonne, and St. Bernard Parishes.

Federal Section 404 Wetland Permitting Program Perceptions

Coastal landowners generally rate the federal Section 404 wetland permitting program as less than adequate. This conclusion is based on the finding indicating an overall mean rating of 2.09 (SD = 0.94), where 1 = poor, 2 = less than adequate, 3 = adequate, 4 = more than adequate, and 5 = excellent. This gives quantifiable verification of opinions expressed by McBride (1992). He reported that Louisiana landowners are frustrated by the current dual wetland permitting system for conducting activities in wetlands.

Many coastal landowners are not familiar with the federal Section 404 wetland permitting program. This conclusion is based on the finding that almost one-third (29%) of the landowners responding to the questionnaire indicated that they were not familiar with the program.

Most small coastal landowners have never applied for a federal Section 404 permit, whereas most large landowners have. This conclusion is based on overall questionnaire findings showing 72% of the small landowners reporting never applying for a 404 permit and 53% of the large landowners reporting that they had applied.

Most landowners feel that the federal Section 404 permitting program should be assumed by the state of Louisiana. This conclusion is based on the finding that 60% of the respondents indicated this response. This

finding supports opinions expressed by McBride (1992) disputing the dual wetland permitting system now in place and recommending "one stop" wetland permitting (elimination of having to apply for both a federal 404 permit and a state CUP permit).

State Coastal Use Permit (CUP) Program Perceptions

Coastal landowners generally rate the state Coastal Zone Management wetland permitting (CUP) program as less than adequate. This conclusion is based on the finding indicating an overall mean rating of 2.33 (SD = 0.93), where 1 = very poor, 2 = less than adequate, 3 = adequate, 4 = more than adequate, and 5 = excellent. This finding supports conclusions made by McBride (1992) indicating large landowner frustration with the current dual wetland permitting program in Louisiana.

Small coastal landowners rate the state CUP program lower than do large landowners. This conclusion is based on findings indicating a significant t-test when the mean CUP ratings for the two land size categories were compared ($t = -2.51, df = 131, P = .01$).

Cameron coastal landowners rate the state CUP program lower than St. Bernard landowners. This conclusion is based on the finding indicating a significant F-ratio when the mean CUP program ratings for the three land size categories were compared and a Tukey's post hoc followup test was conducted ($F = 3.12, P = .05$).

Many coastal landowners are not familiar with the state CUP program. This conclusion is based on the finding that almost one-third of the landowners responding to the questionnaire reported that they were not familiar with the program.

Coastal landowners who have applied for a state CUP perceive their wetlands to be of higher quality than those who have never applied. This conclusion is based on a significant t-test when the perceived wetland quality mean rating for landowners who have applied for a CUP is compared to the perceived wetland quality mean rating for landowners who have never applied ($t = 2.14, df = 156, P = 0.03$).

Most small coastal landowners have never applied for a state CUP, whereas most large landowners have. This conclusion is based on overall questionnaire findings indicating 70% of the small landowners reporting never applying for a CUP and the highest proportion of the large landowners (47%) reporting that they have applied.

Federal Wetland Permitting Agency Perceptions

Of the five federal agencies considered, SCS (NRCS) is perceived by coastal landowners to be the most receptive toward private landowners' goals and objectives, and the agency landowners feel should be responsible for making wetland determinations and wetland permitting.

This conclusion is based on the finding that landowners give SCS (NRCS) the highest overall mean receptiveness ranking (mean 1.92; SD = 1.30), where 1 = most receptive and 5 = least receptive. Additionally, the highest proportion of the respondents selected SCS (NRCS) when asked which federal agency should be primarily responsible for making wetland determinations (41%) and wetland permitting (35%).

Of the five federal agencies considered, NMFS is perceived by coastal landowners to be the least receptive towards private landowners' goals and objectives. This conclusion is based on the finding showing landowners giving NMFS the lowest overall mean receptiveness ranking (mean = 4.05; SD = 1.00), where 1 = most receptive and 5 = least receptive.

When considering federal agencies' receptiveness toward private landowners' goals and objectives, small coastal landowners rank EPA higher than large landowners. This conclusion is based on the finding indicating a significant t-test when the mean EPA rankings for the two land size categories were compared ($t = -3.0$, $df = 151$, $P = .003$).

When considering federal agencies' receptiveness toward private landowners' goals and objectives, Cameron coastal landowners rank SCS (NRCS) higher than St. Bernard coastal landowners, and Terrebonne coastal landowners rank EPA lower than St. Bernard coastal landowners. This conclusion is based on the finding indicating a significant F-ratio when the mean SCS (NRCS) ($F = 3.27$, $P = .04$) and EPA ($F = 3.08$, $P = 0.05$) rankings for the three landowner regions were compared.

State Wetland Permitting Agency Perceptions

Of the five state agencies considered, the Louisiana Department of Agriculture and Forestry (LDAF) is perceived by coastal landowners to be the most receptive toward private landowners' goals and objectives. This conclusion is based on the finding that landowners gave LDAF the highest overall mean receptiveness ranking (mean = 2.33; SD = 1.23), where 1 = most receptive and 5 = least receptive.

When considering state agencies' receptiveness towards private landowners' goals and objectives, small coastal landowners rank LDAF, SCS (NRCS), and DHH lower than do large landowners.

This conclusion is based on significant t-tests when the overall mean receptive rankings for these three state agencies were compared by land size category ($t = 2.50$, $df = 152$, $P = 0.02$); ($t = 2.32$, $df = 153$, $P = 0.02$); and ($t = 2.25$, $df = 144$, $P = .03$), respectively).

When considering state agencies' receptiveness toward private landowners' goals and objectives, Cameron coastal landowners rank DNR lower than St. Bernard coastal landowners. This conclusion is based on a

significant F-ratio when the mean DNR receptiveness rankings for the three land size categories were compared ($F = 3.96$, $P = .02$).

Government Assistance Program Perceptions

When considering landowner-oriented government assistance programs, coastal landowners prefer tax breaks and direct coastal restoration funding over outright government purchase of wetlands. This conclusion is based on higher overall government assistance program mean rankings for the "tax break" (mean = 2.30; SD = 1.42) and "direct funding" (mean = 2.34; SD = 1.32) options than for the "outright government purchase" option (mean 3.80; SD = 1.64), where 1 = most preferred and 5 = least preferred. These findings support opinions expressed by McBride (1992) opposing government stewardship (ownership and/or management) of wetlands and supporting tax incentives for landowner-implemented wetland conservation projects.

Small coastal landowners generally do not favor permanent conservation easements, whereas large coastal landowners generally do favor permanent easements. This conclusion is based on overall questionnaire findings showing 63% of the small landowners were opposed to permanent conservation easements, while the largest proportion of the large landowners (49%) reported favoring permanent easements.

Coastal landowners with perceived higher quality wetlands have lower preference perceptions toward permanent and long-term easements and higher preference perceptions toward tax breaks.

This conclusion is based on findings indicating significant Pearson correlation coefficients between wetland quality perception rating and permanent easement ranking ($r = 0.21$, $P = 0.01$), long-term easement ranking ($r = 0.17$, $P = 0.05$), and tax break ranking ($r = -0.17$, $P = 0.04$).

Preference perceptions for the "outright government purchase" landowner assistance program option were lower for Cameron landowners than both Terrebonne and St. Bernard landowners; however, preference perceptions for "tax breaks" were higher for Cameron landowners than St. Bernard landowners. This conclusion is based on a significant F-ratio when the overall mean "outright government purchase" option rankings ($F = 11.50$, $P = 0.001$) and "tax break" option rankings ($F = 5.95$, $P = .02$) for the three landowner parishes were compared.

Wetland Function and Use Perceptions

Coastal landowners perceive erosion control as the most important wetland function. This conclusion is based on the finding that erosion control received the highest overall mean rank (mean = 3.41; SD = 2.21) among the nine wetland functions considered, where 1 = most important and 9 = least important.

Coastal landowners perceive oil and gas exploration and production as the most potentially harmful wetland use. This conclusion is based on the finding that oil and gas exploration and production received the lowest overall mean rank (mean = 3.60; SD = 3.00) among the 10 wetland uses considered, where 1 = most harmful and 10 = least harmful.

Most coastal landowners earn little or no income from the surface of their wetlands (not counting oil and gas leases). This conclusion is based on the finding that almost three-fourths of the landowners responding to the questionnaire indicated either "no revenue collected" (38%) or "< \$10/acre" (34%) when asked to estimate the per-acre yearly gross revenue obtained off the surface of their wetlands.

Coastal landowners perceive oil and gas exploration and production to be the most important wetland revenue source today and in the future. This conclusion is based on the findings showing oil and gas exploration and production to have the highest overall mean "today" and "future" ranking (mean = 1.94; SD = 2.01 and mean = 2.05; SD = 2.24, respectively).

Most coastal landowners plan to maintain ownership of their wetland properties in the future. This conclusion is based on the finding that over three-fourths of the landowners responding to the questionnaire indicated that they planned to maintain ownership of their wetlands.

Coastal landowners perceive wetland hydrology to be the most important wetland characteristic used to determine if an area is a wetland. This conclusion is based on the finding showing landowners giving wetland hydrology the highest overall mean ranking (1.85; SD = 1.11) when compared to hydrophytic vegetation (mean = 2.20; SD = 0.89) and hydric soil (mean = 2.35; SD = 0.91), where 1 = most important and 3 = least important.

Coastal landowners generally classify the overall quality of the wetlands they own or manage (based on vegetative health and stability, erosion control, saltwater intrusion, etc.) between somewhat poor and good. This conclusion is based on an overall perceived wetland quality mean rating of 2.61 (SD = 1.01), where, 1 = very poor quality and 5 = excellent quality.

Wildlife Refuge Location Perceptions

Most coastal landowners favor the location of a wildlife refuge in the parish where they own wetlands and adjacent to their wetlands property. This conclusion is based on the findings that the majority of the respondents reported favoring refuge location in the parish where wetlands are located (59%) and favoring refuge location adjacent to their wetlands property (55%).

Regulatory Policy and the "Takings" Issue Perceptions

Coastal landowners generally feel that current wetland regulatory policy in the U.S. may be approaching a "takings" under the 5th Amendment of the Constitution. This conclusion is based on the finding that almost two-thirds of the landowners responding to the questionnaire indicated that current wetland regulatory policy may be approaching a "takings."

Wetland Loss Perceptions

Louisiana coastal landowners have lost a significant amount of wetland acreage due to coastal erosion. This conclusion is based on respondents' reported acreage lost due to erosion. This finding is supported by the Louisiana coastal wetland loss rates reported by the U.S. Army Corps of Engineers.

St. Bernard coastal landowners perceive their wetland loss rates to be higher than both Terrebonne and Cameron coastal landowners. This conclusion is based on St. Bernard respondents reporting a higher loss rate (36%) than both Terrebonne (15%) and Cameron (7%) region respondents.

Perceptions of Most Important Issues/Needs Facing Wetland Landowners

The two most important issues facing private coastal wetland landowners are (1) private property rights and (2) coastal erosion. This conclusion is based on responses to an open-ended question asking coastal landowners to identify the most important issues and/or needs facing private wetland landowners in Louisiana. Approximately 29% of the 245 individual issues/needs listed by the 131 landowners responding to the open-ended question, dealt with the preservation of private property rights, and 25% of the individual issues/needs dealt with concerns about coastal erosion.

RECOMMENDATIONS

Based on the findings outlined above, the researcher makes the following 12 recommendations. It should be noted, however, that these recommendations may only be applicable to landowners in the specified land size categories in Cameron, Terrebonne, and St. Bernard Parishes.

Federal and state wetland regulatory programs, administered by the U.S. Army Corps of Engineers (COE) and the Louisiana Department of Natural Resources (DNR), respectively, should be modified to address the "less than adequate" perceptions held by Louisiana coastal landowners. Policy adjustments should address (1) ways to speed up wetland permitting decision-making process, (2) concerns associated with regulatory policy-caused loss of private property rights (the "takings" issue), and

(3) lack of landowner program familiarity. Both the COE and DNR should set and strictly adhere to maximum permit decision time limits that allow applicants to more accurately determine administrative time requirements. Additionally, federal and state statutes may be needed that protect landowners' pre-regulatory era investment-backed expectations when wetland regulations substantially (50% or more) reduce a landowner's property value or use. Lastly, lack of landowner familiarity with both federal and state wetland permitting programs may require that the COE and DNR provide funding to an appropriate educational agency to develop and implement more in-depth educational programs targeting coastal landowners (especially small landowners). Educational programs should include wetland functions and values, the permit application process, landowner options and responsibilities, agency responsibilities, estimated cost of process, and permit process time requirements. At the end of the permit application process, the COE and DNR should also consider sending each permit applicant a well-structured evaluation instrument that better identifies perceived permit application problems and suggested solutions.

The federal Section 404 wetland permitting program should be assumed by the state of Louisiana and administered by the Louisiana Department of Natural Resources-Coastal Management Division. This recommendation is based on the strength of coastal landowner support for state assumption, and the fact that DNR assumption could result in a single-agency, "one-stop-shopping" wetland permit program covering both federal and state requirements. To substantiate such a change, however, the opinions of landowners in other coastal and non-coastal parishes and pertinent non-government organizations would have to be queried.

Regardless of federal or state authorities, NRCS (SCS) should be designated as the primary federal agency responsible for making wetland determinations on private coastal wetlands in Louisiana. This recommendation is based on high landowner receptiveness rankings and wetland determination agency preferences for SCS (NRCS). The opinions held by landowners in other coastal and non-coastal parishes and pertinent non-government organizations would be needed prior to making any final policy changes.

With most landowners planning to maintain ownership of their coastal wetlands, future government assistance programs should focus on providing (1) tax breaks for voluntary wetland conservation projects implemented, and (2) direct wetland restoration funds made available to landowners. This recommendation is based on high landowner preferences for these two government assistance program options.

Large and St. Bernard landowner-oriented government assistance program options should include the availability of permanent conservation easements paying fair market

value in exchange for development rights. This recommendation is based on large and St. Bernard landowner support for permanent easements.

Outright government purchase of private wetlands paying fair market value should not be pursued as a priority landowner-oriented government assistance program option in coastal Louisiana. This recommendation is based on low preference rankings for the government purchase option and strong evidence that Louisiana landowners plan to maintain their wetland ownership in the future.

With oil and gas exploration and production perceived as the most important current and future revenue source for coastal landowners, and non-consumptive tourism enterprises considered the least important, an increased educational focus should be directed toward helping coastal landowners recognize the economic potential of non-consumptive tourism-related business enterprises. Increased landowner awareness of nature-based tourism attractions, such as birdwatching, nature trails, nature photography, boating (boat riding), and storytelling, will be critical to economic diversification and sustained economic growth in coastal Louisiana.

A tourism-oriented educational program for landowners should be designed by a legislatively authorized inter-agency task force. Task force representation should include Louisiana universities; the Department of Culture, Recreation and Tourism; the Louisiana Department of Wildlife and Fisheries; the Louisiana Sea Grant College Program; the Louisiana Landowners Association; the Louisiana Police Jury Association; the Louisiana Municipal Association; and the LSU Agricultural Center's Louisiana Cooperative Extension Service (LCES). Further study as to why coastal landowners do not see non-consumptive tourism-related enterprises as being important would be a crucial first step in the development of an effective educational program. Because of their extensive experience conducting landowner-oriented educational programs throughout the state, the Louisiana Cooperative Extension Service should be given the primary responsibility for implementing the education program once it is fully developed. The researcher further recommends that a formative evaluation program be implemented to assure sustained program success.

With the majority of small landowners not allowing commercial hunting enterprises, educational programs are needed that emphasize the economic potential of waterfowl hunting opportunities in coastal Louisiana. An effective educational program could be designed through a coordinated effort between the LDWF and LCES. Program components should include business management, liability insurance needs, marketing, waterfowl management, state and federal regulations, and hospitality training. With its extensive parish network, LCES should take the lead in the implementation of this educational effort. Periodic program evaluation, including

landowner surveys and commercial business enterprise inventories, would also be essential to program improvement and sustained success.

With oil and gas exploration and production considered the land use most potentially harmful to wetlands, environmental policy should continue to focus on minimizing potential oil and gas impacts in the Louisiana coastal zone. Federal (COE) and state (DNR) agencies responsible for wetland permitting should incorporate permit requirements that assure that all impacts associated with permitted activities are completely mitigated. Additional research substantiating the effectiveness of mitigation programs will be essential to adequately addressing the remediation of impacts caused by permitted activities.

Coastal parishes should consider revenue raising options that are not directly tied to surface wetland use values (land values determined by surface-related annual income). This recommendation is based on the low annual per-acre gross surface-related revenue reported by coastal landowners. Alternative revenue raising options that may be considered include increased oil and gas severance taxes, elimination of the 10-year tax exemption for new or expanded business investments, and/or elimination of the homestead exemption (the first \$75,000 of a primary homestead's value is exempt from local property taxes). With landowners expecting oil and gas exploration and production to be the most important wetland revenue source today and in the future, revenue needed for the provision of local government services may best be provided through this industry. Further research may be needed, however, to better identify alternative revenue-raising options not linked to traditional wetland uses.

Wetland policy in Louisiana should directly address concerns associated with the loss of private property rights. This recommendation is based on the strong

landowner perceptions associating wetland regulatory policy with a "takings" under the 5th Amendment of the Constitution. Policy alternatives that may address landowners' concerns about loss of private property rights include innovative incentive-based programs such as the Wetland Reserve Program (WRP) (a type of permanent conservation easement). Through a WRP contract landowners are paid market value for their land in exchange for a permanent conservation easement that assures that important wetland functions and values are provided in perpetuity. Other non-regulatory incentive-based programs include (1) tax-breaks for landowner-initiated wetland restoration initiatives, and/or (2) the initiation of a landowner conservation credit program, whereby landowners who invest in wetland conservation projects on their land are given habitat credits that can be sold or traded to other wetland permit applicants whose actions will lead to a net loss of wetland functions and values. Federal and/or state permitting agencies would have to assure that all habitat credit producing conservation projects are maintained into the future.

Wetland policy in Louisiana should continue to address concerns associated with coastal erosion. This recommendation is substantiated by the high erosion-caused wetland loss rates and the low wetland quality rating reported by many coastal landowners. This is especially true in St. Bernard Parish, where landowners reported the highest regional wetland loss, the most frequent listed coastal erosion concerns, and the lowest parish wetland quality rating. Additionally, a high proportion of the overall issues/needs listed by landowners included coastal erosion related concerns. Landowner support for coastal restoration in Louisiana seems to be high; however, a special effort must be made to protect private property rights through incentive-based government assistance programs.

WETLANDS FOR WISCONSIN: A WETLAND RESTORATION AND MANAGEMENT PROGRAM FOR LANDOWNERS AND LOCAL GOVERNMENT STAFF

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Abstract: The *Wetlands for Wisconsin* Project is a comprehensive, hands-on, educational program on wetlands restoration and management for private landowners and local government staff. This program recruits highly motivated participants to take part in a 2-day workshop and become "Wetland Cooperators." At the workshop presenters instruct sessions both indoors and at field sites to demonstrate the value of wetlands and to show how wetland restoration and management techniques work. We provide each participant with a binder of pertinent wetland publications, and we pay for their meals and lodging during the workshop. In return, the wetland cooperators agree to implement a sound wetland restoration or management plan and reach out to other landowners with the message of wise wetland stewardship. The government staff cooperators are not expected to implement a wetland stewardship plan, but are responsible for reaching other potential wetland owners. In essence, we recruit people to be our ambassadors of sound wetland management and restoration.

Landowners and local government staff members were selected from applications received from citizens in targeted counties. By empowering those community members who value wetlands, we can begin a grassroots campaign to restore and manage the state's wetlands responsibly. We provide wetland cooperators with the knowledge, resources, and support to implement restoration and management on their property, and they in turn demonstrate to others the personal and societal benefits of wetlands. This project made it possible to impact nearly 1,000 acres directly, and more than 5,000 acres through the efforts of our volunteer wetland cooperators. We hope to expand this effort to more counties in the future.

INTRODUCTION

Wisconsin has lost more than half of its wetlands in the last century. These lost wetlands formerly served to shelter wildlife, recharge groundwater, filter sediments and pollution, and reduce floodwaters. The Federal Coastal Zone Management Act targets the Great Lakes for the protection and wise use of coastal resources. Wetlands in the areas adjacent to the Great Lakes have the potential to play a major role in maintaining or improving water quality. Private landowners are the managers for many thousands of acres of land in the Wisconsin coastal counties. If wetlands are to be restored and properly managed, then the private landowner must play a role.

There are three strategies for working with private wetlands: education, regulation, or acquisition. The latter two strategies, though useful in many circumstances, take the decision-making ability out of the landowner's hands. Contrary to regulation and acquisition, an effective education program, as described here, empowers the private landowner to be a responsible, knowledgeable steward of the land. Many local government staff implement wetland programs, frequently for private landowners. They too should be aware of proper wetland restoration and management techniques to effectively assist their clientele.

Wetland restoration and management are complex issues, and much literature exists on these subjects. We can direct existing literature into the hands of interested

landowners and local government staff through a workshop that draws upon the content of these wetland materials. If we provide the wetland owner or restorer with the knowledge and materials in an applied fashion, then we empower them to be wise stewards of their wetland resource. It also provides them with the power to encourage others to be wise stewards as well. Likewise, if local government staff are exposed to the wetland resource in a hands-on fashion, then they are likely to become more proactive in their wetland work with private landowners.

PROGRAM OVERVIEW

The *Wetlands for Wisconsin* Project brings a creative approach to wetland restoration and management. This program targets private wetlands through a comprehensive, hands-on, education and outreach program. The premise for this project is based on a successful Ruffed Grouse Society-Cooperative Extension Service co-sponsored program for woodland owners, The Coverts Project, begun in New England in 1984 and in Wisconsin in 1994.

Landowners and local government staff were invited to apply to become "wetland cooperators" through an intensive, 2-day wetlands workshop. At the workshop presenters instructed sessions both indoors and at field sites to show how wetland restoration and management techniques work. We provided each participant with a binder of contacts and existing wetland materials. We also

paid for their meals and lodging to attend the workshop. In return, the wetland cooperators agreed to implement a sound wetland restoration or management plan and reach out to other landowners with the message of wise wetland stewardship.

Our goal was to increase wetland restoration and management activities on 10,000 acres of private lands in the coastal counties of Green Bay and Lake Michigan. To meet our goal we were looking for 15 landowners and 10 local government staff to participate in the program.

PROGRAM IMPLEMENTATION

We produced and distributed 1,000 brochures through direct mailings to landowners (members of the Wisconsin Waterfowl Association and former Coverts Program applicants) and local government staff (Land Conservation Department, Cooperative Extension Agents, Department of Natural Resources, and other Wisconsin Coastal Management Program contacts). We also wrote an article for the Wisconsin Wetlands Association newsletter. Interested citizens called or sent in an application request included with the brochure. Landowners were sent a four-page application form, and local government staff received a two-page application form.

We used an existing survey of Wisconsin's wetlands literature from which to draw our resources. We also asked presenters to recommend publications. Copies of selected materials were assembled into a reference binder for each participant at the workshop. We also provided a bibliography of other wetlands materials and how they could acquire copies. We facilitated future communication by including directories (address, phone, and general geographic location) of Wetland Cooperators and presenters.

Our presenters for the workshop came from the following organizations: Wisconsin Department of Natural Resources, U.S. Department of Agriculture's Natural Resources Conservation Service, University of Wisconsin Cooperative Extension Service, U.S. Fish and Wildlife Service, Wisconsin Waterfowl Association, Ducks Unlimited, and the U.S. Geological Survey. We sought out presenters who were not only knowledgeable, but also active in wetland restoration and management, since this was a hands-on workshop.

The 2-day workshop focused on applied wetland ecology. Presenters discussed wetland values and restoration and management options that could be implemented to meet landowner goals. The critical element for landowners was that we helped them evaluate wetland restoration and management within the context of their own beliefs. If participants took ownership in restoring and managing their wetlands and were shown how it could be done, then they would become more likely to take action. Likewise, if government staff members

understood the value and application of these techniques better, then it would become easier in their job to relate to wetland owners.

An evaluation was done to determine the effectiveness of the workshop. This post-workshop questionnaire allowed participants to provide feedback on subject matter, instructors, facilities, and workshop format and methods. We also learned how we can best assist them in their efforts, what actions they planned to take, and how many others they expected to reach. A 4-month survey will allow us to evaluate the short-term success of the program and will act as a reminder of cooperators' commitments to wetland restoration, management, and outreach. Finally, a 1-year cooperator survey will determine the long-term success of the program.

RESULTS AND DISCUSSION

Twenty-five cooperators applied to the program, including 7 local government staff and 18 landowners. Of those who applied, 5 local government staff and 14 landowners attended the workshop (one husband-wife team participated; thus future calculations consider only 13 landowners), composed of 3 women and 16 men. Although the local government staff component was low, these 19 cooperators represented an enthusiastic and diverse group of people.

The local government staff participants were represented by a water resource manager from the Department of Natural Resources, a watershed technician from the Land Conservation Department, a biologist/naturalist from the County Parks System, a wetland project coordinator from the Wisconsin Waterfowl Association, and a Great Lakes water quality specialist from the University of Wisconsin Sea Grant Institute. The average local government staff participant had spent 5 years in his current capacity, 33% of his time consulting an average of 112 landowners, who restored or managed an estimated 28 wetland acres. An estimated 11% of the local government staff cooperator's time was spent on wetland issues, and 10% of their total time involved consultations with landowners concerning wetland issues.

Employment backgrounds of landowners were varied: lakes consultant, real estate broker, environmental researcher, engineer, salesperson, postmaster, carpenter, physician, farmer (2), self-employed, dentist, and biologist. The average landowner participant lived in Wisconsin for 42 years, in his/her community for 21 years, owned or was responsible for managing 56 wetland acres, wanted to restore 33 wetland acres, and lived 5 miles from his/her wetlands. The primary and secondary interests in wetlands were for wildlife habitat (62%), pollution/sediment reduction (38%), enhancement of the natural community (or maintain biodiversity, 15%), aesthetic value (15%), and preservation for succeeding generations (15%). Some landowners were actively involved in

wetland management, including removal of exotics or planting native species (62%); restoring wetlands or installing control structures (46%); and actively managing for wildlife (46%). Despite these activities, only four landowners (31%) had a written plan for wetland restoration or management. Landowners had a broad range of knowledge levels coming into the workshop (Table 1).

Workshop topics covered wetland values, wetland characteristics (hydrology, soils, vegetation, and wildlife), regulations, technical assistance and cost-sharing, natural wetlands management, wetland restoration and management, how to develop plans, and the roles of "Wetland Cooperators." These topics were covered in two mornings of 15-minute to 1-hour sessions. Afternoons were spent reinforcing morning sessions by visiting restored wetlands of various ages and types. Dinner and an hour of free time was spent at a nature center

Our 19 cooperators will have influenced 88 people in addition to implementing wetland restoration or management plans on their own lands. We estimate that the total restored and managed wetland acreage as a result of the *Wetlands for Wisconsin* Project will be 5,656 acres, nearly 5,000 acres of which will be as a result of cooperator efforts.

Costs

The *Wetlands for Wisconsin* Project was funded by a grant from the Wisconsin Coastal Management Program for \$12,500 with \$12,500 in matching funds and in-kind contributions from cooperating agencies, workshop participants, and us. The grant included salary and fringe for 30% of a full-time outreach person. The out-of-pocket costs for Cooperative Extension Service personnel to do

Table 1. Landowner responses to the question, "Which statement most accurately describes the level of knowledge you feel you have about wetland restoration and management?"

Statement	Respondents
A. I have no knowledge of wetland restoration and management.	2 (15%)
B. I am aware of some options for managing and restoring wetlands on my property.	4 (31%)
C. I understand some wetland restoration and management concepts and can explain them to others.	3(23%)
D. I have enough skills to implement some wetland restoration and management activities.	4 (31%)
E. I know as much about wetland restoration and management as most water resource professionals.	0

overlooking a 5,000-acre wetland. This enabled participants the freedom and flexibility to interact with the wetland, each other, or presenters on an informal basis.

Evaluations were highly favorable. Overall, the workshop more than fulfilled participants' expectations. Some comments included: "All the handouts in the three-ring binder are well-chosen and will be very educational"; "I feel a lot more comfortable about going into my wetland management and construction with the valuable material handed out"; and "The quality of the speakers and the effort in putting the restoration booklet together will push me to meet the challenge of spreading the word to my fellow landowners." Participants indicated a commitment to the goals of the program when asked, "What is the very first thing you intend to do as a Wetland Cooperator?" Responses included: "Draw up a detailed plan and set goals and a timetable—the vision has always been there"; "See if I can get my neighbors to budge"; and "Call some of the people I've met at the workshop to discuss partnership possibilities." Each cooperator estimated that within a year an average of 4.9 people will have adopted the wetland restoration and management concepts proposed by the project as a result of his or her efforts.

this project would be approximately \$5,000. This would not include salary and fringe or contributions from cooperating agencies and workshop participants.

Assessment

A true assessment of the *Wetlands for Wisconsin* Project's effectiveness will be determined 1 year from now via a survey of Wetland Cooperator activities. However, we can say from the post-workshop evaluations that we have a firm commitment from participants to meet the wetland restoration, management, and outreach challenges set forth by the program. We were successful in raising awareness of wetland values and issues through the workshop. Evaluations indicate that the workshop empowered landowners to restore and manage their wetlands, and participants appear ready to serve as our ambassadors of wetland restoration and management in their communities. Future surveys will show whether or not this program effectively improved wetland management and increased wetland acreage on private lands.

EXTENSION WETLANDS EDUCATION IN TEXAS

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The United States has lost more than half of the wetlands that existed prior to European settlement. Wetlands continue to be lost at an alarming rate due to human disturbance and natural processes. The loss of our countries' wetlands is costing our society greatly. Wetlands perform many functions that are beneficial, such as water filtration, recharging groundwater, providing natural flood control, and supporting a wide variety of birds, fish, mammals, amphibians, insects, and plants. Numerous commercially important fish also require wetlands to survive. Wetlands also provide many recreational opportunities.

Nearly 75% of the wetlands in the lower 48 states are located on private property. Many of these wetlands exist or existed on agricultural and industrial lands. The recent attention to wetlands by the news media, politicians, environmentalists, and the public has heightened the awareness of farmers, ranchers, urban developers, and industrialists to the value of wetlands. Many farmers, ranchers, urban developers, and industrialists are concerned about wetlands and the role they play in the natural environment. Many do not know, however, how to enhance or manage existing wetlands, restore a converted wetland, create new wetlands, or reduce the impact farming has on existing wetlands.

The Texas Agricultural Extension Service (Extension) has a long-standing, positive relationship with landowners and land managers in Texas. Extension conveys information to landowners and land managers by consistently training and updating its staff and providing educational opportunities for clientele. Since wetlands are a relatively new issue, few Extension staff and even fewer landowners and land managers are knowledgeable about wetlands and wetland management. Extension is, therefore, committed to educating its staff and farmers and ranchers about wetlands and the role wetlands play in our society.

1994-95 WETLAND IN-SERVICE TRAINING WORKSHOPS

In 1994-95, EPA funded and Extension developed a program designed to increase the capacity of Texas to protect its wetlands by educating personnel from Extension, pertinent state and federal agencies, and agricultural and industrial landowners and land managers about the role of wetlands in the environment and their respective values to society. Educating professionals that regularly interact with farmers and ranchers will better equip them to make management recommendations that

consider the value of wetlands. In addition, they will be educating landowners and land managers about wetlands and providing them with the appreciation and knowledge necessary to consider and manage wetlands on lands they control. This was accomplished by developing a wetlands information manual, wetland information video, and conducting three wetland in-service training workshops in south, southcentral, and east Texas.

The wetlands manual entitled *Wetland and Coastal Resources Information Manual for Texas* was developed as a wetland information source for south, southcentral, and east Texas. The manual was adapted from the wetlands protection manual developed by the Louisiana Cooperative Extension Service. The manual was also used as a training guide for the three wetland in-service training workshops conducted in south, southcentral, and east Texas, to educate Extension staff and state and other federal agency personnel about wetlands. The manual should also prove an invaluable reference source for professionals when they are advising landowners and land managers about wetland issues. A complimentary wetlands video entitled *Wetland and Coastal Resources Information for Texas* was also developed as an overview of the material included in the manual.

The three wetlands in-service workshops were conducted in Corpus Christi, Houston, and Overton, Texas, to teach Extension staff and state and federal agency personnel about the functions and values of wetlands, best-management practices, wetland regulations, wetland conservation incentives, and wetland management. The information obtained at the workshops will in turn be used to assist landowners and land managers with general wetland questions as well as wetland management, enhancement, and restoration.

1995-96 WETLAND IN-SERVICE TRAINING WORKSHOPS

In 1995-96, Extension expanded its program to further increase the capacity of Texas to protect its wetlands by updating and revising the wetlands information manual and video developed in 1994-95, for south, southcentral, and east Texas. The manual and video will be updated to include information pertinent to north, northcentral, and west Texas. Extension will then conduct 3 in-service training workshops on wetlands and wetland management for Extension staff and other state and federal agency personnel in this region of Texas. Extension will also conduct 10 multi-county landowner/land manager wetland education workshops in south, southcentral, and

east Texas. Additionally, computerized versions of the Texas and Louisiana wetland information manuals will be developed and implemented on the Texas Wetlands Resource Database network and Internet to make this information more accessible.

The three wetlands in-service workshops will be held in Amarillo, Lubbock, and Abilene, Texas to teach Extension agents, Extension specialists, and other state and federal agency personnel about the functions and values of wetlands, best-management practices, wetland regulations, wetland conservation and management, and programs available for assisting landowners and land managers with wetland conservation, enhancement, and management. The updated wetland information manual will be used to train participants.

Four multi-county landowner/land manager workshop/field days about wetlands management, restoration, enhancement, preservation, function and values, best-management practices, regulations, and economic incentives were conducted in Cameron and Angelena counties. The workshop/field days were designed to educate clientele and influence their decision-making process regarding wetlands on their property. There were initially 10 multi-county landowner/land manager workshop/field days scheduled; however, due to lack of interest and poor turnout only 4 were conducted. The problem may have been that many of the individuals farming and managing the land do not own the land; thus there is no incentive to conserve and manage wetlands for hunting leases. In place of the six remaining workshop/field days, a Farmers, Waterfowl, and Wetlands Shortcourse will be conducted in the Houston area. This shortcourse will focus on economic incentives from wetlands and target landowners who may be interested in gaining additional revenue from wetlands on their property.

MARSHMALLOW PROJECT

Extension is currently developing a program designed to generate youth interest and involvement in wetland conservation and management. One of the most effective methods for changing the behavior of society is to educate its young people. One method of teaching our youth that has proven effective is where youths voluntarily educate themselves through self-study and participation in hands-on activities. Extension is developing a hands-on youth wetlands educational project entitled Marsh Management Activities for Learning the Lifestyles of Wildlife (MarshMALLOW Project), that will educate rural and urban youths and adults about the importance of wetland wildlife and the wetlands they inhabit. The primary purpose of this project is to educate youths and adults about wetland wildlife and wetland habitats, who will, in turn, encourage private urban and rural landowners to conserve, restore, and manage wetlands on their property.

To accomplish this, interested youths and volunteer leaders will form a wetland conservation club, whose goal is to learn about the functions and values, management, and restoration of wetlands. Youths in the wetlands conservation club will communicate with local agricultural and industrial landowners to locate a wetland on their property that they are willing to have restored, enhanced, or managed.

The club will then develop a management plan for their adopted wetland, using information obtained from the wetland management manual specifically developed for the MarshMALLOW Project. Wetland conservation clubs will submit their management plans for review by the judging panel. Clubs submitting quality management plans will be awarded grants on a 1:1 cash or in-kind match ratio up to \$750/club. If a club cannot raise enough cash or in-kind support to be awarded all of the \$750 grant, they will be awarded that portion of the grant they can match. They must match at least 50% of the \$750 in order to receive any money at all. The matching requirement provides an incentive for clubs to circulate in the community, increasing public awareness about wetlands and encouraging community participation.

Immediately after grants are awarded, clubs will be expected to implement their wetland management plans. Clubs will have 8 months to carry out their management plans, at which time wetland management reports must be submitted to the judging panel. Wetland management reports will detail the activities of the wetland conservation clubs to manage, restore, or enhance their chosen wetland. Quality management reports will warrant an on-site visit and evaluation by the judging panel.

Clubs that pass the on-site visit will give a 10-minute oral presentation about their project, which will be evaluated by the judging panel. Scores for the management plan, wetland management report, on-site visit, and presentation will be totaled. The three clubs with the most points will receive awards of \$1,000 (first prize), \$750 (second prize), \$500 (third prize). All clubs participating in the project will be given achievement awards corresponding to the competition level they attained.

CHOCOLATE BAYOU EXTENSION DEMONSTRATION FARM

The Chocolate Bayou Extension Demonstration Farm is a 2,450-acre farm donated to and managed by Extension for the demonstration of methods and techniques for integrating wetlands with rice, cattle, and waterfowl production in an economically viable unit that is environmentally friendly. Current and proposed demonstrations at the farm include the development of a 56-acre moist-soil management unit for waterfowl, 35 acre and 24 acre constructed wetlands, a Chinese tallow tree and sea myrtle control study, deferred-rotation cattle

grazing management, and fencing of depressional wetlands to control grazing. In the near future Extension is planning to lease the area to waterfowl hunters to demonstrate the compatibility of rice, cattle, and waterfowl.

WORLD WIDE WEB WILDLIFE ENTERPRISES INCUBATOR SITE

Texas is the nation's leader in the sale of hunting and fishing opportunities on private lands. Thousands of dollars each year are spent by hunters, fishermen, and bird watchers as they pursue their sport. One of the greatest challenges to many landowners and land managers in the recreational wildlife business is marketing the hunting, fishing, and birdwatching opportunities they offer. Recently there has been a major expansion of the use of the Internet and the world wide web for the marketing and sale of commercial and business products.

The Internet and the world wide web are an inexpensive way for businesses to market their products and services to literally a worldwide audience. However, the remote nature of many ranches and farms and the limited knowledge landowners and land managers have about the Internet and the world wide web have precluded them from participating in this rapid explosion of business on the web. Therefore, Extension proposes to develop a model world wide web site for marketing hunting, fishing, and birdwatching opportunities on private lands in Texas. Extension wants to demonstrate to landowners and land managers the potential of the Internet and world wide web for marketing hunting, fishing, and birdwatching opportunities to potential customers. A minimum of 10 landowners/land managers from south Texas and along the coast who sell hunting, fishing, and/or birdwatching

opportunities on their land will be asked to cooperate with Extension to develop a wildlife enterprise world wide web incubator site on the Internet. The purpose of the site is to help farmers, ranchers, landowners, and land managers market hunting, fishing, and birdwatching opportunities on their land to customers searching the world wide web.

Specific home pages will be developed for each enterprise owner. The pages will provide information about each wildlife enterprise that will be useful to customers searching the web in making a decision to pursue or not pursue the purchase of a seller's product. Customers will be able to request more information about the products for sale from the enterprise owner. The operator will then be able to send more specific information to the customer via electronic mail or ground mail. Ranchers, farmers, and land managers who agree to cooperate by posting their services on the site will be expected to maintain their site after the initial home page setup is provided by Extension.

The number of accesses by surfing customers to individual home pages and the web site will be monitored on a regular basis. Cooperators will keep records on how many inquiries they receive about their enterprise and how many inquiries actually result in sales of their products. Web site visitation, customer inquiries to cooperators, and customer inquiries resulting in sales will be collected monthly for 1 year after each home page is established. After 1 year participants will be encouraged to either move their sites to commercial web site providers or, if approved by Extension, we may convert this to a fee-based service. Results of this study will help us determine if wildlife and wildlife-associated recreational enterprise world wide web incubator sites are a viable option for landowners and land managers to market hunting, fishing, and birdwatching opportunities in Texas.

A STRATEGY TO RECLAIM WETLANDS AND BALANCE BIOMASS LOST TO THE COOLING PROCESS OF A NUCLEAR POWER GENERATING STATION

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Restoration of 20,000 acres of historic wetlands and contiguous upland boundaries is part of a grand-scale estuary enhancement and recovery program, implemented in New Jersey and Delaware by the Public Service Energy and Gas Company (PSE&G). The project is providing a very positive and refreshing signal from the energy industry that wetlands stewardship and cooperation are alive and well.

The energy enhancement program (EEP) is a voluntary initiative offered by PSE&G in preparation for the reauthorization of required state and federal water discharge permits and to address environmental impacts resulting from cooling nuclear generators with biologically rich river water. Entrainment and impingement of aquatic fauna, juvenile and larval stages of fish and eggs have always been a concern with flow-through water cooling systems in the production of electricity by nuclear power generation and the attendant, required cooling processes. The Salem Generating Station, which came on line in 1971, uses a pressurized, hot water, flow-through system. One and a half million gallons of Delaware Bay water per minute are required to cool the facility. The river waters are rich in a wide diversity of aquatic flora and fauna resulting from good wetlands productivity from the rich riverine and estuarine areas adjacent to and north of the generating station. An innovative, rotary, 3/8-inch mesh screen strains and carries away macro vertebrate and invertebrate organisms; other larger restrainers and noise devices ahead of the rotary screen exclude larger fin fish, turtles, and crabs. Organisms smaller than 3/8 inch pass through the screen and cooling system and are sacrificed to the process. Their remains are recycled back into the bay waters.

Restoring mass quantities of biota lost as a known consequence of a nuclear energy electric production system is exactly what the industry, with the help of the New Jersey Department of Environmental Protection and others, hopes to accomplish. Bruce Freeman, former marine fishery administrator in New Jersey, now director in North Carolina, worked closely with PSE&G scientists, Fish and Game staff, university and extension workers, and surrounding communities to develop a biological production model to replace what was being lost or removed from the system, along with all the multiplier effects of the energy web, to predict loss and possible recovery. An evaluation system was developed to test and constantly monitor the success of the project.

The EEP provides a unique opportunity to begin to reestablish historic wetlands lost over the past 150 years to agricultural methods used to dike and drain wetlands in an effort to encourage other drier site native grass species best suited for the production of salt hay. Vast areas of naturally occurring wetlands had been relandscaped to favor more desirable high marsh grasses, *Spartina patens* and *Distichlis spicata*, at the expense of the loss of the predominant low marsh grass, *Spartina alterniflora*. Thousands of acres were diked, drained, and intensively farmed until recently for hay production and dried grasses for other interesting and historic uses. PSE&G proceeded to work with the communities in the selected area to purchase land, easements, and conservation rights of contiguous land to allow for the ultimate inclusion of up to 20,000 acres of wetlands and upland buffers in New Jersey and Delaware.

Installation of five fish ladders in the bi-state area, relinking the bay with anadromous fish spawning grounds, added credence and interest and enthusiasm to the project. Unique, large-scale community efforts were the very basis needed to initiate the project, purchase the land, and provide special assurance that this project was in the best interest of the public and especially the Delaware Bay aquatic resource system. Public meetings were held, the New Jersey State Fish and Game Council and university classes met and were taught at the site in a special effort to keep the public fully informed, involved, and knowledgeable. The in-depth, broad-based ground work was successful in incorporating public interest in the solution to the problem—and it worked!

The reversion of land from the private domain back to the public domain, reestablishment of the integrity of the historic wetlands, guaranteeing the installation of fish ladders, noise makers, upgrading of screening, and limitation of water in the flow-through process in a voluntary manner have created an image of good stewardship and community partnership. The implementation of continuous monitoring system will help to prepare the EEP for use as a national model for the restoration of similar areas with attendant environmental impact concerns.

What is shared in this discussion is what Extension does best: bridging the gap between research and the public, identifying and facilitating good stewardship and cooperation by helping others to define values and responsibilities with meaningful solutions to large-scale problems yielding the highest possible positive impact on the management of natural resources and, ultimately, on the quality of life for all.

TRAINING FIELD STAFF ABOUT WETLANDS AND WETLAND ISSUES: DEALING WITH THE UNKNOWN—A CASE HISTORY

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Abstract: In response to an increasing number of requests for assistance from county-based extension agents in Virginia about regulatory issues relating to wetlands, an in-service training program on wetland definition, delineation, and permit review was developed and conducted in spring 1995. As a means to familiarize agents with the various wetland regulators, representatives from all agencies or organizations who have any regulatory authority over wetlands in Virginia were invited and asked to introduce and describe their agency and its responsibilities, and discuss when and how they conduct wetland permit reviews. Although an important objective of this training workshop was to help eliminate uncertainty and reduce confusion about wetland issues among agents, and thus improve their ability to properly advise clients, an entirely different, yet unplanned, outcome was realized. Instead of conveying that a consistent regulatory process exists, agency representatives revealed considerable disparity on how wetlands were being defined and delineated, when project review was required, and who among the various regulatory agencies should be involved in such reviews. Regardless, agents participating in the workshop (1) expressed satisfaction in learning much useful information, (2) found the unanticipated discrepancies among agency representatives to be “enlightening” and a beneficial “real world” learning experience, and (3) expressed a need for additional “hands on, field-oriented” training to supplement and apply the knowledge gained. In contrast, most agency representatives expressed dismay or a sense of discomfort over what had transpired and suggested that a retreat among just regulators was warranted.

WET AND WILD: WHY LANDOWNERS RESTORE WETLANDS

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Abstract: In the past 10 years, many natural resource agencies and conservation organizations have been involved in wetland restoration. In Iowa alone, between the Wetland Reserve Program (WRP), the Emergency WRP (EWRP), and the Private Lands Program of U.S. Fish and Wildlife Service, over 60,000 acres of palustrine and riparian wetlands have been restored, mostly on private land. This has dramatically reversed 150 years of decline in wetland acres. Other states have similar stories. What motivates landowners to participate in such programs? We undertook an 18-state survey to try to answer the question.

A phone survey of 305 participants in these wetland restoration programs revealed that wildlife play an extremely important role in landowner decisions to restore wetlands. Eighty-four percent of the participants listed "to provide habitat for wildlife" as being "extremely important" in their restoration decision. In fact, the top four reasons were all altruistic in nature, having to do with wildlife, natural beauty, and future generations. Conversely, only 10% listed "financially profitable" as an "extremely important" influence on their decision.

Other results of the survey revealed that, while all these landowners reside in rural areas, few are full-time farmers. Sixty-three percent of the surveyed landowners receive from 0–20% of their income from farming. This has implications both for how we promote such programs and how we promulgate and apply rules for participating in them.

As in other recent research, the survey also revealed that these landowners fished, hunted, had "wild places," and participated in other outdoor activities at very high rates as young people. Over 70% participated in such activities as young people, rates much higher than the general populace.

Implications of these and other results for Extension programs will be discussed.

Biodiversity and Endangered Species

Editor's Note: Four papers were presented in the biodiversity and endangered species concurrent session, but only one paper was submitted for publication in the proceedings.

The following titles were presented in the session:

Ellen Lanier, Oregon Department of Fish and Wildlife—Teaming with Wildlife: The National Diversity Funding Initiative
Chuck Meslow, The Wildlife Management Institute—The Endangered Species Act: How Can We Improve It?
Edwin Jones, North Carolina State University—Development of a Safe Harbor Program and Future Management on Private Lands

DEVELOPMENT OF A FORESTRY, FISH, AND WILDLIFE CENTER

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INTRODUCTION

Public concerns for stewardship and conservation of biological diversity have caused a reduction in the timber supply in the Pacific Northwest on federal lands. This reduction in the availability of federal timber has resulted in an intensification of management activities on private forest lands. The reduced timber supply has also increased timber prices to the point that many nonindustrial private woodland owners, who previously were not interested in selling timber, have entered the market. This intensification of management activities on the private forest base has resulted in additional increased concerns for fish and wildlife species. Reliable and readily accessible information is crucial to the resolution of such concerns.

Elevated concerns for fish and wildlife species in forested habitats of the Pacific Northwest have resulted in considerable research and subsequent regulatory activity. However, forest managers, technical staff, policy makers, and the general public have difficulty accessing information concerning basic biology, habitat requirements, responses of fish and wildlife species to management activities, and implications of various strategies for regulating such activities. Although information is available from a variety of sources including libraries, research centers, unpublished reports, and databases, the fragmented nature of these sources restricts accessibility to information needed for management and policy decisions. Currently, centers that provide these publics with credible, comprehensive, information are not well-known or easily accessible. The Oregon State University Forest Research Laboratory has proposed the development of a Forestry Fish and Wildlife

Information Center (FFWIC) to fill this niche. The purpose of this paper is to present a plan for conducting a feasibility study for the FFWIC.

OUR APPROACH

The feasibility study will be conducted in four phases over a 2-year period. In order for the FFWIC to be sustainable, the correct niche and types of information to be offered must be identified. The four phases of the feasibility study include surveying current information sources, surveying potential clients, assessing opportunities and alternative approaches, and preparing sample outputs. The scope of the FFWIC will be primarily restricted to Threatened, Endangered, and sensitive species in forest environments of the Pacific Northwest. However, other habitats or nonsensitive species may be included depending on client needs.

Current Information Sources

Phase I of the feasibility study will have two objectives: (1) identify information sources regarding fish and wildlife in forested environments, and (2) identify potential models for the FFWIC. We will conduct Phase I during the fall and winter of 1995–96. The potential clients of the FFWIC will likely have varying levels of access to information from both traditional and nontraditional sources. Traditional sources include libraries, unpublished reports, and research reference services, whereas nontraditional sources might include research databases, information databases such as the Oregon Species Information System, and other information centers. We will complete the objectives of

Phase I by formal and informal surveys. Formal surveys in conjunction with Phase II will identify sources of information currently being used by the FFWIC's potential clients. We will conduct an informal survey of known information sources to identify types and formats of information currently available. Research and technical information centers will be informally surveyed to identify potential models on which to base the FFWIC.

Clients and Their Needs

Phase II of the feasibility study will be conducted concurrently with Phase I and will be completed by Spring 1996. The objectives of Phase II are to (1) identify the publics who are potential clients of the FFWIC, (2) determine their specific information needs, and (3) determine the preferred formats for obtaining information. We envision that the FFWIC would be an important source of information for many potential clients including forestry extension agents and specialists, small woodland owners, private and corporate forest managers, members of the Oregon Forest Industries Council, Oregon Department of Forestry, Oregon Department of Fish and Wildlife, conservation and environmental organizations, U.S.D.A. Forest Service, Bureau of Land Management, National Park Service, Oregon State Parks Department, consulting foresters, and policy makers. Mail or phone surveys where appropriate will be designed to query these potential clients regarding: (1) the types of information they need with respect to fish and wildlife in forested environments; (2) the formats that such information would be most useful in; (3) the regularity that they might use a center; and

(4) their willingness to support a center (i.e., what would they be willing to pay for information) in order that it become self-sustaining.

Opportunities and Alternative Approaches

We will conduct Phase III during the Summer, Fall, and Winter of 1996-97 using information obtained in Phases I and II. The objective of Phase III will be to identify the unique niche or niches that the FFWIC can fill. Phases I and II are likely to identify several potential models for the FFWIC ranging from totally electronic information sources (i.e., on-line searches, web-sites, and electronic publications) to a bibliographic information system such as the National Technical Information Service. These potential models will be paired with the information needs of our clients and their willingness to support the center to identify alternative niches that would make the FFWIC self-sustaining. Phase III will result in a report of the potential models that the FFWIC could adopt and possible products that the center could produce. The advantages and disadvantages of each model will be discussed, and an alternative will be recommended based on (1) client needs and access, (2) uniqueness, and (3) potential for the center to be self-sustaining. We will prepare an operation budget for the proposed alternative. This report will be completed by 30 June 1997.

Sample Outputs

During the final phase of the feasibility study (Phase IV) we will develop samples of center products. The objective in this phase will be to develop mock-up products with proposed layout and format designs rather than to develop the actual product. For example, if synthesis or white papers are products proposed for development by the FFWIC, our sample white paper might include a layout with the proposed format and text explaining what might be found in each section of an actual paper. We will prepare these sample products by 30 June 1997.

Wildlife Damage Management: Innovative Programs

STATE AGENCY OVERSIGHT OF THE NUISANCE WILDLIFE CONTROL INDUSTRY

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Abstract: Growth and privatization of the nuisance wildlife control field has been rapid. States should encourage the further growth, development, and privatization of the area of wildlife management but must maintain agency oversight. A model is proposed that would guide state wildlife agencies in their efforts to maintain oversight by: 1) providing educational opportunities for NWCs prior to obtaining a license; 2) mandating continuing education to maintain a license; 3) requiring liability insurance for NWCs. States should also require annual reports describing the species and number of animals captured, disposition of animals, condition of animals, release sites, and numbers of animals released at each site. The cost of developing and administering the program would be self-sufficient by fees submitted by NWCs.

VERTEBRATE PEST MANAGEMENT AND ENDANGERED SPECIES IN CALIFORNIA

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Abstract: In the San Joaquin Valley, California, an increasingly large number of species have been listed as "endangered" or "of special concern," mostly as a result of habitat destruction for agricultural use. As rodenticides pose further hazards to some endangered species, severe restrictions are being placed on their use within endangered species habitat. Cooperative Extension, in association with the California Department of Food and Agriculture and the California Department of Fish and Game, is currently investigating ways of minimizing hazards to endangered species while still allowing farmers and ranchers to control predated animals. Research has shown that simple measures such as modifying existing ground squirrel bait stations can reduce hazards to endangered kangaroo rats and kit fox. This paper will present an overview of the problem and results of current research.

TACKLING FUTURE ISSUES—THE WILDLIFE SOCIETY'S WILDLIFE DAMAGE MANAGEMENT WORKING GROUP

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Abstract: The Wildlife Damage Management Working Group is one of 16 assemblages of Wildlife Society members with similar interests and goals. Its purpose is to promote better understanding of the complexities of managing human-wildlife conflicts and to enhance future capabilities to respond to these challenges. To identify future issues and activities of the Working Group, we conducted two 1-hour "Futuring Sessions." One was held at the Eastern Wildlife Damage Management Conference in Jackson, Mississippi (November 1995) and one at the 17th Vertebrate Pest Conference at Rohnert Park, California (March 1996). Key issues that were identified include: translocation, NWC certification, wildlife vaccination, refereed publications, conferences, symposia sponsorship, information and education, Working Group-NADCA relationships, association with non-professionals, and school curriculum development. The next Working Group meeting will be held in conjunction with the third annual meeting of The Wildlife Society in Cincinnati, Ohio (October 1996). Members will work together to expand the list and prioritize activities.

USING REMOTE DELIVERY IN EXTENSION WILDLIFE PROGRAMS

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JAMES PEASE, Department of Animal Ecology, Iowa State University, Ames, IA 50011-3221

Abstract: Satellite video programming has the potential to reach large audiences over wide areas with efficient use of specialists' time and resources. This session will examine the mechanics and logistics of presenting wildlife programs using this technology. We will describe the production of a 2-hour national broadcast on "Backyard Wildlife Habitat Management," including the use of the original broadcast for subsequent use. The session will include segments from the original broadcast, information on the use of the technology, and discussion of the pros and cons of the technique.

COLORADO TRAPPING REGULATIONS: CAUGHT BETWEEN THE STEEL JAWS OF TRADITION AND PUBLIC EXPECTATIONS

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Abstract: Trapping, primarily with foothold traps, has been controversial in Colorado for at least the last decade. Anti-trapping advocates argue that trapping is inhumane, unselective, and unnecessary, whereas trapping advocates argue that trapping is humane, selective, a part of our heritage, and necessary to reduce conflicts with wildlife. To resolve the controversy, the Colorado Division of Wildlife formed a furbearer analyst team, hired a conflict resolution group, and initiated an 8-month stakeholder input, review, and regulations building process. After the stakeholders could not reach agreement on a set of compromise regulations, the furbearer analyst team crafted regulatory recommendations, which primarily were approved by the Colorado Division of Wildlife and the Colorado Wildlife Commission. The regulations, based upon several of the moderate stakeholder recommendations and an extensive review of the biological and social dimensions of trapping, required the use of padded traps in land sets, pan tension devices, restraining instead of killing snares, eliminated trapping seasons on eight species, and shortened seasons on the other species. Moderate stakeholders appeared satisfied with the regulations but neither of the extremes was satisfied. Agricultural interests encouraged the Colorado Legislature to pass Senate Bill 167, which transferred authority for the taking of depredating animals to the Colorado Department of Agriculture. Anti-trapping and some environmental groups are responding by gathering signatures for a Constitutional ballot initiative, which, if passed, will eliminate all recreational trapping and greatly limit animal damage trapping in Colorado.

Pond Management

MANAGING RECREATIONAL FISH PONDS

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Kentucky has over 135,000 farm ponds. These ponds are used for irrigation, watering livestock, and recreation. However, most ponds are under-utilized for recreation. Existing ponds can provide excellent recreational opportunities if properly managed.

The first step in recreational pond management is to determine the pond's purpose. Ponds can be managed for swimming, fishing, aesthetics, and to attract wildlife. It may be difficult to manage for all of these things simultaneously. The pond owner must decide about goals or what is most important. If fishing is the desired objective, the following should help.

POND DYNAMICS

No two ponds are exactly alike. Ponds close to one another but on the same watershed (surrounding area from which the pond receives rainfall or water drainage) will have slight differences. These disparities are not well understood. Soil characteristics and localized variations in the watershed are unique for each pond. Attributes which affect pond management are associated with plankton, fish populations, and water quality.

Plankton is a term used to describe microscopic and near microscopic organisms that are suspended in the water column. Planktonic life includes plants (phytoplankton) and animals (zooplankton). All phytoplankton are algae; however, not all algae (size) are phytoplankton. Both forms of plankton are important in fish pond management.

Phytoplankton are at the bottom of the aquatic food chain or web. Zooplankton and insects, which are eaten by small fish, graze on phytoplankton. Small fish are food for larger fish. Except for the few terrestrial insects and worms which fall or are washed into ponds, aquatic animals are supported by phytoplankton. An adequate phytoplankton population is essential for producing a large and healthy fish community.

Pond clarity or color can be related to plankton populations, called "blooms," or to suspended sediments and organic matter. Productive water has a green tint. The green color is produced by chlorophyll pigments contained in the billions of phytoplankton cells suspended in the water column. These blooms can die-off or "crash" rapidly, which causes the water to appear dark or black. When that happens, the dead cell decay consumes oxygen; resultant low oxygen levels may stress or kill fish.

Phytoplankton die-offs are common in deep hillside ponds or ponds receiving too much nutrient (manure or fertilizer in watershed runoff).

Sediments washed into ponds after heavy rains can change pond color. Normal color should return within a few days as particle settling occurs. Heavy sediment loads can shade plants and stress fish by reducing photosynthetic oxygen production or clogging gills. Either condition may cause fish deaths.

WATER QUALITY

Water quality is another concern. Factors such as pH, alkalinity, and dissolved oxygen affect fish health and pond productivity. Not all aspects of pond water quality are constant. Dissolved oxygen and pH fluctuate or cycle each day. Alkalinity can change over time, usually weeks to months, depending on the pH of watershed and bottom soils.

Oxygen is not freely available in pond water. It must dissolve into the water (dissolved oxygen) from air or from oxygen produced by photosynthesis. Diffusion of atmospheric oxygen at the water surface is enhanced by wind and wave action. Plants produce oxygen as a by-product of food manufacture during photosynthesis. Aquatic plants, primarily phytoplankton and other algae, release oxygen directly into the water. Photosynthesis is driven by the energy in sunlight. Therefore, oxygen production does not occur at night. Dissolved oxygen levels rise throughout the day. After sunset, oxygen slowly declines as all plants and animals consume oxygen to breathe (respiration). In a well managed pond, dissolved oxygen levels should not fall below 3 or 4 parts per million (ppm or mg/l) during darkness. Oxygen levels below 3 ppm stress fish, and many species may suffocate when oxygen is below 2 ppm.

Pond pH varies daily due to respiration and photosynthesis. The carbon dioxide released from respiration reacts with water, producing carbonic acid. Acidity (pH between 1-7) is a measure of the hydrogen ion level in water. Acidity increases (pH falls) as the hydrogen ion concentration increases. As carbonic acid is formed from heightened nighttime carbon dioxide levels (increased plant respiration), pH is lowered and the pond becomes more acidic. During daylight, phytoplankton use carbon dioxide in photosynthesis; reducing acidity and increasing pH. Pond pH may normally fluctuate between

6.5 and 9. If the pH drops below five (e.g., acid runoff in mining areas) or rises above ten (low alkalinity combined with enhanced carbon dioxide removal by dense phytoplankton or algal blooms), fish may become stressed and die.

Alkalinity is related to pH; pH indicates whether water is acidic or basic. The quantity of base in water defines what is known as alkalinity. These bases, usually bicarbonates, react with hydrogen ions and buffer pH changes. Alkalinity can increase the availability of carbon dioxide and other nutrients to phytoplankton. A total alkalinity of 20 ppm or more is necessary for good pond productivity.

BASIC PRINCIPLES OF FISH POND MANAGEMENT

Good fishing in farm ponds depends on one's understanding of and ability to follow some fundamental rules. The essentials of fish pond management include:

- (1) proper pond construction and watershed management;
- (2) removal of unwanted and overpopulated species of fish;
- (3) liming and/or fertilization;
- (4) species selection and stocking;
- (5) harvest and record keeping;
- (6) evaluation of pond balance;
- (7) weed control.

Pond Construction and Watershed Management

Poorly constructed ponds are hard to manage. Water levels may change dramatically due to seepage and inadequate watershed area. Shallow areas may cause aquatic weeds to proliferate rapidly. Erosion and contamination from the watershed may make pond management difficult or impossible.

Generally, Kentucky ponds need 3 to 5 acres of watershed per acre-foot of pond volume. Soil types and vegetative cover on the watershed will affect runoff. Usually, ponds with wooded watersheds require more area than impoundments supplied by field or pasture watersheds. If the pond is fed by springs, less watershed may be necessary. An encircling diversion ditch can be used to prevent or minimize rapid pond flushing, which can occur when watersheds are too large.

Shallow areas, less than 2-1/2 feet, can promote aquatic weed growth by allowing sunlight to reach the pond bottom. Pond banks should slope at a 2:1 or 3:1 ratio—horizontal distance to height—and should be high enough to allow a minimum depth of 2-1/2 feet.

Livestock should be fenced well away from the pond. Cattle can cause severe erosion damage on pond banks and levees. Eroded sediments slowly fill the pond and create

shallow areas which enhance weed growth. Animal wastes may wash into the pond during heavy rainfalls and cause water pollution or nutrient overload problems. Watering areas should be located below the pond. Livestock should not be allowed to graze or roam on watershed land.

Ponds should be separated from row-crop land by a turf barrier. Pesticides, herbicides, and contaminated soils washed into a pond can kill fish. Turf or grass strips 50–100 feet wide, surrounding the pond, reduce soil erosion and chemical runoff from neighboring pastures and fields.

Pond leakage due to improper construction is common. Soils for pond construction must contain a minimum of 20% clay. Pond dams should be constructed with a compacted clay core. Trees or other woody vegetation should not be permitted to grow on embankments. Ponds need drains so water levels can be easily regulated. When building or renovating ponds, get help. Contact the local U.S.D.A. Natural Resources Conservation Service office and the Kentucky Cooperative Extension Service.

Fish Removal

Ponds that are poorly managed or ignored usually experience poor fish harvests. Fish populations become imbalanced or contaminated with unwanted species. Typically, unmanaged ponds become crowded with small, stunted green sunfish (*Lepomis cyanellus*) or bullhead catfish. The best remedy for these situations is to eliminate all fish and start over. Destroying unwanted fish is easier, less expensive, and requires less chemical if the pond is partially drained and the fish are concentrated. Fish can survive in small puddles. Treat all puddles regardless of size.

Rotenone is a registered aquatic chemical which can be used to kill fish. In Kentucky, rotenone for fish control must be purchased from the Kentucky Department of Fish and Wildlife Resources. Contact the conservation officer, district fisheries biologist, or extension aquaculture specialist for information about purchasing and applying rotenone.

Rotenone dissipates within 3–20 days depending on water temperature and weather conditions. Generally, it is safe to restock 2 weeks after applying rotenone during the warm months of spring, summer, and autumn. To check for residual rotenone, place a few small fish in a minnow bucket and float them in the pond. If the fish are alive after 24 hours, it is safe to restock.

Pond Fertilization

Fertilization is usually necessary to provide phytoplankton with adequate nutrients for growth, much the same as fertilizing fields increases crop yields. Proper fertilization increases food availability throughout the food chain and indirectly increases the total amount of fish a pond can support. However, ponds should be limed first.

By increasing pH and alkalinity alone, nutrient availability may be improved enough to sustain an adequate phytoplankton bloom

Fertilizing ponds will increase fish production by a factor of two or three. Infertile ponds will seldom produce more than 200 pounds of fish per acre. Well managed, fertile ponds will support 300–600 pounds of fish per acre. If the pond is fished infrequently or receives some natural fertilization, only half the recommended rates (Table 1) may be needed, or fertilizer may not be required at all. Once started, a fertilization program should be continued or fish growth may become stunted due to reduced food supply.

Not all fertilizers work well in ponds. Phosphorus is usually the limiting nutrient in most ponds and is tied up by bottom sediments as a result of chemical precipitation and decomposition. Once trapped, phosphorus is no longer available to phytoplankton and promotes rooted weed or filamentous algae growth. Nitrogen is rarely limiting in older ponds. New ponds may need nitrogen; however, once established, ponds infrequently require nitrogen.

Fertilizers are labeled with N:P:K ratios or percent composition of nitrogen (N), phosphorus (P), and potassium (K). The equivalent of 8 pounds of phosphate per acre is a commonly recommended treatment rate. Table 1 lists application rates for commercially available fertilizers.

Table 1. Recommended pond fertilization rates (lbs/acre) on a per treatment basis.

Fertilizer formulation	Application (pounds/acre)
20–20–5	40
16–20–4	40
18–46–0	18
13–38–0 (liquid)	20
10–34–0 (liquid)	20
0–46–0	18

Liming Before Fertilization

Fertilization will not stimulate a good phytoplankton bloom if alkalinity is below 20 ppm. Check alkalinity first. If alkalinity and pH are low, the addition of powdered, agricultural limestone should help. It is not advisable to use quick or slaked lime; these compounds can cause a rapid pH change which may kill fish. The amount of lime necessary depends on the chemical characteristics of bottom sediments or mud. A soil sample from the pond bottom must be analyzed to determine how much lime is required.

Take mud samples from several locations in the pond; combine, mix evenly and spread the sample out to dry. After drying, send the combined sample off for analysis at

the University of Kentucky Soil Testing Lab. Mark the sample “pond mud” so the appropriate tests can be conducted. The analysis report will indicate proper liming rates.

Ponds should be limed similarly to land used for alfalfa production. Another way to estimate liming requirements is to apply 1¼ to 1½ times the amount of agricultural lime used for row-crops in nearby areas. It is not possible to over-treat a pond with agricultural limestone. Limestone does not dissolve once the pH reaches 8.3.

Lime must be applied as evenly as possible over the entire pond so it can react with the bottom mud. Contact your county extension office to determine the best method of applying lime. Limestone dissolves slowly over time and is washed out of the pond with overflow water. Ponds which require lime usually need repeat treatments every 3 to 5 years. Alternatively, annual lime applications at one-fourth the original amount can be used to maintain alkalinity and pH at acceptable levels. If a pond needs lime, it will not respond well to fertilizer.

When to Fertilize

A simple method of determining when to fertilize measures the clarity of pond water. The depth of light penetration in water correlates with the phytoplankton density or bloom. Light penetration can be measured using a Secchi disk. A Secchi disk is made from an 8-inch diameter disk of plywood, metal, or plastic. Mark the disk into quarters and paint each set of opposing quadrants white and black, respectively. Attach the disk to the bottom of a broomstick or pole. Indicate with tape or paint the distances 12, 18, and 24 inches from the disk.

The desired bloom density allows light to penetrate to a depth of 18 inches. Lower the Secchi disk into the water until it just disappears from sight and record that depth. Use Table 2 as a guide for fertilization based on Secchi disk measurements.

Table 2. Recommendations for pond fertilization and management based on Secchi disk measurements.

Secchi disk measurement	Recommended management
≥ 24 inches	fertilize
18–24 inches	good bloom—do nothing
12–18 inches	dense bloom—watch closely
6–12 inches	bloom too dense —find cause; prepare to aerate
≤ 6 inches	oxygen depletion likely; nighttime aeration is indicated

There is no need to fertilize if the Secchi disk disappears close to 18 but shallower than 24 inches depth. Fertilizer is needed when the disk is visible at 24 inches or deeper. Measurements above 18 inches depth (e.g., 12 inches) indicate the bloom is too dense. Do not fertilize and continue to monitor closely. Readings less than 12 inches deep mean the bloom is excessive and oxygen depletion could occur. Low Secchi disk readings in muddy water (suspended sediments) are not reliable estimates of phytoplankton blooms.

The water is too nutrient rich in the last situation (Table 2). Try to determine the source of the nutrient entering the pond. The pond may have been over fertilized. Livestock manures or field fertilizers may have washed into the pond. Overfeeding fish can result in excess nitrogen and phosphorus loads; if so, reduce or stop feeding. Be prepared to aerate at night.

How to Fertilize

Granular or liquid fertilizers may be used. Phytoplankton have no roots and absorb nitrogen, phosphorus and other required elements directly from the water. Granular fertilizers should not be broadcast directly into the pond. Fertilizer particles sink to the bottom. The nutrients then become tied up in bottom sediments and are unavailable for phytoplankton uptake.

Solid fertilizers should be placed on a platform (e.g., a sheet of plywood) that is 12 inches underwater. One platform is needed for every 5 acres of pond surface. Situate the platform in an area of the pond which receives good wind and wave action—water circulation. Granules placed on the platform will slowly dissolve and promote a bloom.

Liquid fertilizers must be diluted with water before application; undiluted, they too will sink to the bottom and be trapped by sediments. Once diluted, liquid fertilizer can be sprayed or splashed into the pond. Apply evenly over as much of the pond surface as possible.

Ponds should be fertilized no sooner than 21 March and when water temperatures have reached a minimum of 60°F. Fertilization should stimulate a phytoplankton bloom within 2 weeks. If a bloom does not appear, fertilize again and continue at 2-week intervals, no more than three times. After a bloom has developed, fertilize as necessary (Secchi disk guide, Table 2) to maintain it. Continue phytoplankton management until 21 September or until water temperatures have dropped to 60°F.

Ponds which routinely experience large volumes of water flow-through (runoffs or flooding) lose fertilizer rapidly and do not sustain good blooms. Therefore, fertilization is ineffective and should not be attempted. Many ponds will flush repeatedly in winter and early spring but respond well to fertilization during the dry periods of late spring, summer, and fall.

Constantly muddy ponds (visibility of ≤ 12 inches) do not usually respond to fertilization. Because of the shading effect, it is difficult to establish phytoplankton blooms in turbid water. Therefore, the pond is unproductive and receives little photosynthetically produced oxygen, which can account for as much as 95% of aquatic oxygen content. Contact your county extension office for information about clearing muddy water.

Fertilizing ponds with an aquatic weed problem stimulates weed growth only. Nutrients are absorbed by the unwanted vegetation, not by phytoplankton. Weeds must be controlled first. Establishing a fertilization program before weeds appear is one of the best methods of weed prevention. A good phytoplankton bloom can shade out weeds and compete for essential nutrients.

Species Selection and Stocking

The choice of fish to be stocked depends on the pond owner's goals and the resources available. It is difficult to manage bass and bluegill populations in ponds one-half acre or less. Stocking combinations that work better in small ponds ($< 1/2$ acre) are catfish; hybrid bluegill and bass; or hybrid bluegill, bass, and catfish.

The largemouth bass (*Micropterus salmoides*) and bluegill sunfish (*Lepomis macrochirus*) combination is the most common strategy for stocking ponds in the Southeast and Midwest. It works well in ponds larger than one-half acre and can provide excellent fishing for both species. The beauty of the bass-bluegill system is its simplicity. In a well fertilized pond, zooplankton and insect larvae will be plentiful enough to supply food for bass fry and all sizes of bluegill. Bluegill grow rapidly and reproduce repeatedly throughout the spring and summer; providing bass with an abundant food supply (forage). With proper harvest techniques, bass will grow rapidly and prevent bluegill from overcrowding the pond. Several large bluegill will survive and sustain good bluegill populations and fishing.

Channel catfish (*Ictalurus punctatus*) can be added to a bass-bluegill pond. However, catfish will compete with bass and bluegill for natural foods and lower overall bass-bluegill harvests. Table 3 gives recommended stocking rates for bass, bluegill, and catfish in new or renovated ponds. Blue catfish (*Ictalurus furcatus*) may be stocked instead of channel catfish. Blue catfish are better predators than channel catfish and will also compete with bass for bluegill.

One can obtain fish for new or renovated ponds from the Kentucky Department of Fish and Wildlife Resources. Contact your county conservation officer for more information. Private hatcheries also sell fish and may offer varieties or hybrids that have been selected for rapid growth. Contact your county extension office for a list of live fish suppliers.

Table 3. Suggested bass-bluegill-catfish stocking rates for new or renovated ponds larger than ½ acre.

Species	Fertilized	Number stocked/acre
bass	yes	100–125
	no	75
bluegill	yes	400–500
	no	300
catfish	yes	50
	no	25

Bluegill should be stocked in early autumn (September) to ensure sufficient growth and maturation for spring spawning to occur. Bass should be stocked in May or June so they can grow rapidly, feeding on bluegill fry. Bluegill spawn three or four times between spring and fall. Bass should average ¼ to ½ pound after the first season and can approach 2 pounds if forage is plentiful. Catfish may be stocked in fall or spring. When stocking catfish with bass, be careful that the catfish are at least as large as the bass being stocked.

Alternative Stocking Strategies

It is difficult to manage bass-bluegill fishing in ponds less than one-half acre. These ponds are better for catfish or other species. Catfish are good fighters when hooked and are excellent table fare. Stock 200–500 catfish per acre and offer feed. If stocked alone, catfish may reproduce and the pond can become overpopulated. Catfish are cavity spawners. Reproduction can be prevented by: 1) removing all stumps, rock piles, etc. from the pond; 2) not allowing muskrats or beavers to colonize the pond (catfish will spawn in the burrows); and 3) not placing containers (e.g., tires or milk cans) in the pond that might be used for breeding. Bass stocked at about 20–30/acre should help control catfish spawns.

Other fish with potential for use in small ponds include: blue catfish, rainbow trout (*Oncorhynchus mykiss*) (mid-autumn and winter months), redear sunfish (*Lepomis microlophus*), hybrid bluegill, threadfin shad (*Dorosoma petenense*), golden shiners (*Notemigonus crysoleucas*), and fathead minnows (*Pimephales promelas*). Species which should not be stocked into farm ponds include: crappie, gizzard shad (*Dorosoma cepedianum*), bullhead catfish, and flathead catfish (*Pylodictis olivarius*). These species rapidly overcrowd ponds and may reduce populations of desirable fish species.

Crappie are highly popular sport fish but are not desirable for small ponds (in this instance, less than 50 acres). Crappie reach sexual maturity when 2 to 3 years

old and are approximately 7 to 8 inches long. If stunted, they may be only 4 inches long. A young, half-pound female crappie can produce 50,000 eggs. Just a few successful spawns during one season will overcrowd a pond. When this year class of juveniles grows, they consume all available food. Growth stops, and these young fish become stunted. Young crappie compete directly with juvenile bass and bluegills for prey. Large crappie will feed on small bass and bluegill. It is virtually impossible to manage bass and crappie populations together. The end result is poor fishing for all species.

Redear sunfish—also known as “shellcrackers” because they eat snails—can be stocked with bass and bluegill. Redear sunfish grow larger than bluegill and are excellent sport fish. Shellcrackers are not as prolific as bluegill and do not provide sufficient spawns for bass forage. If you want redear sunfish, stock 20–25% redear in place of bluegill (e.g., 300 bluegill and 100 redear/acre).

Hybrid bluegill have large mouths and can be easily trained to accept commercial fish feed. Many pond owners like to stock hybrid bluegill and feed them. If fed, they grow rapidly and are excellent for angling. Hybrid bluegill are not sterile. Most are males; but if females are present, they do breed. Reproduction is undesirable and leads to overpopulated ponds. Therefore, predatory fish should be stocked to feed on young hybrid bluegill. Bass, stocked at 20–30/acre, control spawns effectively. This combination works best for ponds one-half acre or less.

Fathead minnows are slow swimmers, have a small adult size, and can be stocked (1,000/acre) as forage in channel catfish ponds. These minnows are quickly eliminated if stocked with bass.

Rainbow trout can survive in Kentucky ponds during late autumn and winter. They should be stocked when water temperatures are at or below 65°F, usually mid- to late October. Fingerlings (7–9 inches long) feed on insect larvae, small sunfish, or minnows and grow rapidly. Trout readily accept commercial feeds and may reach 1 pound by April if offered a trout chow. Rainbow trout die when water temperatures reach 70–72°F in April or May.

Harvest and Record Keeping

Ponds should not be fished for 1 year following stocking. After the first season, bass are often easy to catch. The most common problem in small ponds is removing too many bass. Harvest must be carefully controlled to maintain good fishing.

When bass are over-harvested, ponds become overpopulated with stunted bluegill. If that happens, it is difficult to restore balance to the pond. It may be necessary to poison the fish and start again. As a general rule, fertile ponds can sustain an annual harvest of 25–35 pounds of bass per acre. If the pond is infertile, annual harvest should not exceed 10–15 pounds/acre. Do not begin bass harvest in a new pond before spring spawning,

water at or above 60°F. Year-old bass (8–12 inches long) are sexually mature. Catch and release bass; and enjoy successful angling more often.

Although research has not shown bluegill removal to be an effective means of reducing their numbers in overpopulated ponds, bluegill should be harvested also. A good general rule is to remove 10–15 bluegill for each bass taken or 4 pounds of bluegill to each pound of bass.

Catfish may be harvested when they reach a size that satisfies the pond owner. In ponds stocked with bass and bluegill, catfish spawns do not usually survive. Catfish must be stocked periodically to replace individuals that have been removed. Large catfish fingerlings (≥ 8 inches) should be stocked into ponds with established bass-bluegill populations to minimize predation by bass.

Do not rely on memory. Keep records about numbers, sizes and species of fish caught. Pond balance can be evaluated from catch records and seine data. Table 6 is an example of a record keeping sheet for pond management.

Evaluation of Pond Balance

Pond balance should be checked at 1- or 2-year intervals. The local district fisheries biologist with the Kentucky Department of Fish and Wildlife Resources may be able to provide assistance.

Balance can be checked with a 10- or 15-foot minnow seine. The best time to check is early summer. Seine several shallow areas of the pond. Refer to Table 4 to evaluate findings.

If seine catches contain both young bass and recently hatched bluegill fry, the pond is most likely balanced. The pond is imbalanced when no young bass or bluegill fry are seined but many intermediate size bluegill (4–5 inches long) are caught. Samples containing large numbers of undesirable species mean it is time to poison and restock.

Weed Control

Aquatic weeds are a common problem in farm ponds. Rooted aquatic vegetation furnishes habitat for some small aquatic animals, increasing available food. Vegetation also provides small fish with cover to hide from predators. However, if left unchecked, weeds can take over the entire pond and remove the nutrients required for phytoplankton production.

Aquatic weeds can be controlled manually or by chemical and biological means. Manual control of plants such as cattails is only practical when they first appear. Woody vegetation along dams can be successfully controlled by hand.

Chemical control is possible with herbicides. However, many herbicides are not approved for aquatic use; and the weeds in question must be accurately identified. Herbicide applications may cause oxygen depletions. Oxygen depletions often occur following herbicide application during hot weather in ponds with heavy weed overgrowth. Check with your county extension office, a fisheries biologist, or an aquaculture specialist for plant identification and herbicide recommendations. Whenever applying chemicals, protect yourself and others. Carefully follow label instructions, always.

One of the simplest and most economical long-term methods of controlling rooted aquatic vegetation in new or recently treated ponds is to stock grass carp (*Ctenopharyngodon idella*). The grass carp or “white amur” is an Asian carp brought into the U.S. for aquatic weed control. Once they reach a length of 10 inches, these fish are primarily herbivorous. They do not stir up bottom mud like common carp or disturb the nests of other fish. During warm weather, grass carp can consume quantities of weeds equaling 30–40% of their body weight daily. Grass carp are considered good eating by many people.

Table 4. Evaluation of pond balance using seine and catch data.

Types of fish caught	Recommendation
seine data: small to intermediate size bass and bluegill catch data: bass and bluegill of various sizes	no additional management necessary
seine data: small and intermediate bluegill; no bass catch data: few intermediate bass; large bluegill	no additional management necessary
seine data: no bass or bluegill	harvest bluegill and stock 25, 6–8 inch bass/acre
catch data: intermediate bass only; large bluegill	harvest bluegill and stock 25, 6–8 inch bass/acre
seine data: unwanted species	remove 50-75 bass/acre; stock 30, 3–5 inch bluegill/acre
catch data: unwanted species or no fish	remove 50-75 bass/acre; stock 30, 3–5 inch bluegill/acre
	rotenone and start over
	rotenone and start over

Grass carp prefer flowing water and will swim over a pond spillway if given the opportunity. An escapement barrier can be placed across the spillway to prevent that from happening. Only sterile, triploid grass carp may be stocked in Kentucky. A list of certified, triploid grass carp suppliers and information about building an escapement barrier can be obtained from the Kentucky Department of Fish and Wildlife Resources or the Kentucky Cooperative Extension Service.

The number of triploid grass carp that should be stocked depends on weed species and the magnitude of the problem. Table 5 presents recommended stocking rates. Ponds supplied by large springs remain cool and require additional grass carp for effective weed control. If the pond contains large bass, grass carp fingerlings must be longer than 8 inches. Bass eat small grass carp.

Table 5. Stocking rates for triploid grass carp.

Weed evaluation	Grass carp stocked/acre
new pond or minor weed problem	5
or moderate weed problem (10–20 % coverage)	12–15
severe weed problem or spring fed pond	≥ 20

POTENTIAL PROBLEMS

A common cause of fish kills is pond “turnover.” Turnovers are related to pond stratification. Stratification occurs when surface water warms faster than water at greater depths. The warm layer is lighter and does not mix with cool, deep water. The cool water near the bottom becomes stagnant; oxygen is depleted and toxic compounds may be produced by bacteria and decaying organic matter. A turnover occurs when the upper layer cools quickly and mixes with the stagnant layer. The resultant mixture may not contain enough oxygen to support fish. Turnovers usually take place after a cold, heavy rain or a sudden cold front passage. Immediate or preventive aeration may save the fish. Fish kills can also be caused by oxygen depletions resulting from bloom die-offs or decomposing vegetation killed by herbicide applications.

As already discussed, most problems are related to improper pond management. Good management includes enhancing food availability for fish; controlled harvest to balance fish populations; weed control; and preventing situations that may cause fish kills. These are not simple tasks. Ponds are complex ecological systems and require personal commitment and insight for productive management.

ENHANCEMENT TECHNIQUES

Many methods are used to improve farm pond fishing. Some of these include adding fish shelters/habitat, supplemental feeding, checking and adjusting water levels, aeration, and destratification.

Artificial reefs or fish shelters allow young fish to escape predation. Felled cedars or discarded Christmas trees, anchored to the bottom, offer excellent refuge. Stake beds (stakes driven into the bottom), rock piles, and tire reefs make good fish sanctuaries. These structures should be placed at a depth of 2 to 6 feet; no more than 3 should be supplied per acre.

Fish spawns can be encouraged by furnishing breeding areas. Place sand and gravel beds at several locations around the shoreline and at a depth of 2 to 5 feet. The sand and gravel should be 4 to 6 inches thick and contained within a frame or box. Spawning beds permit observation of reproductive success and are necessary in ponds with silty bottoms.

Providing supplemental, commercial fish feed increases the growth of sunfish and catfish. Bass do not readily accept artificial feeds but do benefit from the increase in forage. Offer feed in the same area and at the same time each day. It is important not to over feed. Supply what the fish will consume in 10–15 minutes but no more than 15 pounds/acre each day. Fish can be fed from April through October. Winter feeding is not required but will improve bluegill growth and spawns. During winter months, use a sinking feed; do not offer more than 3 pounds/acre daily.

Ponds with drains have distinct management advantages. In relatively deep ponds, the water can be drawn down 2 to 3 feet in late fall and maintained at that level throughout the winter. Fall draw-down helps control aquatic weeds as a result of freezing and drying on areas of exposed pond bottom. Lowering water levels also concentrates fish, increasing forage availability to bass—bass growth is improved and sunfish populations are reduced. Ponds should be allowed to refill during March and April.

Ponds which experience annual, low oxygen fish kills may benefit from aeration (or destratification if > 6 feet). Many types of electric aerators are commercially available. Supplemental aeration is effective, using one horsepower of electric aeration per surface acre of water. If a turnover or sudden bloom die-off occurs, additional aeration capacity may be necessary.

Finally, small farm ponds are man-made and not natural environments. They must be carefully managed to provide productive, recreational fishing. Think of a pond as a garden or an orchard. It must be properly laid out, fertilized, seeded (stocked), weeded, pruned (selectively harvested), and protected from acts of God (e.g., oxygen depletions) to be bountiful. Good management takes time and effort. However, the rewards are good food and outdoor recreation.

SUSTAINABLE CHANNEL CATFISH FARMING: LOW MANAGEMENT PRODUCTION THROUGH MODIFIED STOCKING AND FEEDING PRACTICES

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Sustainability has become the recent "buzz-word" in aquaculture and agriculture. As Claude Boyd indicated in San Diego (Aquaculture '95), aquaculture is not truly sustainable because aquaculture relies on external feed, chemical, and energy inputs. The United States Farm Bill of 1990 more narrowly defined the key components of sustainability as: maintaining profitability, supplying food and fiber needs, using non-renewable resources efficiently, enhancing renewable resources, and improving the quality of life in rural areas.

Intensive aquaculture practices have pushed production as high as 7,000 to 10,000 lb/acre. The objective has been to increase profitability by maximizing harvest weight (biomass) per unit volume/area of production system. However, these practices almost always exceed the biological carrying capacity of the production unit. As with feedlot livestock production, overcrowding usually leads to problems with environmental degradation, disease, off-flavor (aquatic animals), and a reduction in individual performance of the cultured species. In several instances (e.g., shrimp farming in Bangladesh, China, Taiwan, and Thailand), the long-term results of intensive production practices appear to have been economically and (potentially) environmentally devastating.

While the U.S. catfish farming industry has not experienced the catastrophes observed in the shrimp farming industry, it has manifested several of the warning signs that indicate production is at the upper limits of carrying capacity. Widespread disease, antibiotic-resistant bacteria, off-flavor problems, and routine aeration have become common for intensive channel catfish culture.

In recent years, Enteric Septicemia of Catfish (ESC) has flourished in the crowded production ponds of Mississippi. Off-flavor results from dense phytoplankton (algae) blooms and micro-organisms that accompany the heavy nutrient and organic loads produced by fish wastes (ammonia and manure) and uneaten feed. On any given day during the catfish production season, as many as 40–60% of the ponds sampled can contain off-flavor fish. Nighttime aeration, throughout the summer, has become the standard not the exception—because oxygen demand exceeds the natural regenerative processes of the pond environment.

SUSTAINABLE OR LOW-MANAGEMENT CATFISH PRODUCTION

For the purposes of this discussion, sustainable aquaculture will be viewed as commercial channel catfish production that:

- respects the biological or ecological limits of the production pond;
- requires minimal external inputs; and
- can be conducted with limited technical skills.

To quote Greg Henson, Extension Agent for Agriculture in McLean County, this is fish farming that can be "done with a 5-gallon bucket and a pick-up truck (or horse-drawn cart)" and without quitting the day job. The underlying concepts are:

- maximize biological efficiency in the production pond environment without exceeding natural carrying capacity;
- reduce the cost of production; and
- establish profitable, low-management production techniques for catfish.

Several field demonstrations have been conducted in Kentucky to examine the feasibility of improving production efficiency and pond yields using low stocking density and modified feeding practices. Altering the time of year for stocking channel catfish fingerlings was also explored. The primary objectives were to: take advantage of cool-weather growth; closely match feeding with actual catfish growth; and keep pond biomass at or below natural, pond carrying capacity (approx. 1,500 lb/acre) during critical periods—the hot weather experienced from July through mid-September. A secondary objective was to avoid heavy nutrient loads from fish waste products and uneaten feed.

Autumn Fingerling Stocking

The project demonstrated that autumn stocking increased channel catfish fingerling weight by 70–90% between the beginning of October 1991 and mid-April 1992. Fish were stocked in 0.5- and 1.0-acre ponds. Fingerlings (0.1 lb each) were stocked at 2,000 fish/acre. Feeding, at 1–3% of biomass, was adjusted in accordance with standard temperature-based recommendations. Surface water temperatures reported for a large, local reservoir (Lake Barkley) were used to adjust feeding.

Channel catfish fingerlings (0.1-lb) are in their rapid growth (exponential) phase. By stocking fingerlings in early autumn rather than the following spring, they benefit from cool-weather feeding (when water temperatures are > 50°F). Fingerling growth is reduced but still good during cool weather. Because temperature and biomass are low, pond carrying capacity is not taxed. In western Kentucky, water temperatures are usually below 50°F from mid-December to early March.

Low-density, autumn stocking in combination with temperature-based feeding substantially increased channel catfish fingerling weight by the subsequent spring. The advanced spring fingerling size (0.19-lb) allowed production of a 1.45-lb food-fish (1,343 fish/acre) in 180 days. These findings exceeded expectations for

single-season, catfish growth in northern latitudes of the southeastern United States. This was accomplished by a “first-time” fish farmer, a teen-age boy still in high school.

Low-Density Stocking and Modified Feeding

These two practices were demonstrated through the use of mathematically generated feeding tables (Table 1) and low stocking density (1,500 fingerlings/acre). Growth was assumed to be exponential for fish weighing from 0.1–0.53 lb each and linear for larger (> 0.53 lb) catfish (Fig. 1).

Channel catfish with an average, individual weight of 1.3 lb (1.0 lb = 454 g) were produced within 175 days using low stocking densities and tables to adjust feeding. These studies were done in 2.25- and 2.5-acre ponds. Catfish fingerlings were 0.1 lb each at the beginning of the study, 21 April 1993. Ponds were sampled and partially harvested on 14 October 1993.

Fish were fed a 32% protein, floating commercial catfish diet. Daily feeding was capped at 30 lb feed/acre but could go as high as 35 lb/acre. Fish were fed once each day. Feed was offered when dissolved oxygen would be highest, late afternoon or early evening. Feeding rates were adjusted every 7 days (Table 1).

After 175 days, survival was estimated to be greater than 95% and biomass to be 2,000 lb/acre. Food conversion ratios were 1.68 and 2.0. Fish weights as well as projected pond yields and food conversion ratios were 25–30% better than traditional expectations for channel catfish production in Kentucky. Projections and estimates were based on mean, individual weights and daily feed consumption, measured at the end of the study. It is interesting to note and perhaps the most important information collected; this was accomplished by a “first-time” fish farmer who had no university training.

Table 1. Channel catfish feeding table predicting catfish weights and daily feeding rates at 7-day intervals, assuming exponential growth for 0.1- to 0.53-lb fish and linear growth for fish >0.53 lb (1.0 lb = 454 g). Daily feeding is capped at 30 lb feed/acre.

Fish size		Time (days)	1,500 fish	
(lb)	(K)		Wt (lb)	Feed Fed (lb)
0.10	45	0	149	4.5
0.12	54	7	179	5.4
0.15	68	14	225	6.7
0.19	86	21	284	8.5
0.23	104	28	344	10.3
0.29	132	35	437	13.1
0.35	159	42	526	15.8
0.43	195	49	645	19.3
0.53	240	56	794	23.8
0.59	270	63	892	24.2
0.66	299	70	990	24.6
0.73	329	77	1088	25.0
0.79	359	84	1187	25.5
0.86	389	91	1285	25.9
0.92	418	98	1383	26.3
0.99	448	105	1481	26.7
1.05	478	112	1579	27.1
1.12	507	119	1678	27.5
1.18	537	126	1776	27.9
1.25	567	133	1874	28.3
1.31	596	140	1972	28.8
1.38	626	147	2070	29.2
1.45	656	154	2169	29.6
1.51	685	161	2265	30.0

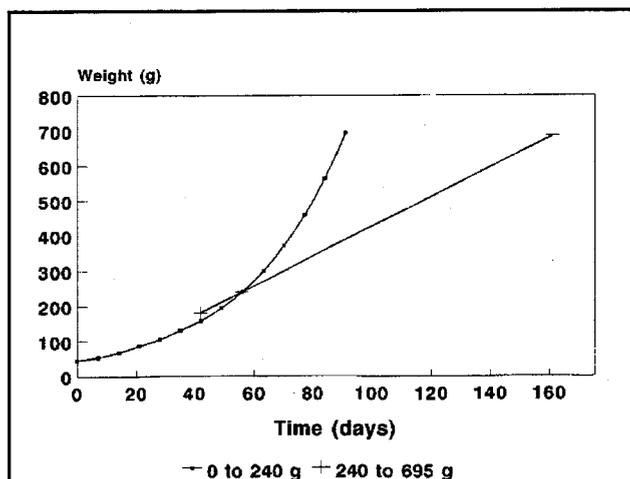


Fig. 1. Predicted channel catfish growth for 0.1-lb fingerlings stocked at 1,500 fish/acre.

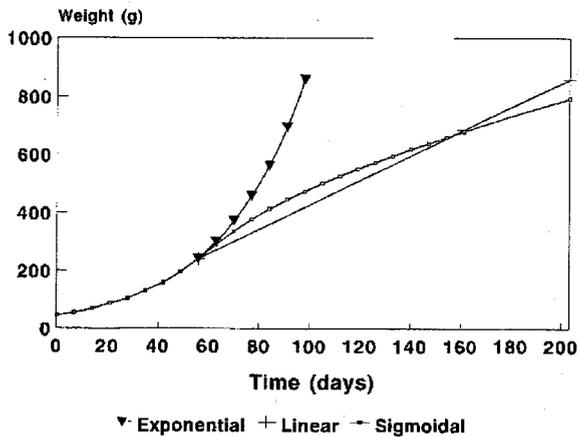


Fig. 2. A comparison of predicted sigmoidal (natural), exponential, and linear growth patterns for 0.1-lb channel catfish fingerlings stocked at 1,500 fish/acre.

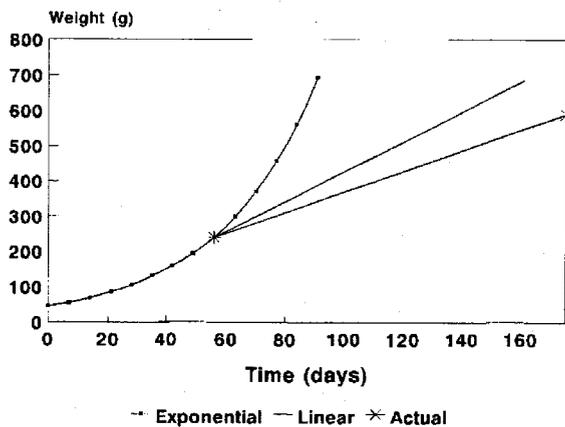


Fig. 3. Predicted growth compared with mean harvest weight for 0.1-lb channel catfish fingerlings stocked at 1,500 fish/acre in 2.25-acre and 2.5-acre ponds.

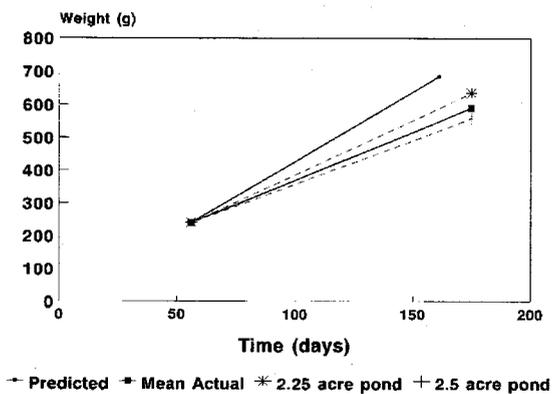


Figure 4. A comparison of predicted and actual mean harvest weights for 0.1-lb channel catfish fingerlings stocked at 1,500 fish/acre in 2.25-acre (0.9-ha) and 2.5-acre (1.0-ha) ponds.

Table 2. Channel catfish feeding table predicting catfish weights and daily feeding rates at 7-day intervals, assuming growth is exponential for fish between 0.1-0.7 lb each and linear for fish > 0.7 lb (1.0 lb = 454 g). Daily feeding would increase by 0.52 lb every 7 days for fish > 0.7 lb each and would be capped at 35 lb feed/acre.

Fish size		Time (days)	1,500 fish	
(lb)	(g)		Wt (lb)	Feed Fed (lb)
0.10	45	0	150	4.5
0.13	58	7	195	5.9
0.16	74	14	240	7.2
0.21	95	21	315	9.5
0.27	121	28	405	12.2
0.34	154	35	510	15.3
0.43	197	42	645	19.4
0.56	252	49	840	25.2
0.71	322	56	1065	26.6

It is likely that channel catfish growth is truly a sigmoidal pattern (S-shaped curve, Fig. 2). However, an S-shaped growth curve is approximated reasonably well by an exponential curve followed by a straight line (Fig. 1 and 2). The math for linear and exponential equations is much easier to handle than the math for a sigmoidal function. Retrospectively, it seems that channel catfish growth is exponential (rapid) a little longer (up to a 0.7-lb fish) and more rapid than was originally assumed (Fig. 2 and Table 2).

Combining Low-Density And Autumn Fingerling Stocking with Modified Feeding

The results of these demonstrations suggest individual channel catfish growth is rapid from 0.1 to 0.7 lb (50-60 days) and then slows for larger fish (Figures 2, 3, and 4). Therefore, the most critical time to feed accurately is during the first 2 months of the spring-summer production season. Mathematically generated feed tables improve production efficiency by allowing the farmer to closely match feeding with natural growth rates. Nitrogenous and organic wastes as well as uneaten feed would be minimized because the amount of feed offered is not in excess of that needed for good growth.

Stocking fingerlings in autumn produces larger fingerlings and food-fish by the subsequent spring and autumn harvest, respectively. Catfish fingerlings stocked at the beginning of October (1,500 fingerlings/acre) could easily attain a weight of 1.50 lb each and a total biomass of 2,250 lb/acre by October of the following year. Continued

feeding until December (up to 35 lb of feed/acre daily) in conjunction with periodic, size selective harvest (fish > 1.25 lb each) through mid-spring of the next year could further increase pond yields. Second-season fingerlings would be autumn stocked "under" harvest-size catfish. These fingerlings could consume uneaten feed and natural foods left by the larger, first-season catfish—improving net feed utilization.

Because low fish biomass and the use of feeding tables limits waste production, the nutrients released would stimulate (fertilize) pond productivity rather than pollute it. It is generally accepted that fertile ponds will support 300–600 lb of fish/acre without additional feed or energy inputs. Low stocking density allows fish to take advantage of naturally available food organisms in addition to commercial feed. In theory, the fish manure and uneaten feed associated with 1,500 fish could support sufficient aquatic life (insects, crustaceans, worms, etc.) to support 500 lb/acre of bonus fish growth.

A general estimate for channel catfish production is to assume that 1.0 lb of food-fish will be harvested for each fingerling stocked. Using this projection, 1,500 fingerlings could be expected to yield 1,500 lb/acre. The estimated biomass of the low stocking density demonstration was 2,000 lb/acre—500 lb/acre more than generally accepted. It seems plausible that this bonus growth is related to an increase in pond fertility (natural foods) promoted by fish wastes, and efficient (table) feeding. Low biomass (fish density), efficient feeding (good growth and limited wastes), and nutrient (fish wastes) stimulated fertility take full advantage (improved efficiency) of the pond ecosystem without exceeding biological and environmental limits.

SUSTAINABLE LOW-MANAGEMENT PRACTICES

It seems feasible that a combination of low-density, autumn stocking (1,500 fish/acre), table feeding, and continuous size selective harvest from autumn through spring could produce catfish yields as high as 2,250 to 3,000 lb/acre. Ponds are not aerated because biomass and oxygen demand do not become critical during hot weather. However, feeding is stopped during periods of low oxygen and resumed when fish begin feeding aggressively again. Disease is not treated except in the case of a serious outbreak—low fish density minimizes stress as well as disease occurrence and spread. Low biomass and limited waste production promote pond fertility and natural foods while maintaining acceptable water quality. Heavy nutrient and organic loads are absent, and the likelihood of off-flavor problems is reduced. All of this can be "done with 5-gallon buckets, a team of horses, and without quitting the day job."

INTENSIVE CHANNEL CATFISH PRODUCTION

Intensive catfish production techniques leave little room for error and can be unforgiving for the novice. Withholding antibiotics during a disease outbreak or eliminating summer aeration is likely to cause a 50–100% fish-kill in intensive production systems. With the low management approach, not treating a disease or no aeration might result in a 5–10% fish loss, possibly 25% under unusual circumstances.

As the number of pounds of catfish produced per acre increases, the cost to produce a pound of fish increases. A catfish yield of 4,500 lb/acre requires significant external inputs: energy (e.g., aeration), chemicals, antibiotics, feed, time, labor, etc. These additional inputs cost money and cut into potential profits. There is a point at which additional inputs do not increase yields and profits sufficiently to offset the extra costs and "risk" involved. Somehow, intensive aquaculture seems to have avoided the close scrutiny of "the economics of diminishing returns."

The basic costs for low-management catfish production, feed (\$630; \$0.14/lb) and fingerlings (\$225; \$0.15/fish), would be \$855/acre. Similar costs for intensive production, feed (\$1,260; \$0.14/lb) and fingerlings (\$675; \$0.15/fish), would be \$1,935/acre. Using the basic costs above and a wholesale catfish value (live-weight) of \$0.80/lb, low-management production would yield 2,250 lb fish/acre worth \$1,800 and intensive production would generate 4,500 lb/acre worth \$3,600. Net profit (harvest value minus "basic costs") would be \$945/acre and \$1,665/acre for low-management and intensive farming, respectively.

A few hundred dollars profit per acre is significant when considering a 1,000-acre channel catfish operation. However, deducting the costs associated with aeration, antibiotics, algicides, and a 15% fish loss would substantially reduce the profit/acre for intensive practices. The additional costs and risk of intensive catfish farming might not be acceptable for the 1.0- to 5.0-acre producer.

Marketing more than a few thousand pounds of fish requires wholesale pricing, bulk sales, and large-scale processing. The opportunities for local retail sales (\$1.25/lb, live-weight) are more realistic when working with the smaller harvest of a low-management, channel catfish business. Similarly, retail sales can provide greater net profits, as high as \$1,950/acre, for 1.0- to 3.0-acre farms.

TOWARDS THE FUTURE

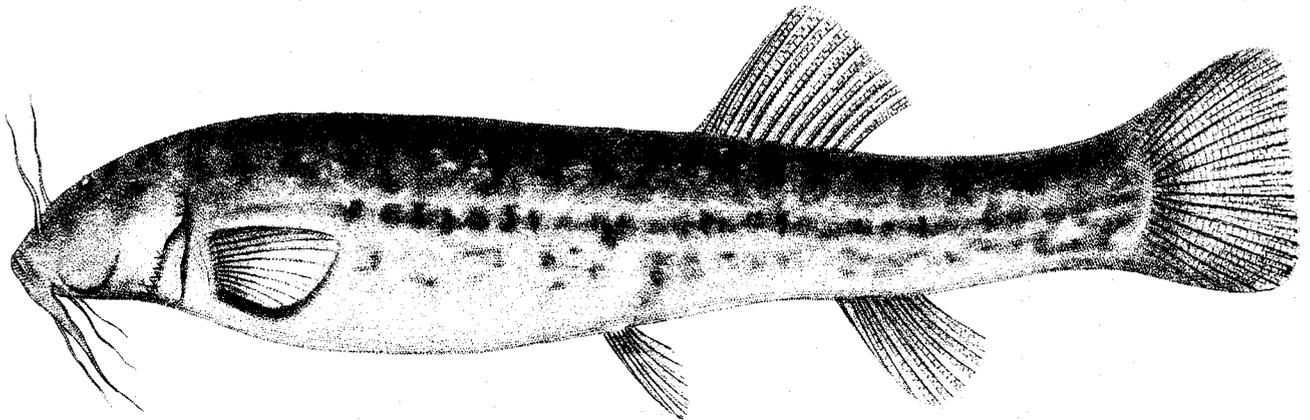
Ninety thousand individuals, each farming a “low-management,” 2.5-acre channel catfish pond, could surpass the total annual channel catfish production for the southeastern United States in 1993 (440 million pounds). Future producers may improve pond efficiency further by incorporating filter feeding fish and molluscs into sustainable low-management systems; taking advantage of the plankton populations present, yet largely unused, in catfish production ponds. Furthermore, new technology may radically redefine the production unit as we know it.

Undoubtedly, competition for aquatic resources will continue to escalate in the 21st century. Moderate increases in the cost of electricity or petroleum-based fuels could significantly affect the profitability of intensive fish production practices. Whether channel catfish production

is done in high-tech raceways and recirculation units, intensively managed ponds or sustainable low-management systems; the practice used must be energy-efficient and environmentally sound. Ultimately, in order to benefit the most people, production technology must be user-friendly and practicable with limited resources. Bottom line, “keep it simple.”

ACKNOWLEDGMENTS

The demonstrations reported were funded, in part, by the Tennessee Valley Authority. We gratefully acknowledge assistance with demonstrations by Kenneth Perry and William Green, Cooperative Extension Agents for Agriculture with the University of Kentucky Cooperative Extension Service.



THE USE OF AGRICULTURAL LIMESTONE AND GYPSUM IN PONDS

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Ponds built in areas that have acid soils and soft water may not always perform well for fish production. Such ponds may benefit from liming if the water has a total alkalinity of less than 20 mg/l (20 ppm). If alkalinity is more than 20 mg/l, liming may not be beneficial. Alkalinity measures the buffering capacity of the water and is usually a good indicator of productivity. Carbonates, bicarbonates, hydroxides, phosphates, and organic substances are the main components of water alkalinity. Water hardness is caused by calcium, magnesium, iron, and aluminum salts, most often in the form of carbonates, sulfates, or chlorides. Ponds that have water hardness concentrations of less than 20 mg/l may also benefit from liming. Alkalinity and hardness can be measured with commercially available water test kits, or by State Fisheries or Extension Service Aquaculture Specialists. Generally, total alkalinities of 100–120 mg/l, water hardness concentrations of 100–250 mg/l, and pH values between 6.5–9.0 are considered desirable for freshwater fish production.

Liming a pond properly will raise the pH of bottom muds and water, and make phosphorus more available for plant production. Low levels of phosphorus may limit the growth of a pond's microscopic plants, which are the foundation of the aquatic food chain and pond productivity. Fish populations should benefit from liming. Liming can enhance nutrient cycling; the breakdown of organic matter, and may also help clear muddy pond water.

Liming may be less effective if the pond has a large watershed and water is exchanged more than once every 3 or 4 weeks. Surface coal mining spoils contain pyrites, which can produce sulfuric acid when exposed and weathered. Ponds should not be constructed on these watersheds unless the soil has been tested or the acidic runoff water can be diverted away from the pond. Ponds should be limed during the late fall or winter, especially if a pond fertilization program is begun the following spring. If low alkalinity ponds are fertilized before being limed, much of the phosphorus may be lost to the bottom muds. Therefore, the effort and expense of fertilization could be wasted. However, lime should not be added to a pond which has been recently fertilized as it tends to remove phosphorus from the water.

Ponds can be limed with liquid lime, basic slag, or agricultural limestone. The acid neutralizing value represents the ability of a liming material to neutralize acid when compared with pure calcium carbonate (which represents 100%). Liquid lime works rapidly but contains 50% water, which doubles the amount of material to apply. Basic slag has a neutralizing value of 50–79%. The values for agricultural limestone range from 95–108%. Hydrated

or slaked lime has a value of 136%, and calcium oxide has a value of 179% and should not be used to lime fish ponds. Calcium oxide or hydrated (slaked) lime will not increase carbonate alkalinity and could drastically raise water pH, which may kill fish. Agricultural limestone is usually the best choice. It is inexpensive (\$9.00–\$22.00/ton) and safe to use in fish ponds. Agricultural limestone should be ground fine enough to pass through a 10 mesh sieve. Small particles will dissolve more readily in water. A sieve analysis may be required to determine particle size and assign the lime an efficiency rating.

The amount of lime required per surface acre of pond is determined by analyzing pond mud samples. Samples should be taken randomly from deep and shallow areas, making an "S"-shaped pattern over the entire length and width of the pond. Mud samples can be collected from existing ponds using a boat and an 8-oz can attached to a long pole or by taking small plugs of mud with a length of PVC pipe. In ponds greater than 5 surface acres, three to six similar sized mud samples should be taken per acre. Smaller ponds require 10–15 mud samples per surface acre. The samples should be mixed together and allowed to air dry on a flat surface. Pond mud samples should then be pulverized and placed in a soil sample box marked "fish pond." These samples can then be submitted to a private soils testing lab or to your county extension office to be sent out for processing (for a small fee).

Lime application rates will usually be made on the basis of 1,000–10,000 lb/surface acre. The equation used is similar to the following:

$$\text{Application rate} = \frac{\text{Liming Rate}}{\frac{\text{Neutralizing Value} \times \text{Efficiency Rating}}{100}}$$

Lime should be distributed as evenly as possible over the entire surface of a full or dry pond. The best time to lime a pond is before filling, lime can be applied with a spreader and mixed into the pond bottom with a disc-harrow. Small, full ponds can be limed by spreading bagged lime from a boat or by broadcasting it from the shore. Large ponds may require greater amounts of lime, which is more economical when purchased in bulk quantities. Lime can be loaded onto a ½-inch plywood platform placed over the bow of a large boat or between two small boats. The material can be shoveled or washed

off the platform using a water pump, while moving slowly across the pond. A boat 18 feet long by 6 feet wide can carry 1,500 lb of agricultural limestone.

Ponds may need to be limed every 3–5 years. A good general rule for liming ponds is to apply lime at rates similar to those used for alfalfa field preparation. To maintain a pond's pH and alkalinity at desirable levels, the lime should be applied annually by adding one-fourth of the initial application. Pond alkalinity and pH should be checked each year to evaluate the effectiveness of supplemental liming. Total alkalinity should not be less than 20 mg/l with pH values between 6.5–9.0.

Considering the relatively low cost involved in the maintenance of a pond's lime requirement, ponds should be limed before implementing a pond fertilization program. If liming does not improve fish production to a satisfactory level after 1 year, a fertilization program should then be tried.

Adding agricultural gypsum to ponds can precipitate available phosphates, which can reduce dense algae blooms, increase water hardness, and may reduce turbidity. The pH of pond waters (generally with a pH \geq 9.5) that have high alkalinity and comparatively low calcium hardness may be reduced by the addition of gypsum (calcium sulfate) or land plaster. High water alkalinity and

low calcium hardness often occur where bicarbonate and carbonate ions are associated with the more soluble sodium, potassium, and magnesium elements, as opposed to calcium. When plants remove carbon dioxide from the water during photosynthesis, carbonate ion concentrations increase. In the presence of the less soluble calcium, the hydrolysis of carbonate to hydroxyl ions elevates the afternoon water pH to approximately 9.5 or 10.0. At this point, calcium carbonate begins to precipitate. Since the hydrolysis of carbonate and the formation of hydroxides that elevate pH have been limited by carbonate precipitation, pH will not increase further. However, where alkalinity is high and calcium concentrations are low, afternoon pH may rise above 10 and become toxic to some aquatic organisms.

According to Auburn University researchers, agricultural gypsum may cost approximately \$200.00 per ton. The rate of application in mg/l can be calculated by the following equation:

$$\begin{aligned} &\text{Application rate} \\ &\text{of agricultural} \quad = \text{total alkalinity (mg/L)} - \text{total hardness (mg/L)} \times 4 \\ &\text{gypsum (mg/L)} \end{aligned}$$

Fee-Fishing Enterprises

Editor's Note: Three papers were presented in the fee-fishing concurrent session, but one paper was not submitted for publication in the proceedings.

The following title was presented in the session but not submitted for publication:

Jeffrey Hinshaw, North Carolina State University—Utilizing Coldwater Species for Fee Fishing

FEE-FISHING: INTRODUCTION AND MARKETING

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Essential ingredients for a successful fee-fishing operation include: location, knowledge of clientele, facility design, providing services, advertising, and management of the fish. A fee-fishing operation is a business, a recreational people-oriented business, and not just a method to market fish.

LOCATION

The most successful fee-fishing operations are within 50 miles of a 50,000+ population center. Other location factors which can enhance fee-fishing operations are proximity to other public attractions (including public fishing areas, but not other fee-fishing enterprises), high-traffic zones, and aesthetically pleasing settings.

CLIENTELE

Fee-fishing appeals to all types of anglers, even experienced anglers. However, an important segment of the fee-fishing clientele are the elderly, families with children (including single-parent), and the physically handicapped. These diverse groups offer unique opportunities to encourage fishing while increasing and promoting the consumption of fish.

FACILITY DESIGN

Design of fee-fishing facilities should include considerations for safety, convenience, security, and control of access. Good security design will increase client safety while reducing theft and vandalism. Regulations, prices, hours of operations, and liability statements should be clearly posted. Restrooms and trash containers should be easily accessible and serviced regularly.

Proper pond design for fee-fishing operations should include: multiple relatively small ponds (< 2 acres) with levees that allow vehicular traffic, accessible banks, unobstructed bottoms, overflow drains and emergency spillways, and a good water source (piped to each pond). Multiple ponds allow managers to treat a pond with a disease without losing business, to concentrate fish to improve catch rates, and to isolate fish deliveries so as not to introduce diseases to existing populations. Existing hill-type ponds can be used for fee-fishing but usually present management problems with access and fishing success.

SERVICES

A fee-fishing operation is a people-oriented recreation business that requires the management be "P-R" people and provide concessions that meet all anticipated needs of the clientele. Well-designed and stocked concessions can increase profitability and customer satisfaction. Concessions should include everything from bait to drinks, snacks (even complete meals), tackle, first aid and cosmetics supplies (e.g., sun screen), and clothing (with logo). Fish cleaning services and processed fish for direct sales can also increase profitability and open other niche markets. Many fee-fishing operations have become small-scale processors or fish fry catering businesses.

ADVERTISING

Common advertising methods employed by fee-fishing operations include: road signs, newspapers, radio and TV commercials, fliers, visitor guides, and direct mailings. However, the best advertising is "word of mouth." Aesthetically pleasing surroundings, good concessions, courteous service, and successful angling will bring in both repeat and new customers. Questionnaires suggest that every satisfied customer equals 8 to 10 new patrons.

MANAGEMENT

Critical management considerations for fee-fishing operators include: species selection, hauling and stocking (including density and frequency concerns), feeding, water quality and aeration, weed control, and fish health management.

In warmwater fish operations farm-raised catfish, carp, sunfish (possibly bass species), or tilapia are the best choices for stocking. Stocking wild fish leads to high mortality rates, introduction of diseases, and reduced catch rates. Purchasing fish from aquaculture facilities that have previously serviced fee-fishing operations and using live-haulers that have a proven reputation are the best advice for new managers. Most fee-fishing operations stock 4,000 to 6,000 pounds per acre but research in Georgia has shown that stocking densities as low as 2,000 pounds per acre do not affect catch rates. Fish bite best the first few weeks after stocking. Fish become "hook-shy" over time if left in the same pond; therefore, fish should be periodically seined and moved to other ponds or removed altogether (i.e., processed, etc.).

Feeding of fish, at least at maintenance levels (i.e., ° to 1% body weight) will both maintain the health of the fish and improve catch rates. Fish can be fed every other day or three times per week to reduce labor. Winter feeding is also important to maintain the health of the fish. Fish are probably best fed in the evening, after closing, as long as aeration can be provided as needed through the night. Most fee-fishing operations do not allow the use of minnows or other live fish as bait because of the potential for their release and colonization of the ponds (to the detriment of the desirable species).

Management of water quality in fee-fishing ponds should be similar to any aquaculture facility for that specie. Probably the most commonly recommended or

needed water quality management strategy is maintaining dissolved oxygen above 3 ppm by utilizing mechanical aeration. Many fee-fishing managers have no understanding of dissolved oxygen or water quality dynamics and this offers extension agents and specialists an opportunity to assist them in improving the management and profitability of their operations. Off-flavor is another water quality related phenomenon that is all too common in newly stocked fish, and managers need to learn how to test for off-flavor and manage accordingly.

Restrictions on fishing or other water uses severely limit the utilization of herbicides to control aquatic weeds in fee-fishing operations. Therefore, grass carp (or white amur) are the best alternative in states in which they are legal. Establishing a phytoplankton bloom or applying herbicides early in the season (March or April) before the fee-fish operation opens to the public is another viable management strategy for control of aquatic vegetation.

Predisposed stress or stress due to handling and hauling causes many diseases to appear at fee-fishing operations. Fee-fishing operators must learn to watch for the signs of stress and disease at the hauling truck and in the ponds. Correct diagnosis is another problem at fee-fishing establishments, and managers need to work closely with a qualified diagnostician and precisely follow treatment procedures and withdrawal time on antibiotic treatments.

Finally, fee-fishing managers need to keep good records. These records should include stocking times and rates, catch or removal rates, feeding rates, water quality measurements, and stress or disease problems for each pond. Without adequate records it becomes virtually impossible to manage fee-fishing ponds successfully (i.e., for good catch rates and customer satisfaction).

DEVELOPMENT AND MANAGEMENT OF FISHING LEASES

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Abstract: The popularity of developing sportfish leases is increasing rapidly in the South, much as development of hunting leases has done over the past three decades. This trend is occurring because an increasing number of: (1) landowners realize that their ponds and reservoirs are valuable resources capable of generating additional profits and (2) anglers desire a level of exclusivity not normally available on public waters. A sound economic evaluation of sportfish leasing opportunities is essential if landowners are to identify their most profitable alternatives. Net present value analysis is recommended as one method for evaluating compared profitability of selected investment and leasing strategies. Case studies are presented to illustrate analyses where sportfish leasing is the sole recreational lease and where sportfish leasing is viewed as a value-added amenity when combined with a hunting lease. Key economic values directly affecting the profitability of sportfish leasing alternatives include investment costs, lease rate, annual operating costs, interest rates, and desired rate of return on investment.

INTRODUCTION

Leasing of hunting rights to generate income for landowners has become a common practice in most southern states. However, leasing of fishing rights largely has been limited to "fish-out ponds," where channel catfish, rainbow trout, or other species are stocked at high densities in specially designed (aquaculture) ponds. Other fee fishing systems include day and long-term leasing of ponds and reservoirs for sport fishing. The popularity of fishing leases as farm or ranch enterprises has not kept pace with hunting leases largely because water resources held in the public domain have been more available compared to state and federal land for sporthunting.

Nevertheless, a new trend involving fee fishing is slowly developing across the South. An increasing number of landowners that lease hunting rights are realizing that ponds and reservoirs on their property are valuable resources with the potential to generate additional profits.

Properties with sportfishing opportunities should be more valuable than lands leased for hunting alone depending on the profitability of sportfish leases. A survey of Texas hunting leases reported that ponds were present on nearly a third of the ranches.

Furthermore, fishing was considered a popular recreational activity on 18% of all Texas hunting leases. Results of a 1985 survey by the U. S. Fish and Wildlife Service indicated that while 16.7 million adult Americans hunted, over 2½ times that number (46.6 million) went fishing.

Demand for opportunities to lease sportfishing rights is expected to increase as the number of American anglers increases. It has been reported that the real demand for fishing is more than twice the real demand for hunting among Texans. Furthermore, anglers reported that on average they would take almost twice as many trips as

hunters. Anglers were willing to take five trips at an average of 125 miles/trip, while hunters were willing to take three trips at 250 miles/trip.

Sportfishing as an income generating enterprise in combination with hunting leases recently has begun to interest some landowners. This is especially true on properties that are not capable of supporting hunting recreation because of limited tract size, urbanization, etc. An increasing number of pond owners have realized that there is a demand for quality sportfishing opportunities. Much of the demand for leased fishing rights results from increased fishing pressure on public waters, decreased construction of new reservoirs, desire for exclusivity, and reasonable expectations of catching fish.

The most important ingredient to successfully leasing private waters for sportfishing is proper management of fish populations to ensure they remain at levels capable of supporting reasonable harvest rates. The increasing interest in catch and release fishing enhances the opportunities for more anglers to share the available fisheries resources. Catch and release also is consistent with anglers' desire for exclusivity and expectations of catching fish.

MANAGEMENT

Major steps involved in sportfish leasing include locating lessees, establishing the terms of the lease, and drawing up the lease agreement. Landowners offering fishing rights based on a management plan of "there's the gate and here's the key" will seldom be successful. Careful consideration of expected revenues and costs of starting a sportfish leasing program will provide reasonable expectations for profit. Landowners will have to plan carefully their leasing enterprise to match resources, demand, and profit expectations. For instance,

sportfisheries emphasizing trophy size fish receive considerable publicity, yet surveyors report trophy fishing ranks low as a motivation to go fishing.

Larger ponds and reservoirs offer more options for managing fish populations. For example, a landowner with a 10-acre reservoir is better equipped to manage exclusively for largemouth bass than a landowner with a 1-acre pond. Even though a market may exist for a target species such as largemouth bass, landowners might consider that other species such as channel and blue catfish, sunfish, crappie, and even rainbow trout may be compatible, appeal to a broader range of clientele, and offer increased angling opportunities.

Marketing is an important responsibility managers face in operating successful fishing leases much as it is for successful hunting leases. Landowners successfully leasing private waters for fishing will offer unique experiences at reasonable prices. This experience will be something that is not readily available or accessible to the general public. Careful evaluation of direct competition from other leasing operations, of alternatives anglers have for fishing in public waters, and of the number of potential lessees is necessary.

Lease fees received by landowners consist primarily of various input costs and returns to landowner labor and management. Investment costs may vary from one-time expenses such as pond construction or improvement to annual operating input costs including fertilizers, labor, chemicals, etc. Many landowners will be leasing fishing rights on existing ponds or lakes and not be incurring actual costs involved in pond or reservoir construction.

Three management strategies are important to developing fisheries on private lands: 1) appropriate stocking rates and species balance; 2) control of noxious aquatic vegetation; and 3) fertilization to increase carrying capacity. Other important operational activities include water quality maintenance, fish attractor construction/maintenance and fish population surveys conducted by a professional biologist. Additional expenses may include security, liability insurance, and a portion of the property's ad valorem taxes.

VALUE-ADDED AMENITIES

In addition to the basic input costs previously mentioned, additional amenities that are often provided to clientele include service-related items such as boats and motors, fishing tackle, guide services, meals, and lodging. These value-added items increase the cost of the lease, but are often desired by clientele. The landowner establishing a profitable leasing enterprise must determine in advance the extent that potential customers are willing to pay for value-added amenities. It is important to ensure that revenues exceed costs of establishment and operations for the enterprise to be profitable.

ECONOMIC ANALYSIS

The potential profitability of investing in a sportfish lease enterprise should be evaluated prior to start-up in much the same way as any long-term investment with expected returns during future years. Net present value (NPV) analysis is an appropriate economic tool for estimating the profitability of establishing a sportfish leasing enterprise while accounting for the long-term nature of the investment. NPV also accounts for the time value of money or, in other words, the earning potential money has if placed in an interest-paying account.

For example, the value today of a contract promising to pay \$100 after 5 years is \$68.05 (assuming money would earn a real rate of 8% interest in an alternative investment). On the other hand, a \$68.05 investment today at 8% (real rate compounded annually) interest would grow to \$100 at the end of 5 years. In other words, a person would be indifferent between having \$68.05 today and \$100 5 years in the future with the opportunity to earn an 8% real rate of interest.

The discount (interest) rate used in estimating NPV is determined by several factors, including the landowner's goals, expected return of alternative investments, level of risk involved, and prevailing inflation rate. It also is appropriate to consider opportunity costs in economic evaluations and in establishing the discount rate since other activities may be negatively impacted by the decision to lease part or all of the available fishing rights.

For example, a landowner facing costs and revenue in Table 1 for an existing 10-acre pond receives more than the 8% real return on investment included in the NPV analysis, as indicated by the positive NPV estimate. In this example, the lease fee could decrease to \$902 before the landowner begins to realize an 8% return on investment. If the 10-acre lake was located on a 1,000-acre hunting lease, the \$1,250 annual lease fee for fishing rights might be included with the 1,000 acre hunting lease by adding \$1.25 per acre to the original hunting lease charge.

MARKETING AND PROMOTING SPORTFISH LEASES

Outdoor recreation experiences consist of five parts: planning and anticipation, travel to activities, on-site activities, travel from activities, and recollection of experiences. All of these elements are important to successfully marketing the fishing enterprise.

Marketing consists of matching the resources of an operation with the needs and desires of the clientele. However, marketing a recreational enterprise differs from marketing traditional commodities such as crops, livestock, and timber. Landowners interested in marketing

Table 1. Example net present value (NPV) analysis of sportfish leasing on an existing 10-acre lake¹.

Item	Years				
	Start Up	1	2	3	4
Revenue-Lease Fees	\$1250	\$1,250	\$1,250	\$1,250	\$1,250
Fingerlings	700				
Fertilizer	150	150	150	150	150
Lime	40	40			
Herbicide	200	200	200	200	200
Labor	250	250	250	250	250
Taxes	30	30	30	30	30
Insurance	100	100	100	100	100
Net Income	(220)	250	520	520	520
NPV ²	\$1,502				
Breakeven lease price ³	\$902				

¹Assumptions used in creating this example include: 1) lease fees collected at the start of each year to eliminate borrowing operating capital; 2) start-up costs are assumed to be on owner capital contribution; 3) operating costs are incurred at the beginning of each year; 4) NPV calculated using an 8% real rate of return; and 5) lake contains fish populations but supplemental stocking of Florida bass and channel catfish fingerlings is planned.

²NPV = current value of future net incomes minus initial start-up costs.

³Lease price at which NPV equals \$0.

sportfish recreation will deal with a "non-standard" commodity and will, more likely than not, deal directly with clientele (marketing retail).

If on-site lodging is available and/or the property is close to an urban area, landowners may want to employ a lease of limited duration (i.e., day, weekend, or week). However, if landowners do not desire a high degree of contact with the public or cannot provide lodging, a season-long or year-round lease may be preferred. Each landowner must determine the marketing strategy that best suits the individual situation.

Many people mistakenly believe that marketing is just another word for advertising. Promotion of sportfishing recreation as a commodity is based on the principle that the product is inherently desirable and that consumer familiarity is all that is missing from the marketing mix.

Promotion can take on many forms, only one of which is advertising. Personal selling by landowners and word of mouth by satisfied customers are two very effective ways to promote leasing arrangements. Advertising techniques that have proven successful for hunting leases also apply to sportfish leases. Word of mouth, local news, and Chambers of Commerce are primary sources of advertising for hunting and fishing lease information. Other successful advertising techniques include, but are not limited to, magazine articles, television, radio, sports shows, trade journals, and direct mailouts.

LEASE AGREEMENTS

In order to prevent misunderstandings and clearly define the terms of the sportfishing lease, a written lease agreement should be developed by the lessor and signed by both parties. With obvious modifications, many considerations included in hunting leases can be used as a basis for developing written sportfishing lease agreements. Deer lease agreements include duration of the lease, description of the lease tract, access, species available, hunting methods, density of hunters, price, payment schedule, use of facilities, lease transferability, and rights of renewal of the lease.

Although it is possible to prepare a written sportfishing lease on your own, it is recommended that you consult your lawyer during the actual drafting of the document. Money paid for such services may well prevent potential legal problems. It also is important that at least two copies of the lease are prepared and properly signed; one copy for the landowner and the other for the lessee(s).

LANDOWNER LIABILITY

As with hunting leases, landowners must address the issue of liability whenever sportfishing rights are leased. Landowners leasing sportfishing rights should include a "hold harmless" clause in a written lease agreement that protects them from liability and makes lessees responsible

for damage or accidents. Since hold harmless clauses are not infallible, landowners should consider extending insurance coverage or requiring lessees to purchase liability insurance that covers both parties.

SUMMARY

Although the leasing of sportfishing opportunities is a relatively new enterprise compared to hunting leases, management and marketing concepts are similar. Landowners interested in marketing sportfishing recreation must wear two hats: the hat of a fisheries manager to maintain suitable fish populations and the hat of a successful business manager to maintain positive cash flows and profitability while working with clientele.

Unfortunately, many individuals are accomplished and comfortable in one of these roles, but lack the skills or interest to be attentive to the other. The success of sportfishing operators depends upon a well-thought-out, detailed, and written management and marketing plans. The intense competition that exists today for the public's recreation dollar almost ensures that those depending on blind luck will not succeed. The availability of quality fishing is an important component of a sportfish recreation enterprise. However, it is only one part of the entire recreational experience.

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Aquatic Exotics: the Good, the Bad, and the Ugly

Editor's Note: Three papers were presented in the aquatic exotics concurrent session, but only one paper was submitted for publication in the proceedings.

The following titles were presented in the session but not submitted for publication:

Dennis Lassuy, U.S. Fish and Wildlife Service—Finfish
James Shelton, University of Georgia—Shellfish

EXOTIC AQUATIC PLANTS—SOME GOOD; SOME BAD

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Aquatic plants, like all other plants, may be weeds in one location and a source of income and therefore coveted in another location. Introduction of exotic aquatic plants to the United States has always proceeded at a rapid rate. Many plants were brought in for horticultural or agricultural purposes. A greater number of aquatic species were brought in as aquarium plants and then accidentally or purposely introduced into the wild as a future source of income. A much lesser number have been introduced into natural waters from ballast pumpage. Most are of tropical or semi-tropical origin and initially were confined to waters in Hawaii, Florida, or California. Expansion of their range to other states has progressed until many exotic aquatic plants have become both a problem to water managers and a source of profit to the aquarium industry.

As a rule exotic plants are not considered pests unless they are highly invasive. It is generally recognized that the nonindigenous aquatic plant species which are most invasive include hydrilla (*Hydrilla verticillata*), Eurasian watermilfoil (*Myriophyllum spicatum*), waterlettuce (*Pistia stratiotes*), alligatorweed (*Alternanthera philoxeroides*), parrot-feather (*Myriophyllum aquaticum*), egeria (*Egeria densa*), and waterhyacinth (*Eichhornia crassipes*). The latter is recognized as the world's worst aquatic weed and in many areas the most prolific.

Very few aquatic plant species are reported to have been accidentally introduced. These are usually from ship's ballast and include waterlettuce, alligatorweed, and salvinia (*Salvinia minima*). Horticulturists are credited with the introduction of the waterhyacinth for its showy flowers. Hydrilla, egeria, parrotfeather, Eurasian watermilfoil, limnophila (*Limnophila sessiflora*), and hygrophila (*Hygrophila polysperma*) were all introduced by the aquarium trade and often sold as oxygenators. In areas where water conditions are favorable and the native vegetation is disturbed, these invasive species rapidly become the dominant species.

FLORIDA

The best current book on the situation in Florida is *Nonindigenous Aquatic and Selected Terrestrial Species in Florida* by McCann, Arkin, and Williams. The authors present a well-balanced and in-depth review. Most aquatic biologists and the general public are unaware of the magnitude of the aquatic plant industry. In Florida alone over 1,000 entities engaged in collection, culture, sale, research, or restoration are recognized and catalogued. The same information is not available for other states, but if retailers are included most states have at least ¼ to ½ of this number. A cursory check of a major wholesaler in the Houston area indicated shipments to 44 different states. This indicates the possibility of rapid transport of most plants to any place in the nation within 24 hours. This ease of transmission makes control of problem species possible only with the cooperation of the aquarium industry. Unfortunately many of the "supermart" type stores use personnel without training in identification of problem species. Therefore, sales are made on the basis of how "pretty" the plants are or will be. Then the aquarium or ornamental fish pond owner cultivates the plants until they exceed the needs of the system or the system is terminated. In these instances, the closest water course is the recipient of unwanted plants. In this way plants get spread throughout many ecosystems with no concern about potential harm.

The rapidity of spread of an introduced species is determined by factors such as speed of growth, multiple reproductive methods, and tolerance to a variety of water conditions. In addition the density of the native aquatic plant community and the stress or disturbance of the system may favor the introduced species over the endemic species. Control measures have traditionally been expensive, ongoing, and of limited effectiveness. It has been reported that between 1980 and 1991 over \$98

million was spent in Florida public waters for the control of waterhyacinth, waterlettuce, and hydrilla. Other plant control efforts have been less expensive but nevertheless the total costs are quite high.

CALIFORNIA

Based on information from Mr. Nathan Dechoretz of the California Department of Food and Agriculture, the only two aquatic plants giving serious problems in that state are alligatorweed and hydrilla. They recognize that both of these are potentially of great economic consequence. Therefore, they have devoted massive efforts to eradicating any infestations found. Their annual report indicates they are spending in excess of \$2 million per year to eradicate these two species, which is more than all other plant eradication efforts combined. Further discussion indicated that purple loosestrife, *Lythrum salicaria*, and yellow water lily, *Nymphaea mexicana*, are minor problems in localized areas.

The eradication effort on hydrilla in Lake Murray, California has centered on quarantine and denial of public access to control spread of the plant. Dredging and mechanical removal by hand was practiced, and in 1994 the stand was marked eradicated after no plants had been found for 3 years.

Chemical applications and drawdowns have been used on other lakes, including Clear Lake and the All American Canal system. More recently the Imperial Valley Water system has become infested, and this is being partially controlled using triploid grass carp at rates of 100 fish per mile of flowing system and 100 fish per acre in ponds. In addition chemicals (Komeen and Mariner), mechanical (mud pumps, draglines, and backhoes), cultural (drawdowns prior to treatment and excavation), plus physical (roguing by hand and shovel) are being employed. At this time they expect to eradicate the hydrilla by the end of 1996.

At this time California is reporting only six counties, Imperial, Shasta, Calaveras, Madera/Mariposa, Tulare, and Lake, with active populations of hydrilla. All of these are being treated with chemicals, triploid grass carp, and/or drained. Success in controlling hydrilla in California is apparently due to their ability to quickly respond to new infestations. This includes delimiting the infestation, quarantining the water body to reduce spread, and a rapid response to stop the plant from production of tubers.

HAWAII

The best information that I have found on exotic aquatic plant introductions into Hawaii is contained in *Perspectives in Aquatic Exotic Species Management in the Pacific Islands*. Volume 1 entitled *Introductions of Commercially Significant Aquatic Organism to the Pacific*

Islands was written by L. G. Eldredge and was published by the South Pacific Commission. An interesting paragraph indicates "To these is added a newly recognized period: The past decade, when greater westernization and more affluence allowed for the development of the aquarium-ornamental aquatic plant and animal industry. Presently, this is seen in only a few islands—Guam, Saipan and Oahu (Hawaii)—but should be a warning for other developing areas. During this period numerous aquarium organisms have 'escaped' into ponds and streams, becoming established." The paper goes on to document the numbers and extent of these arrivals and those now established.

Munro in 1993 reported that for Hawaii, the number of introductions for commercial aquaculture with subsequent escapees has not been overly detrimental. This is apparently due to the fact that commercial aquaculture is more or less confined to red algae, pearl oysters, and penaeid shrimps. In contrast the release of aquarium or ornamental plants provides many examples of destructive results from decline of native animals, alteration of the environment, and introduction of new diseases and parasites. By definition most freshwater aquarium organisms are intentionally introduced. Though legislation controlling importation exists, enforcement is often lacking.

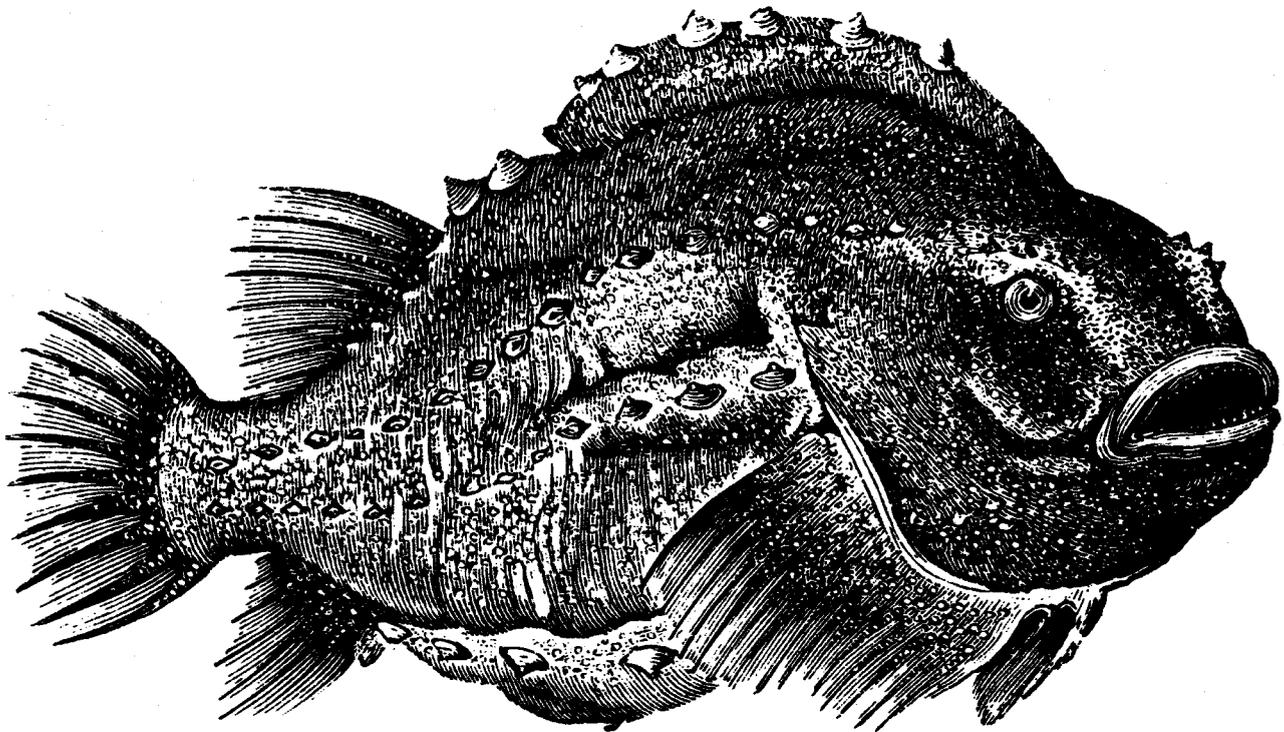
Eldredge indicates that 17 species of macroalgae have been introduced to Oahu, and two have displaced native species. *Hypnea musciformis* has been the most disruptive introduced species. He states "The majority were deliberately transplanted for commercial interests for chemical or agar production; two were accidentally carried in oyster shipments. . ."

BIOLOGICAL CONTROL

The advantages of using biological control agents have been discussed in many workshops. These include (if the organism is safe and effective) longevity, constant effort, low costs, possible selectivity, and for some species the possibility of a desirable food product. Chemical or mechanical methods, though more traditional, have been limited in long-term efficacy. In addition the labeling of new aquatic herbicides by the Environmental Protection Agency has become more complex and costly to pursue. It is generally recognized that the time and resources required for evaluation, testing, and gaining approval of a biological control agent for release into the field is also considerable. At this time biological control agents are either available or being tested for alligatorweed, waterlettuce, water hyacinth, hydrilla, Eurasian watermilfoil, parrotfeather, hygrophylla, and limnophila.

SUMMARY

Many aquatic plants have been introduced into the United States with a limited amount of investigation of undesirable traits. This should be rectified. At the same time there is a tendency to brand all exotics as bad, and ignoring the fact that many domesticated animals and food plants in use in the United States are exotics. As Extension specialists we must be aware of the dangers of poorly-thought-out introductions, but at the same time we must be open to the possibilities of improved plants and animals for the public that we serve.



Continuing Education for Adults and Youth

Editor's Note: Six papers were presented in the continuing education concurrent session, and three were submitted for publication in the proceedings.

The following titles were presented in the session but not submitted for publication:

Will Cohen, Texas A & M University—Wildlife Mini-grants: a Concept Paper

Jim Pease, Iowa State University—Building Coalitions for Environmental Education

Edwin Jones, North Carolina State University—Status of the Wildlife Habitat Judging Program

NATIONAL 4-H SPORTFISHING PROGRAM

CATHERINE A. ELLIOTT, University of Maine Cooperative Extension, 5755 Nutting Hall, Orono, ME 04469-5755

In May I went to the Cornell Biological Field Station with nine volunteers from Maine to attend the pilot training for the National 4-H Sportfishing Program. While I was there, Ron Howard, chair of the program development committee, asked if I was coming to this meeting, and if so, would I speak about the sportfishing program. In the euphoria of the moment, I said yes, then immediately began to wonder why I had said yes.

Although I live more than 50 miles from here, I am giving this talk without slides and I haven't been fishing for over 25 years, so I hardly qualify as an expert!

At the opening session of this conference we heard Holly Davis give us her very eloquent perspectives—in John's Munn's words, her song. That reminded me of the two young people who spoke in New York about how their experiences with New York's sportfishing program has affected them and changed their lives—had given them their song. Then I realized that I really have two messages today—one is about 4-H Sportfishing, the other is about helping young people find their song. And even as adults we can learn a new song. When it comes to fishing, I am still just humming, but I am working on it.

Until early April, I had no intention of going to New York the first week of May. We have a 4-H specialist whose first love is fishing; he had made all the arrangements, assembled the team, was ready to go, and then decided to retire! A faculty member was needed to go along with the van load of volunteers. Fish are wildlife, right? I can assure you that I was not even humming at that point!

During, and before, this time, I was working on writing part of Maine's next Plan of Work. In writing the situation statement for the Environmental Quality Issue, I came across some of the research that has looked at the life-changing influences and events that have led people to becoming active conservationists. Two factors consistently surface: time spent in a "beautiful" outdoor place, usually over an extended period of time; and the

influence of a caring adult. Hearing Holly's story, and those of the two young men in New York, reminded me of that research, and brought the realization that we all have the potential for doing magic—for being that adult, for being the influence that changes the course of a young person's life. It's not just about teaching a child to fish, or name trees, or understand ecology, it's the magic in helping a child find their song. The 4-H Sportfishing Program is the newest of our tools for doing magic. Along with Ron Howard, the members of the program development team include Shari Dann, Bruce Matthews, Andy Martin, Sharon Rushton, Lonnie Nelson, George Babey, Jim Miller, and Allen Smith. My apologies to anyone I missed! There have been many other folks involved in writing the curriculum, which is currently about 3 inches thick. The final version is due out this fall. The major sponsor of the program is the American Sportfishing Association (ASA). You may also be familiar with their educational arm, the Future Fisherman Foundation that sponsors the program Hooked on Fishing, Not on Drugs. ASA is providing the resources and expertise, 4-H is providing the structure, delivery method, and access to kids, as well as considerable expertise. The program, unlike most other youth fishing programs, is designed to be a long-term, mentor-based, and community-based program. The New York workshop, for the northeast region, will be followed by one in Michigan, June 8-14, 1997, for the northcentral region, then a third in 1998 for the south central region, and a fourth in 1999 in the west. For information about the Michigan workshop, contact Shari Dann.

During the 5-day workshop, two team members attended sessions in one of five skill areas. Aquatic Ecology and Biology included topics such as food webs, cycles, adaptations, habitats, management, fish biology, limnology, oceanography, and careers. Tackle Crafting involved learning about hooks, knots, jigs, spinners, plugs, spoons, flies, creels, and rods, and how to build and

maintain them. Woodworking and sewing projects are also included, and everyone had fun making fish prints. Angling Skills covered factors related to successfully getting kids fishing, as well as spin-casting, spinning, bait-casting, and fly-casting skills. Both salt and freshwater skills were included, and even some ice fishing skills for folks in more northern climes. Where to fish and what to fish for were followed by how to handle and prepare your catch.

Ethics and Fisheries Management covered laws, ethics, and the gray areas in between. Population estimates, catch rates, fisheries and watershed management, historical, cultural, and social perspectives, and economics were some additional topics. Last, but not least, the Team Coordinators learned about all the things that go into a successful program, from effective leading, teaching, and coaching for different learning styles, to planning a program and doing fund raising. Working effectively with volunteers was another important topic, as were recognition and rewards, and program evaluation. All team members got to try their hand at being teachers during a peer teaching session.

Each team, from the 11 states attending, was also challenged to develop an implementation plan to help guide us upon our return to our states. Team meetings

weren't always my favorite part of the day, but we did get our work done and have a plan that included training more trainers, and doing a workshop for volunteers next spring.

As you can well imagine, we didn't work all the time! Fishing Olympics (how fast can you tie a clinch knot blindfolded?), opportunities to try out fishing rods and reels, a banquet, awards for everyone, and an auction provided a fun way to get to know folks from other states. All in all a very busy week, a great learning and teaching experience.

So, by the end of the week, I was beginning to hum a little. I had had a fly casting lesson and I had tied three flies—all firsts for me. I had decided that not being an expert will actually work in my favor as we get this program going in Maine—it's easier to ask questions when you aren't expected to have any of the answers! Although I don't have expertise in fishing, I do have a great team of volunteers to work with, a great curriculum (that will be in final form and on my desk this fall, right Ron?), and a belief that I, and you, can make a difference in the life of a child.

I encourage you all to get involved, in whatever way you feel comfortable, and maybe even push yourselves a little. You might just learn a few new words to your song. And best of all? It's fun!!

PROFESSIONAL SOCIETY, STATE AGENCY, AND EXTENSION PARTNERSHIPS NEEDED FOR FORMAL CONTINUING EDUCATION OF WILDLIFE PROFESSIONALS

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INTRODUCTION

While professionals readily desire continuing education programs to sharpen and update their skills, distractions, demanding schedules, lack of employer support, and expense often create barriers for regular continuing education attendance. Many professions such as accountants, pharmacists, and lawyers have a formal certification criteria which requires post-graduate testing to obtain certification and then participation in continuing education to maintain certification. The prestige of becoming a CPA, a licensed engineer, or a member of the bar carries an assurance of a certain level of competence and often translates into higher salaries for those who have achieved it. Therefore, there is a motivation to obtain this certification and to obtain the continuing education requirements necessary to maintain it.

Unfortunately, the wildlife profession does not have this formalized structure. Certification can be obtained by merely proving successful completion of an approved array of courses. There is no accreditation of schools from where these courses are offered and no assurance of competence for those completing this coursework. In addition, once certification is obtained, there is no continuing education requirement to maintain certification. Besides creating very little incentive or prestige for certification, there is little incentive for individuals to seek and participate in formal continuing education activities.

The Society of American Foresters (SAF) is similar to the Wildlife Society in that they do not require post-graduate testing to obtain certification. However, they do require graduation from accredited programs, and experience is required in order for individuals to become certified. A continuing education requirement of 60 credit hours in 3 years is needed to maintain certification. Prior to their certification program, SAF required graduation from an accredited school to obtain full SAF membership. SAF also has a voluntary continuing forestry education and professional development recognition program (CFE program), which is similar to the Wildlife Society's Professional Development Program. Both programs are voluntary, and both societies issue certificates to recognize a required amount of continuing education credits within a specified period of time. The difference seems to be in the level of participation in the two programs. In Indiana, over 70% of active SAF members regularly attend in-state CFE programs and meet certificate requirements. Since 1993, 7 members have earned 11 CFE certificates. Only

three Indiana members of The Wildlife Society have participated in and obtained the Professional Development Certificate. The primary employer of foresters and wildlife biologists (Indiana DNR) does not offer a hiring or pay incentive for those participating in these programs. Therefore, the primary difference in participation rates appears to lie in the responsibility of the state chapter of the society in monitoring and recording an individual's progress towards this certificate.

The SAF CFE program is managed at the state society level by an SAF CFE contact. Primary responsibilities include: 1) evaluation and approval of continuing education activities held within the state, 2) thorough examination of all applications for CFE certificates from applicants in the state society, 3) forwarding of approved applications to the national office, 4) promotion of CFE programs and continuing education opportunities to foresters and employers, and 5) direct and continuing contact with the state education or continuing education committee.

PROFESSIONAL SOCIETY PARTNERSHIP

Purdue University Department of Forestry and Natural Resources began a formal continuing education program with the Indiana Society of American Foresters in 1986. This partnership resulted in extension personnel in the Department of Forestry and Natural Resources organizing and conducting four CFE continuing education programs per year. Advertisement and registration is conducted by the state Chapter of SAF. The chapter has a continuing education committee which polls its members and determines the next slate of programs to be offered. Extension personnel have responsibility and control of program quality and content. The SAF CFE contact determines CFE credit qualifications for each program and maintains all records.

The Indiana Chapter of The Wildlife Society did not have a parallel program for continuing education offerings. Initial attempts to establish a program in the late 1980s were unsuccessful due to lack of commitment by the key employer (IDNR) and restricted travel funds available to state employees. In 1993, a former president (Dean Zimmerman) of the Indiana Chapter of the Wildlife Society formed a continuing education committee for the state society. A partnership was developed between the Indiana Chapter of the Wildlife Society (ICTWS) and the Purdue Department of Forestry and Natural Resources

whereby the extension wildlife specialist (EWS) would be responsible for developing all educational programming (selecting and inviting speakers, selecting field tour locations, developing all handout materials, producing all program announcements, final programs, distributing all program publicity, printing all nametags, providing all AV equipment needed, and assisting with meeting logistical arrangements). ICTWS was responsible for selecting desired workshop topics, collecting registration fees, paying all bills associated with the workshops, and assisting with meeting logistical arrangements. An initial survey was distributed to all ICTWS members, which determined the demographics and willingness of members to participate in a formal continuing education program.

SURVEY RESULTS

A continuing education survey was distributed to approximately 90 professional wildlife biologists in Indiana at the Spring meeting of the Indiana Chapter of the Wildlife Society (ICTWS) 5-6 March 1992. The balance of the 120 members of ICTWS not able to attend the meeting were notified of the survey through the January ICTWS newsletter. Sixty (60) surveys were completed and returned.

The top four desired workshop topics identified in the survey (in priority order) were:

1. Comprehensive Wetland Workshop
2. Changing Agricultural Practices
3. Recent Changes in Wildlife Management Ideas
4. How to Positively Influence the Public

The demographic profile of respondents was as follows: Seventy-five percent are IDNR Division of Fish and Wildlife employees. About 1/3 (38%) are administrators, 60% hold bachelor's degrees, 28% have a master's degree, and 8% have Ph.D.s. Respondents averaged 13.7 years experience and have been out of school for an average of 14.5 years. Ninety percent are members of ICTWS, and 63% are members of the National Chapter of TWS. Seventy-eight percent are currently qualified to become certified or associate wildlife biologists or have obtained certification.

The two methods used most frequently by respondents to keep up-to-date in their profession in order of importance are scientific journals and professional and technical meetings. Conference proceedings, workshops, lectures, and seminars were of medium importance used by 43%-63% of respondents. The most important professional journals (in order) are JWM, Wildlife Society Bulletin, USFWS Research reports, and in-service publications and reports; journals were read an average of 3.5 hours on the job and 2 hours off the job per week.

Continuing education programs are strongly supported (avg. 4.75 on a 5.0 scale). However, respondents felt their employer considered continuing education programs of

medium importance (avg. 3.3 on a 5.0 scale); 52% did not know how many days per year they were permitted for continuing education activities. In spite of this, 100% said they would attend one workshop per year. Sixty-five percent would attend on their own time, and 63% would attend without per diem. The best time for a workshop is a weekday (73%) in the winter (63%); 43% would support registration fees of \$40-\$60, while 80% would support registration fees ranging between \$20-\$40.

Professional dedication and the commitment to personal improvement is obvious. However, the lack, or perceived lack, of employer support for continuing education and professional improvement is also apparent. It was clear that if ICTWS wished to initiate a regular continuing education program, clarification of the major employers' attitudes, level of support, and policies on this issue needed to be sought and publicized to the respective employees before the workshop series was initiated.

AGENCY PARTNERSHIP

Meetings were initiated between the Indiana Division of Fish and Wildlife (DFW) Administration, ICTWS Continuing Education Committee, and the Extension Wildlife Specialist. Survey results were presented, and potential alternatives for DFW support and endorsement of such a program were discussed. The DFW had a training officer who provided required training (e.g., Total Quality Management, blood-borne pathogen training, training on the American Disabilities Act, etc.) for division personnel. The division had a training budget which was separate from (and larger than) their travel budget for employees. Previously, all expenses for DFW employees to attend a ICTWS meeting or event were paid from travel funds. Due to funding limitations, employees were limited to one meeting per year and selected the ICTWS Spring meeting as their choice event. These meetings usually contained an educational program with invited speakers and a technical paper session from volunteer contributors. However, these events did not provide concentrated training on a selected subject. The DFW recognized that they needed to include training on critical wildlife-related topics to round out their training program but did not have the manpower to conduct such an effort. All parties recognized that a partnership between the DFW, ICTWS, and Purdue University would provide an ideal arrangement to suit everyone's needs.

DIVISION OF RESPONSIBILITIES

In order for the DFW to use training funds for workshop activities, they had to enter into a formal arrangement with one entity who would provide the training activity and were required to write one check for this activity. The ICTWS served as the organization formerly charged with providing the training. The

ICTWS then "subcontracted" with Purdue University to provide the educational component of the training sessions. The EWS worked closely with the ICTWS continuing education committee to design a workshop on a topic selected by the committee (with input from all members of ICTWS). Once the topic was selected and a general workshop outline developed, it was the responsibility of the EWS to invite speakers, design sessions and handout materials needed to conduct the workshop. The education committee and the EWS divided responsibilities for logistical arrangements. These two parties worked together to establish a registration fee to cover the cost of all meals, lodging, and workshop costs. However, in order to accomplish this, an estimate of attendance was needed. The EWS worked with the DFW training officer and provided a draft program for the training session fees and a ballpark estimate of the registration fee required. The training officer then polled all employees of the DFW to determine interest levels in this proposed workshop and provided a minimum attendance number to the EWS. This number was then used to calculate the final registration fee. A final workshop brochure was then printed and mailed to all ICTWS members and other appropriate mailing lists within the state. Any non-DFW employees were instructed to mail their registration fees directly to the ICTWS and were responsible for making their own lodging arrangements. All DFW employees registered for the workshop through their training officer. He provided a final list to the ICTWS, who then made lodging arrangements for all involved and had these rooms direct-billed to ICTWS at the conclusion of the workshop. Meals for all attendees were included in the registration price.

This arrangement allowed the DFW to enter into a turnkey contract with one organization to provide a complete training session for their employees. The ICTWS served as the agency that then subcontracted for all other needed services, (lodging, meals, and educational programming.) This also provided the ICTWS with an opportunity to provide regular continuing education training to the rest of its members and ensured a stable level of attendance on which to base registration fees and logistical arrangements. In addition, incentives were provided to the ICTWS to do a good job of publicity and quality assurance for the workshops. If attendance exceeded expected levels, excess funds could be collected. These funds were then placed in a Continuing Education Fund and used to conduct other educational activities conducted or sponsored by the ICTWS.

WORKSHOPS CONDUCTED

Initially the agreement between DFW, ICTWS, and Purdue University was to provide one formal continuing education program per year. It was agreed that if special needs arose or if interest increased, that additional workshops would be conducted. In 1993 and 1994 one workshop was conducted on topics selected by ICTWS membership on the initial survey (Table 1). In 1995, the selected workshop topic of "Increasing the Awareness and Knowledge of Natural Resource Issues with the Public, Media and Legislature" was selected by the membership at the 1995 spring membership meeting. Beginning in 1995 the ICTWS joined forces with ISAF and developed workshops that were included in both societies' formal continuing education series. This partnership ensured higher attendance, provided interaction between foresters and wildlife biologists, focused the attention of both disciplines on a common topic, introduced experts around the region on selected topics to these natural resource professionals, and focused both wildlife biologists and foresters on looking for ways to cooperatively manage for common resources. Primary responsibility for the workshops alternated between the two societies. Proceeds or losses for cooperative workshops were divided evenly. The cooperative arrangement with the ISAF is not permanent. The decision for cooperative workshops are topic driven and will change as different workshop topics are selected.

RECOGNITION AND INCENTIVES

While attendance in these workshops has been good, no formal recognition or incentives for continuing education participation are in place for the wildlife professionals in Indiana. While some argue that personal desire for excellence should be incentive enough to drive individuals to seek out and participate in continuing reeducation activities, no mechanism is in place to distinguish those who take the initiative to update their skills from those who don't. This is important when individuals are representing themselves to employers or prospective clients. While it exists in many other professions, it is absent in the wildlife profession.

In 1995, the ICTWS created a Certification and Continuing Education Credit (CCEC) committee. This committee was combined with the old certification committee. Discussions were then initiated with the main employer of wildlife professionals in Indiana (DFW). Potential incentives discussed included pay raises, preference for travel to meetings, or some form of formal recognition. While this definitely helps DFW employees, it does not apply to ICTWS members employed by other organizations. The CCEC committee is developing a survey to all ICTWS members to solicit ideas and opinions on how the chapter might structure continuing education

Table 1. Formal continuing education workshops conducted by the Indiana Chapter of The Wildlife Society

Year	Title	Sponsorship	Attendance
1993	Comprehensive Wetland Workshop	The Wildlife Society	130
1994	Changing Trends in Agriculture: Wildlife Implications and Opportunities	The Wildlife Society	55
1995	Impacts of Forest Management Practices on Neotropical Migrant Birds	Society of American Foresters The Wildlife Society	165
1995	Increasing the Awareness and Knowledge of Natural Resource Issues with the Public, Media and Legislature	The Wildlife Society Society of American Foresters	95
1996	Impacts of Forest and Wildlife Management Practices on Indiana Herptile Populations	Society of American Foresters The Wildlife Society	100
1996	Impacts of Forest and Wildlife Management Practices on Neotropical Migrant Bird and Herptile Populations: A Field Workshop	The Wildlife Society Society of American Foresters	50

recognition program to recognize those certified wildlife biologists who have participated in formal continuing education programs. The challenge will be to develop something that is meaningful, be recognized by employers and prospective clients.

Alternatives considered to date center around a system similar to that used by the Society of American Foresters where credit for workshops is determined by the state chapter and records of participation are maintained at the chapter level as well. Methods for granting credit for non-ICTWS workshops would also have to be put in place. A desire to keep continuing education credit criteria consistent with the national program has been expressed. The major undecided factors at this point center around how achievement of continuing education criteria will be recognized. A simple certificate or plaque does not carry the prestige or recognition required of employers or clients. Some form of title with a corresponding publicity campaign to employers and clients will probably be required.

SUMMARY

The formal partnership between the ICTWS, DFW, and Purdue University was necessary in order to establish a formal continuing education program for professional wildlife biologists in Indiana. This arrangement has provided benefits to all parties involved and ensures that a quality continuing education program is conducted with

minimal burdens placed on all parties. For this continuing education program to realize its fullest potential, a formal recognition program is needed which identifies Certified Wildlife Biologists who maintain an active continuing education program. The existing program implemented by the parent chapter of The Wildlife Society is not being utilized by the majority of state chapter society members. It is believed that assistance by state chapters in recording and granting credit (as conducted by SAF) may increase participation. The backbone for such a program is already in place in Indiana. However, no structure for increasing the prestige and importance of such an achievement is in place. Further efforts of the organizations involved in this partnership will be directed at accomplishing this last needed step.

EXTENSION PROGRAM DEVELOPMENT: EVOLUTION IN CHANGING ENVIRONMENTS

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As I was developing these brief comments, I considered using the title, "We're not in Kansas Anymore, Toto." While some of the things we need to do are the same ones we have been doing for the past 30 years, others are quite different—primarily the environments, audiences, or types of requests. Some of that is adaptive reiteration. We have needed to learn new things to treat the needs of new audiences. Perhaps we use wood duck nest structure experience to assist an urban homeowner in placing bat boxes, or answer questions about how to colonize a pond with snakes and frogs rather than managing it for fish production. Perhaps we hold for landowners meetings to a Wall Street hotel meeting room or to a Dallas convention center rather than to the willing minds and rough hands of dairy farmers, ranchers, and woodland managers. Perhaps we face "hobby landowners" who had wildlife conservation or some personal interpretation of that term on their minds. We employ the classical music approach of theme in variations by adapting presentations to the sites and the potential audience.

Some of us are involved in complex computer modelling of projected economic returns or population dynamics rather than maintaining an acute and persistent relationship with natural history in our areas. We may be more involved with multimedia programs for distance learning than we are with creation of publications for public consumption. Our capabilities as statisticians are often required for evaluations of program impact, rather than the analysis of biological data to determine impacts of management practices. Research has become, of necessity, increasingly basic with funding coming increasingly from grant funds. Doing good things for good people, while still the essence of our professional careers, now requires documentation in triplicate for the auditors or regulators who determine whether we are worthy of continued funding. All of us work with some audiences contaminated with the results of a 25-year campaign to anthropomorphize wildlife and the multiple challenges that presents to education in either management or biology of wildlife. In spite of the "Rodney Dangerfield syndrome" we still wind up on Unabomber hit lists or as the targets of the alphabet soup anti-management organizations or as the conscience of the agriculture programs in land grant universities.

While all of this is happening, we are watching real funding shrink. Availability of graduate assistants or technicians continues to be a challenge unless we are entrepreneurial enough to generate the soft funds to cover them. The young guys we knew as mentors have become

the grand old men of the business whose expertise entered retirement with them. Our numbers shrink, our duties multiply, our audiences expand, and the demand increases both in keeping up with the changing knowledge base and in servicing a growing and demanding population.

I recall standing thigh deep in a long, alder-lined pool casting to rising brook trout while a sport coat-clad photographer gathered shots for a developing slide set. The angler who splashed around the bend below us watched before asking what we were doing. I explained that we worked for Cornell Cooperative Extension and that we were working—getting photographic footage for a training slide set we were building. He watched a while, then wandered off upstream saying, with obvious envy in his voice, "working—man, that must be one helluva job!" That has not changed. Ours is not a job or perhaps even a profession. It is a calling or a passion for things wild and the appreciation and stewardship of those things. We differ from the plunderers (they have not gone away) in having a long-term bottom line—still uncommon so long after Earth Day. We differ from the protectionists in considering people part of the equation and wise use as a viable option. Many of us differ from a growing proportion of our professional colleagues in knowing the difference between a #4 Newhouse and a 3N Victor, the need for ground truth and site specificity, how to bag a buck or a turkey with a topographic map, the artistry of tying and casting a fly, how to tint a snare coffee brown, pale amber, or white to blend with the background, and how to talk to the resource users from a base of shared knowledge and skill. Part of our challenge is to convey that knowledge to the next generation of specialists, many of whom lack the backgrounds we take for granted.

On the 4-H side, we find ourselves needing to remember that the combination of life skills, sound and understandable subject matter, and audience interest are all key ingredients in effective sneaky prophylactic education. We cannot simply dump subject matter and expect the youngsters or their leaders to absorb it. We must provide the mechanics to get our programs used. Many of the "old" programs are still valid with a willing audience of young people if we can sell agents or teachers on them.

Certain principles emerge from these situations:

1. Reiteration is an outstanding strategy in stable environments, but it must be balanced with innovation in changing environments. We can take a lesson from salmon here. Returning to a natal stream to spawn is an excellent strategy IF the stream remains a viable

spawning site. You made it, therefore your offspring should. Having a few mavericks in the bunch who try something new could save the entire population, however, if conditions changed too much to support life.

2. We need to learn to make others wizards for the things that we do, rather than being the wizards that address all the problems people encounter with wildlife. Some of our tasks will never change or disappear, but locating fertile ground for creating new leadership and concentrating on creating leadership in the areas we serve is essential. This task is much more difficult and less rewarding than being the direct audience contact, but it adds degrees of freedom in interesting times. Having a high colonization rate for new habitat is vital to our success, and that cannot be accomplished without sending substantial numbers of propagules. Those propagules need to be spread to the non-participating states as well as to new program areas.
3. The potential for failure exists with any "new" program. A modest amount of risk is essential if we are to experience success with emerging audiences. At the same time, it is wise to consider the strategies used by successful species over evolutionary time—protecting those features that have been important in the phylogeny of the species while adapting to new conditions. Overspecialization can lead to the saber cat syndrome, leaving us in a niche that leads toward extinction.
4. We must meet, not only among ourselves, but with many other groups of professionals, while trying to

keep up with the growing knowledge base in our fields and those that support them. Although this task will continue to grow in difficulty as the doubling rate of knowledge increases, our survival and the quality of our information depend upon it. Failure to do so approximates the genetic load or founder effect observed in populations founded by small samples of a gene pool and prevents us from reaching the potential we have in meeting our target audiences.

5. Winning in the game of Extension is like winning in the game of life. It only means we have the option of continuing to play in the game. Like survival, the victory must be won on a continuous basis.

Every person in this room and many who wish they could be here understand these principles both in wildlife and, at least intuitively, in their Extension careers. We are only as good as the last program, bulletin, or presentation. At the same time we are adopting new technologies and generating new programs to fit the needs of new audiences, many of the "old" challenges have become more acute; and most of us are under pressures to do more with less and fewer. A few promising signs exist. We are in the federal budget. We have a position in the small number of goals CREES has published, even if some of our production agriculture colleagues interpret it to fit their particular niches. We have had an impact and carry strong influence within the profession and with state and federal agencies. But we cannot stand still and reflect. As missionaries for Leopold's concept of environmental stewardship we must adapt, adopt, modify, and press on.

Wildlife as an Asset to Landowners

Editor's Note: Six papers were presented in the wildlife as an asset concurrent session, and five were submitted for publication in the proceedings.

The following title was presented in the session but not submitted for publication:

Jim Knight, Montana State University—Introduction: Must Wildlife be a Landowner Liability?

PRIVATE LANDS: THE NEW FRONTIER FOR WILDLIFE AND RECREATION MANAGEMENT

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Abstract: Private lands are the new frontier for managing wildlife that covers two-thirds of the United States, provides habitat for 85% of wildlife, and offers opportunities for outdoor recreation. Wildlife and recreation are increasingly viewed as a product of agricultural and forest lands rather than by-products. The role of landowners to manage wildlife on private lands and the incentives to do so are unclear. Historical conflicts between governments and landowners make working together a new challenge. The "debris" of controversy erodes the building blocks for solutions; thus, debates about governmental controls over wildlife must be replaced with the pragmatic recognition that private landowners control the fate of habitats, wildlife, and recreation on private lands. Wildlife administrators must face these changing times and enable the private sector to assist with the governments' missions by enabling the private sector to become guardians and stewards of resources. A new age of trust, empowerment, enfranchisement, and cooperative planning should herald in programs for habitat, wildlife, and recreation management in the new frontier of private lands management for wildlife and recreation. Recommendations are offered.

PRIVATE LANDS AND NEW FRONTIERS FOR WILDLIFE

Private lands are the new frontier for wildlife and wildlife-based recreation management. It is time for all wildlife interests—local, state and federal agencies, universities, recreationists, landowners, and the business community—to plan positively together toward mutually beneficial programs. One line of thinking contends that wildlife is a public good and that wildlife conservation and related management are matters only for public agencies: land management agencies make decisions about habitats; wildlife agencies manage the animals. No doubt, governments manage public parks, forests and rangelands, refuges, and areas that are set aside for landscape values, species management or acquired for hunting and other types of wildlife-based recreation. Governments can impact conservation on public lands; but, the wildlife conservation movement must recognize the predominance of private land in the United States (about two-thirds of the country) and that many species of farmland and ranchland wildlife are dependent for much of their habitat on private lands.

LANDOWNERS ARE WILDLIFE MANAGERS ON THE MAJORITY OF LANDS

Kimball (1963) indicated that 80% of the animals taken by hunters and 85% of the wildlife habitat that is economically feasible to improve is found on private lands. Another line of thinking is that proper management of private lands is an absolute necessity if society cares about ecosystem values and quality recreational experiences.

Traditionally, wildlife was a by-product of private agriculture and forestry. Wildlife responded indirectly to land management decisions. If landowners were not interested in the production or use of wildlife, then habitat might be destroyed and wildlife populations reduced. If landowners were not interested in encouraging recreational use of wildlife, people would be denied access to enjoy wildlife on those lands. Landowners calculated monetary claims for wildlife damage, posted land against access, voiced complaints at agency hearings, perpetuated anti-hunter sentiments, and promoted ill feelings toward wildlife management agencies. On the positive side, they allowed access—free or for a fee—and supplied needed

wildlife habitats. Landowners who gained social or economic benefits from wildlife and recreationists found ways to protect and enhance habitats and populations.

Nowadays, wildlife and recreation should not be by-products; rather, they should be planned products. Private land managers can support wildlife conservation and use by becoming wildlife entrepreneurs who produce products and services and reap commensurate rewards. Landowners can be stewards of nature by including wildlife and recreation as part of holistic land management. Governments can enable the process by supporting landowners' opportunities. Although these positive relationships are not well developed, there is no doubt that landowners are wildlife and recreation managers simply because they possess the base resources and have a significant control over habitats, animals, and human use.

Private landowners have been tolerant or intolerant of people and wildlife on their lands, but few landowners are doing a thorough job of managing those resources. Why should they? How do they benefit? Who encourages them? Who helps them to manage? A few incentives were provided by state agencies: signs to protect property; landowner preference permits to hunt on one's own land; license coupons for monetary redemption; game damage payments; predator control programs; habitat cost sharing; and extension education. Some states offered special seasons and permits to accommodate the management and business needs of landowners who use wildlife as part of providing recreational opportunities.

Most cooperative programs between governments and the private sector were not sufficient to meet modern day needs such as: managing increased big game populations and decreased wildlife in general; maintaining and enhancing migratory birds and endangered species; or providing quality recreational experiences for a growing population of outdoor enthusiasts. We need better ideas, new systems, and trust that the private sector can be good stewards.

DEMANDS INCREASE ON DWINDLING LANDSCAPE RESOURCES

Times have changed from the perceived good old days when environmental demands were relatively simple, private altruism and neglect benefited wildlife and wildlife interests, and governments acquired and managed public lands. The days are behind us when government created more government and had all of the answers to society's needs. The big chunks of real estate have been acquired. Public environmental interests and citizen group activism have expanded, and demands on wildlife and wildlife lands have broadened. Society now knows that private lands are important components of the environment; thus landowners face increasing governmental regulations which limit uses of their personal properties. Simultaneously, landowners face poor prices for

agricultural crops, while the lure increases to sell their water and agricultural lands for development interests. Pragmatically, landowners must manage for their best short- and long-term interests. Wildlife, wild habitats, and outdoor recreationists are not always valuable to landowners, but private land is valuable to environmental interests and to recreationists.

Traditional wildlife users and political supporters, the hunters and anglers, want more and better land and wildlife resources. Other users such as viewers, photographers, campers, wilderness hikers, and farm and ranch recreationists also demand more and better places to recreate. Landowners can benefit from this increased demand for wildlife and wildland use, but they need to recoup production and service costs. Recreationists can pay to use private lands, and society can pay for its demands.

COOPERATION BETWEEN PUBLIC AND PRIVATE SECTORS IS NOT AUTOMATIC

Meaningful cooperative programs are difficult to develop when participants fear a loss of rights or responsibilities. The founding principles from which land and wildlife agencies seek to continue their system of public-based wildlife management do not include giving up rights and responsibilities to the private sector. Governments' budgets currently depend upon public-managed systems. Professionals in government do not want to give up their jobs, working budgets, prestige, or the control that they have attained by being in charge of management. Recreationists who were accustomed to free use of wild land resources are increasingly having to pay for quality experiences on private lands. Public lands remain essentially available for use with no or minimal use fees, and taxpayers' dollars are insufficient to manage the lands properly.

Landowners are balancing the costs and benefits of their enterprises and determining whether and how wildlife, natural habitats, and outdoor users fit private management plans. Society is demanding cleaner and less exploitative uses of our environment, and there is no doubt that private land contributes to the problems and can provide some solutions. Conflicts arise when some of society is asked to give at the expense of the other parts. Conflicts arise when resources and opportunities are taken without just compensation.

Groups in conflict are less likely to cooperate when they perceive that the issues are polarized and the other participants are not listening. Perpetuating conflicts, rather than solutions, becomes more important to the philosophies of some individuals and to the survival of some agencies and organizations. Solutions become clogged with the "debris" of symptoms, self preservation, divisiveness, and mistrust. Wading through the debris-filled currents of change in search of higher ground is often too much of a risk or too great a task for society to

bear; therefore, no clear philosophy, policy, or practice has emerged that North Americans can document for wildlife and recreation management on private lands! Perhaps a new philosophy can emerge, but not without appreciating how debris affects the current of change.

DEBRIS IN THE CURRENT

Conflicts among governmental agencies, landowners and recreationists have generated a state of "debris" in our perceived system for wildlife management. Debris is often necessary because it caused "noise" in the system and draws attention and causes thought and action. At first, the debris is destructive because it serves only to block actions rather than to create new actions. Debris is found floating in the current on polarized sides of issues where advocates do not agree and they probably do not listen. Over time, debris can be cleared and resolutions are possible when thoughtful minds focus on the true issues, see the problems more clearly, and seek constructive solutions. One needs only to read James Bovard's book (1995) entitled *Lost Rights: the Destruction of American Liberty* to understand the anxieties and fears among some private individuals and groups that governments cannot be trusted and should in fact be feared. That sentiment alone compels some landowners to stay away from management of habitats, wildlife, or users because governments are involved.

Antagonists are right- and left-wing advocates, even militants, and a complement of middle roaders who don't want government to take from them, control them, tax them, tell them what to do, or how to do it. A similar group thinks government does too little. Advocates fight for animal rights, states' rights, race rights, and private rights. They bomb government buildings, protest against taxes, lay in front of bulldozers, place metal spikes in trees, vote for guns, and vote against guns. They believe in God and they are Godless. They support "traditional" family values and they have "family orientations" with a twist. They love wildlife, hate wildlife, and tolerate wildlife, but certainly they influence decisions that impact the future of wildlife and management of public and private lands.

Unfortunately, when private landowners get involved with wildlife, opponents to involving the private sector use scare words and phrases to pile up intellectual debris such as "privatization," "commercialization," and "European System." The argument is that private interests take away from public interests. These attempts serve only to cloud progressive thinking. Advocates have three points in common: (1) they are trying to create certainty as they see it, out of uncertain times; (2) they have a conviction that their approach is the only course of action with arguments bolstered by truths and debris as needed; and (3) they want more personal involvement in outcomes. Polarized influences are growing, and each extreme thinks the other

is radical and dangerous. Uncertainty about the future has become a major concern in their life and in the lives of those whom they impact.

The United States Congress creates further debris and uncertainty by championing changes in environmental legislation that enable opportunities for some persons and enrage others. Two contrasting examples include laws to prevent regulatory takings of private and business opportunities and the endangered species legislation which could limit private activities. Other contested issues include legislation associated with water quality, wetlands, and clean air which are promulgated to protect environments, yet uses of private lands may become limited.

The people feel apart from decisions that are made on their behalf. They feel imposed upon. At the same time, when the federal government is making congressional laws to "protect" people and environments, there is also rhetorical and fiscal shifts of decision making powers and authority to lower levels of government, ostensibly to involve the people who are the ultimate targets of reform. However, landowners who want to manage wildlife on their properties lack appropriate empowerment and the needed authority and responsibility to do the job properly.

WHO OWNS THE WILDLIFE?

Wildlife entrepreneurship is complicated in North America by the question of who owns the wildlife. Wildlife theoretically belongs to the people in common, but actual use of wildlife is governed by law. Consequently, governments have become the owners of wildlife in administrative, regulatory, and conceptual ways regardless of the rhetoric that wildlife belongs to the people. Governments tell the people if and when they may use wildlife. Going one step further, some employees of government behave as if wildlife belongs to them personally and wildlife cannot be managed without their sole and direct involvement. The custodial powers assumed by governments in North America have created one of the best public land-based wildlife and land management systems in the world, yet governments' relationships with private landowners and private lands is in need of improvement.

In practice, landowners may be the wildlife owners because they control much of the lands and waters that animals, recreationists, governments, and society need. Models exist in Europe, Africa, and even in the U.S. where conservation and outdoor recreation are served well by actions of interested recreationists and landowners on private land. Examples include German hunting districts, South African game ranches, or private hunting areas managed in Colorado, Texas, and probably every other state in the nation.

Government-controlled wildlife and recreation management is not the only possible paradigm for success, and the specter of "ownership" should not stand in the way of wisdom and practical application. We can add governments' efforts to the wealth of interest, knowledge, and money available through private, university, and non-governmental organizations to focus proper resource management on private land. Wildlife and natural resources management professionals have developed a storehouse of knowledge and practices that promote wildlife, hunting, viewing, and recreation on public land that could be applied to the private sector.

Not only must our existing professionals redirect their thoughts and actions toward private objectives and practices, but so too must landowners redirect their thoughts from wildlife as a detriment to wildlife as an asset. The private sector as a whole has not been eager to cooperate. It may have been more socially acceptable to complain about wildlife and recreational problems and to bash governments than to work positively and proactively. It will take a great deal of good will by professionals and the "sharing of ownership" with users and landowners to provide sufficient incentives to compensate landowners for wildlife production and recreational access.

TRUST, PLANNING, EMPOWERMENT, AND ENFRANCHISEMENT

Reasons for public and private sectors to work together are more obvious than the willingness to do so. There is a mutual level of distrust that prevents clear and cooperative thinking and a more trusting relationship must be developed. Each sector has been harmed by the other. Each sector reaps benefits from the other. Each sector manages now under authorization and constraints imposed by the other. Each sector does not admit wanting help from the other, but help is needed. Sectors cannot work positively together with those attitudes. Sectors cannot see obvious programs of mutual benefit because they will not look. But, there is hope! Words mean a lot especially when persons believe in them. Wildlife agencies and landowners would work together nicely if they believed in and practiced the meaning of four words: Trust, Planning, Empowerment, and Enfranchisement.

Trust

No one works well when trust is low. Private and public sectors have to trust before they can be willing to cooperate. Trust is not given; trust is earned! Both sectors need to look for opportunities that earn trust and then be able to recognize trusting relationships when they arise.

Planning

"Planning" is a word often used synonymously with "organizing," but organizing is still a ways down the stream to success. Public and private sectors cannot

organize if they are on different spectrums of thought and action. Here, "planning" suggests looking toward the future, working to trust, or as *Webster's Dictionary* puts it, "to devise or project the realization or achievement of," and to "intend." Public and private sectors must plan to work together in a spirit of trust, then prudently evaluate the outcomes with a fair and open mind.

Empowerment

Empowerment is a philosophical willingness to share authority and responsibility. Persons want to work together when there is trust and when they find ways to do so. Public and private sectors each have powers to share. When they entrust some of that power to the other sector, that enables cooperative action.

Enfranchisement

Enfranchisement is the official way that public and private sectors can agree and begin to organize their objectives, roles, and responsibilities. Private landowners are enfranchised by governments to become wildlife and recreation managers with expectations that land, animal, and user management will be of high standards. When standards are breached, privileges of the private sector are lessened. This is not a "parent to child relationship" however, because governments and the private sector are expected to do their share as "adult" partners. This relationship is new to the former governmental and "parental" approach to wildlife stewardship. Hunting, fishing, viewing, and other wildlife-based recreational uses of private land provide natural and pragmatic enfranchises where public and private sectors can cooperate.

CONCLUSIONS AND RECOMMENDATIONS

Modern wildlife managers can overcome conflicts between landowners, government, wildlife, and people by seeking positive solutions that benefit hunters, recreationists, landowners, agencies, local communities, and ultimately wildlife and the land. Private lands need management attention. Private lands will be managed for wildlife—good or bad—with or without governments' help because landowners have the land and their actions influence nature! The goals of governmental wildlife managers, recreationists, landowners, and business leaders should be to encourage, not to deny proactive and positive wildlife and landscape management by the private sector. Participants must trust and be trusted, and governments can enfranchise private partnerships for action.

The following ideas set the stage for critical thinking about what private landowners, users, and natural resource management professionals can do to manage wildlife and recreation on private lands.

1. Calculate the real costs for producing and maintaining wildlife, habitats, and recreation on private lands.
2. Like any business, find ways to reduce costs and receive enough benefits to justify production.
3. Recognize private landowners as equal partners in conservation to provide habitat, wildlife, and access.
4. Reduce costs of taxes and threats of liability for landowners who manage lands for wildlife and recreation.
5. Provide special incentives to landowners who increase wildlife through proper management. Such incentives can include special timing and duration of hunting seasons, permits used at landowner's discretion, compensation for managing threatened and endangered or other non-hunted species, and a simplified and stable regulatory environment.
6. Recreationists can form working and financial relationships with landowners and public agencies. Management practices can be initiated, funded, and implemented by committed and dedicated recreationists on private land.
7. Landowners and recreationists can form associations to manage and market resources.
8. Landowners should not illegally restrict access to public lands nor should they use public lands for personal gain to the detriment of other publics who have similar interests in the values on public lands. These practices only infuriate parts of society who will retaliate by trying to restrict legitimate activities on private lands.
9. Where public lands are isolated and intermixed with private lands, management and recreation plans can allow those lands to be used by the public during managed periods and for private objectives at other times if habitats, wildlife, and recreational developments merit such consideration.
10. Wildlife and the natural environment should never be valued solely by economic terms. Intrinsic and emotional values should always weigh in the balance of how resources will be valued, allocated, and used on public and private lands.
11. A wildlife, recreation, and habitat plan should be written for every property with potential for free or fee use. Perhaps several parcels of land would need to be combined into functional ecological and economic units. One would hope that plans will be written cooperatively between wildlife agencies and landowners. Some plans will be simple, while others will require detailed input. In each case, wildlife and recreation should be included within the whole management scheme. Holistic management considers the resources and markets available (supply and demand) along with human resources necessary to carry out plans. One of the major benefits to landowners from fee-hunting has been the knowledge of and control gained over persons using their lands. Control could have been developed without the fee if landowners would have had a plan; but, money helped the plan to develop.
12. Wildlife, their habitats, and associated recreation are assets from which whole communities should recognize, nurture, and profit. The protection of open space afforded by making wildlife, habitats, and recreation valuable to communities is reason enough to bring governments, landowners, private individuals, nongovernmental organizations, recreationists, and businesses together to protect their resources and to invest in that protection.

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FISHERIES AND WILDLIFE HABITAT INCENTIVE PROGRAMS IN MISSOURI: PARTNERSHIPS IN LAND STEWARDSHIP

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Fish and wildlife resources are highly valued by Missourians. Over 70% of Missouri residents annually participate in fisheries and wildlife activities. However, the future of fisheries and wildlife conservation depends to a large extent on the land-use decisions made by landowners, as approximately 93% of the state is under private ownership. These landowners have different motivations, circumstances, and land ownership objectives which govern their management decisions.

Educational programs which enable landowners to make informed decisions regarding the conservation of fish and wildlife are critical to land stewardship and resource sustainability. Although idealistic concepts, "stewardship" implies "care and responsible management" of the land base and ecosystems which sustain fisheries and wildlife resources. Resource professionals and educators are continually challenged to develop and successfully implement meaningful programs which put these idealistic concepts into practice on private lands.

A variety of proactive fisheries and wildlife habitat incentive programs have been developed and implemented in Missouri through land stewardship partners. These focused programs have been designed in part to demonstrate that agricultural production and fisheries and wildlife habitat enhancement can be compatible and to promote the concept that these resources and supporting ecosystems are an asset to the landowner. An educational process serves in motivating landowners to participate and take advantage of the technical assistance these programs provide. Through these efforts both resource management and land ownership objectives are accomplished. A brief summary of two of these incentive programs, the Partners for Prairie Wildlife Program and Stream Stewardship Program, is provided in an effort to share ideas on making wildlife an asset to the landowner.

PARTNERS FOR PRAIRIE WILDLIFE PROGRAM

The Partners for Prairie Wildlife Program is basically an incentive program for improving grasslands. Prairie wildlife populations have been declining for a number of years due to several factors, including the loss of prairies, decreased diversity in grasslands, and the increased amount of woody encroachment into pastures, prairie, and fencelines. The Missouri Department of Conservation is testing a pilot program designed to reverse the tide of declining quality grassland habitat by offering landowners incentives to change management in favor of prairie

wildlife. The Partners for Prairie Wildlife Incentive Program is offered in cooperation with the Missouri Department of Natural Resources Soil and Water Conservation Districts Commission, Natural Resources Conservation Service, and county Soil and Water Conservation Districts. Additional funding is provided by the U.S. Fish and Wildlife Service and Monsanto Agricultural Group. University Extension provides educational assistance.

Objectives of the incentive program are to: 1) enhance grassland diversity and structure to improve wildlife nesting and broodrearing cover; 2) reduce fragmentation of prairie landscapes by removing invading trees from prairie soils; and 3) demonstrate that livestock forage production and prairie wildlife habitat improvements can be compatible.

Two target zones have been established for program participation. These zones are in west central and southwest Missouri, and both are associated with State Prairie Conservation Areas.

Briefly, the incentive practices include:

- PPW-1, Converting fescue to warm-season grasses;
- PPW-2, Converting fescue to alternative cool-season grasses/legumes;
- PPW-3, Controlling introduced cool-season grasses in native prairies;
- PPW-4, Overseeding lespedeza into an existing stand of cool-stand grass;
- PPW-5, Overseeding lespedeza into an existing stand of warm-season grasses;
- PPW-6, Overseeding lespedeza into wheat or other small grains;
- PPW-7, Resting prairie;
- PPW-8, Implementing a rotational grazing system;
- PPW-9, Restoring prairie wildlife habitat fragmented by tree invasion; and
- PPW-10, Fence replacement.

The Soil and Water Conservation Districts handle the application and the cost share payment procedures. Missouri Department of Conservation biologists evaluate the area proposed for a particular practice and certify that wildlife nesting or broodrearing habitat will be improved.

STREAM STEWARDSHIP PROGRAMS

Missouri is a stream state, with more than 56,000 miles of waterways providing water, fisheries and wildlife habitats, and recreational opportunities. These water resources depend on the stewardship of natural resources within the watershed. One method of achieving resource management and land ownership objectives is to promote the concept of watershed and stream stewardship. Educational programs addressing these concepts are of particular importance. An example of a proactive stream stewardship program, developed by the Missouri Department of Conservation and land stewardship

partners, has been to provide incentives to landowners for the long-term conservation of stream corridors on private land.

Stream Stewardship Programs have been initially implemented on three pilot streams in southern Missouri. Through voluntary participation, landowners who practice good stream stewardship are rewarded through a process of receiving bid payments over a 10-year period in exchange for an easement to conserve healthy stream corridors. Qualifying landowners must have an active Soil and Water Conservation Plan and own at least one-fourth mile of frontage along one of the pilot streams. Landowners retain complete control of trespass rights and have a variety of management options available for income production, including fish and wildlife management, timber and fuelwood production, and hay production. If the stream corridor is used for grazing, fencing is required with a percentage of the costs reimbursed.

WILDLIFE AS NATURAL ENEMIES OF CROP PESTS

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Abstract : One asset of wildlife to landowners is the potential but understudied role of birds and other species as endemic natural enemies of crop pests. Enhancing such natural enemies as part of sustainable agricultural systems offers promise for maintaining agricultural competitiveness while providing wildlife habitat in intensively farmed areas. The University of Nebraska has established an agroforestry research team to address interdisciplinary questions and outreach associated with this topic. Included are studies of bird, mammal, and insect use of woody and herbaceous corridors and adjacent cropfields in east-central Nebraska. Uncultivated areas needed to sustain natural enemies of crop pests also provide other benefits. Properly planned windbreak edges, for example, can enhance stewardship of soil and water by preventing erosion, conserving moisture, and increasing dryland crop yields. Management practices that enhance endemic natural enemies of crop pests and provide other benefits can better ensure long-term continuation of agriculture and living wild resources, an opportunity for extension education and future research.

INTRODUCTION

Typical agricultural systems are managed as monocultures with large fields of one plant type such as corn, soybeans, or wheat. Such monocultures are used to increase production efficiency and to make management easier, but the result is that the aim of conventional agriculture is to reduce biological diversity (Gerard 1995). This conference session is focused on an appropriate question of what good is having diversity of habitats and wildlife in farming systems; is it a liability or an asset to landowners and how can we best enhance the positive values? One way to approach this is to find opportunities that combine the needs of biological conservation with the needs of people so that both might benefit. Habitat is often the primary need of wildlife on farms, whereas people need, as examples, sufficient income, crop protection from pest insects, soil and water stewardship, and aesthetic and recreational opportunities for the family. Various fee hunting approaches can provide farm income from wildlife as a crop or product that is harvested from the land. Other values of wildlife to farms stem from the role of wildlife or their habitats as a part of the agricultural system. Integrating biological resources into agricultural systems to provide compatible and beneficial functions can help ensure the sustainability of both agriculture and native plants and animals.

Diversity in current agricultural systems is primarily through edges such as windbreaks, riparian zones, or other habitats that are outside or adjacent to the crop system

(e.g., Stauffer and Best 1980, Best 1983, Bryan and Best 1991). Properly planned windbreak edges can enhance stewardship of soil and water by preventing erosion, conserving moisture, and increasing dryland crop yields and profits (Brandle et al. 1988, 1992). Windbreaks and other vegetated field edges in intensively farmed areas provide essentially the only habitat diversity available for wildlife, including birds, spiders, and predatory insects that are endemic natural enemies of crop pests (Johnson and Beck 1988, Trnka et al. 1990, Johnson et al. 1992). Although birds do forage and occasionally nest in crop fields, including strip intercropping systems, nest success in fields is low, and adjacent uncultivated areas are essential habitat components for nearly all birds that use fields (Sunderman 1995, Fitzmaurice 1995, Stallman and Best 1996)

NATURAL ENEMIES OF CROP PESTS

There is limited information available on natural enemies of crop pests in agroecosystems, but information available is encouraging, as indicated in the following examples. Downy woodpeckers (*Picoides pubescens*) are important predators of overwintering European corn borers (*Ostrinia nubilalis*) in North Dakota (Frye 1972), Louisiana (Floyd et al. 1969), and Arkansas (Wall and Whitcomb 1964). Northern flickers (*Colaptes auratus*) are an important predator of southwestern corn borers

(*Diatraea grandiosella*) in Arkansas (Wall and Whitcomb 1964) and Mississippi (Black et al. 1970). The woodpeckers consume the larvae by pecking into the stalks after harvest. McEwen et al. (1986) studied winter wheat fields in Montana and found that horned larks (*Eremophila alpestris*) and McCown's longspurs (*Calcarius mccownii*), two grassland birds, had high proportions of cutworms (mostly pale western cutworms, *Agrotis orthogonia*), grasshoppers, ants, and beetles in their diet, and concluded that bird predation could supplement other controls. Other studies have recorded birds consuming pest insects on tobacco (Stewart 1975), cabbage (Strandberg 1981), corn (Stewart 1973), rice (Zhang 1992), and orchard crops (Wearing 1979, Roland et al. 1986, Zhang 1992). Madden (1982) found that avian predators of the wood wasp (*Sirex noctilio*) in pine plantations in Tasmania enhanced the effectiveness of other biological control agents and recommended, as has been done for other monocultures, increased habitat diversity for birds by interruption of pure stands with corridors of natural vegetation.

Although there are some data on small mammal use of windbreaks (Yahner 1982, 1983), little is known about associated effects on adjacent crops or the role of small mammals in agroforestry systems. Small mammals that occur in crop fields can have both positive and negative effects. Some may dig and consume newly planted corn (Johnson 1986), but some also consume weed seeds, unwanted waste grain, and crop-damaging insects (Zimmerman 1965, Whitaker 1966, Beasley and McKibben 1976, Holm 1984, Young 1984) including grasshoppers, wireworms, cutworms, and corn earworms (*Heliothis zen*) (Gillette 1889, Orcutt and Aldrich 1892, Fitzpatrick 1925, Holm 1984, Getz and Brighty 1986). One cutworm may damage three to four corn seedlings (Archer and Musick 1977, Clement and McCartney 1982), so each cutworm consumed by a predator may represent the saving of several corn plants. Studies of bat food habits have found that big brown bats (*Eptesicus fuscus*) eat spotted cucumber (corn rootworm) beetles (*Diabrotica undecimpunctata*, Whitaker 1972) and alfalfa weevils (*Hypera postica*, Bellwood 1979 as cited by Humphrey 1990). Further, the calm air on the leeward side of windbreaks appears well suited for bats or birds to attack flying insects.

Although it is unlikely that natural predators could control a widespread pest insect outbreak, they apparently contribute, along with other biological control factors, to regulation of insect populations and to prevention of outbreaks, especially when pest numbers are low to moderate (Pimentel 1961, Getz and Brighty 1986, Zhang 1992, Trnka et al. 1990, Johnson et al. 1992).

UNIVERSITY OF NEBRASKA PROGRAM

The University of Nebraska has established an agroforestry team to address the interdisciplinary questions and outreach associated with agroecosystems, including biological control of insect pests. Agroforestry systems blend the benefits of agricultural and forestry practices into more sustainable land management systems. Various studies by team members have compared birds, small mammals, insects, and spiders in woody and non-woody edges (Dix et al. 1995). Two complementary studies evaluated bird use of woody and herbaceous corridors and adjacent cropfields in east-central Nebraska (Fitzmaurice 1995, Sunderman 1995). They considered the conservation values of woody and herbaceous edges for birds and the potential birds may have as natural enemies of crop insect pests.

In a comparison of windbreaks versus herbaceous fencerows (Sunderman 1995), bird species richness and abundance were greater in the windbreak edges during all seasons ($P \leq 0.05$), with the exception that richness did not differ in winter ($P = 0.15$). In adjacent cropfields, mean species richness was greater in fields bordered by woody edges in late summer ($P \leq 0.03$) and approached significance in spring ($P \leq 0.07$), but did not differ in summer, fall, or winter ($P \geq 0.39$). Bird abundance in cropfields bordered by woody edges approached higher than in herbaceous-edged fields during spring ($P = 0.09$), but the reverse occurred in winter ($P = 0.09$). Bird abundance did not differ between the two field types during summer, late summer, or fall ($P \geq 0.52$). In late summer and fall, bird abundance varied considerably among sites, in part due to flocks of house sparrows (*Passer domesticus*), common grackles (*Quiscalus quiscula*), and American robins (*Turdus migratorius*). In winter, most (81%) birds observed using fields were flocks of horned larks.

Ten small mammal species, including species known to consume crop insect pests, were captured at these windbreak sites during 1,293 trap-nights. The 394 captures occurred in all edge types and in fields out to 200m (transect length) from edges. White-footed mouse (*Peromyscus leucopus*) was the most common species captured in woody edges, and deer mouse (*P. maniculatus*) the most common in fields. Deer mice and grasshopper mice (*Onychomys leucogaster*) were distributed evenly throughout fields ($P > 0.05$), whereas white-footed mice were concentrated within 50 meters of the edge ($P < 0.05$).

A study comparing woody versus herbaceous riparian corridors and adjacent cropfields (Fitzmaurice 1995) had results generally similar to those in the windbreak study. In the riparian study, bird species richness was higher in woody edges than in herbaceous ($P \leq 0.06$) during all sampling periods except late summer, when it showed the same trend ($P = 0.13$). Bird abundance appeared to be higher in woody edges during spring, fall, and winter

($P \leq 0.18$) but did not differ during summer and late summer ($P \geq 0.52$). In fields, bird species richness and abundance did not differ between those with woody versus herbaceous edges ($P \geq 0.56$) except during the wet 1993 spring when richness and abundance were higher in fields with herbaceous edges ($P \leq 0.06$). The herbaceous-edged fields, during spring 1993, had four woodland bird species and high numbers of red-winged blackbirds (*Agelaius phoeniceus*) that contributed to these spring 1993 results. There was confounding woody vegetation present at some of the herbaceous sites, which appeared to increase the observations of woody-habitat species at those sites.

In both studies, species composition varied between woody and herbaceous sites, reflecting vegetation present and bird habitat preferences. Bird numbers in cropfields were generally higher within about 50m of the edge, but open-area species such as horned larks avoided edges. Bird use of fields changed through the season along with crop growth and increased vertical structure; with omnivorous ground feeders predominant early in the growing season; and with lower canopy, upper canopy, or aerial foragers present throughout the growing season. Results overall indicate that woody edges generally had greater species richness and abundance than did herbaceous edges, but that the two edge types accommodate different species, an important point for management decisions. Although bird numbers were generally higher near field edges, foraging by various species of both birds and small mammals occurred throughout the field area studied, indicating potential predation impact on insect crop pests out to at least 200 m from edges.

Another study is currently in progress to evaluate birds, insects, and habitat variables in organic and nonorganic systems by examining field pairs, with each pair comprising one organic and one nonorganic field similar in edge and environment. Preliminary results from 1995 indicate that species richness may not differ between the organic and nonorganic pairs, but that abundance is higher in the organic.

MANAGEMENT CONSIDERATIONS

Woody corridors in agricultural landscapes can help reduce soil erosion, shelter crops from wind damage and desiccation, enhance moisture conservation, and serve as filters for field runoff, important for ground and surface water quality. They also provide wildlife habitat important to a variety of species in intensively farmed landscapes (Best et al. 1990). The woody vegetation and associated wildlife provide recreational and aesthetic benefits in rural areas and may enhance the quality of life for farm families.

Field-edge windbreaks and riparian corridors, which tend to become naturally established with woody vegetation, are among the few woody habitats within the Midwestern farming region. Some landowners clear the

trees and shrubs, in part to increase crop area or to better accommodate farming equipment, but clearing the trees also removes benefits of the woody vegetation. A more thorough understanding of the values of these habitats will enable landowners to make better-informed management decisions about them. Determination of the bird species and numbers using woody and non-woody corridors and their adjacent cropfields establishes baseline data for evaluating how such areas might be managed to enhance natural enemies of crop pests.

Our results from Nebraska indicate that field-edge vegetation benefits a wide variety of bird species, including insectivores and omnivores that likely have value as natural enemies of crop pests. Further, neotropical migrant bird species, many of which are in decline, apparently benefit from the woody vegetation as habitat during migration and perhaps nesting. Herbaceous edges contribute habitat for additional species. Field edges with woody vegetation, in comparison to non-woody, appear generally to have greater overall species richness, more neotropical migrant bird species, and generally more individuals. Herbaceous edges, however, provided habitat for species such as dickcissels (*Spiza americana*) that do not frequent woody areas. Bird abundance within the cropfields studied was generally similar regardless of edge type, but species composition differed. In fields, bird species richness and abundance appear to be influenced by the edge vegetation present in the overall agricultural landscape and, in some cases, by the edge vegetation adjacent to a particular field.

The best type of edge for a particular site may be determined, in part, by its location in relation to adjacent or nearby habitats. Research and management decisions should consider the effects of edge vegetation in relation to adjacent habitats in the landscape and with natural resource conservation in mind. For example, grassland edges adjacent to grassland fields would probably have benefits for grassland bird species, whereas a narrow grassland edge isolated by a broad expanse of row crops, would be of limited value. Similarly, a network of windbreaks or woodland edges, such as in our studies, would have benefits for woodland-edge bird species, especially if other woodland habitats were nearby. So the overall amount or network pattern of a habitat type may be an important management variable. Because both woody and herbaceous edges support specific bird species, landscape management plans should consider the amounts of similar habitats, woody or herbaceous, that are available near the respective edge types.

Pest insects are susceptible to predation both in the cropfield and in the field edge. At field edges, natural enemies can attack pest insects that come to the field edge for some life cycle need or that are blown there by the wind. Predation pressure on insect crop pests from birds and small mammals, based on predator foraging locations, appears to be highest within 50 m of field edges but occurs throughout fields at least 200 m from edges. The edge

non-crop habitats are necessary components for most of the natural enemy complex and most were more abundant within 50 m of the edge. Avoiding pesticide application on strips of cropland adjacent to field borders might reduce their harmful effects to predators without increasing economic losses to crop damage. The Conservation Headlands program in Europe involves pesticide application strategies to protect field edges and to reduce negative impacts on desirable species (Hassall et al. 1992, Sotherton et al. 1993). Similar approaches merit evaluation for potential benefits on Midwestern farms.

Extension personnel have the opportunity to communicate to clientele what is known about natural enemies of crop pests in sustainable agriculture and to encourage research to fill data gaps. There are management practices that currently can be used to enhance biological control of crop pests and, for the future, opportunities to involve landowners in identifying and testing sustainable approaches that better ensure long-term continuation of agriculture and living wild resources.

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WALK-IN HUNTING AREA PROGRAM IN KANSAS

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Abstract: Hunting license sales in Kansas are declining. Hunters often cite the lack of access as a reason for no longer hunting. Some landowners are seeking opportunities to use wildlife and other natural resources as a source of supplemental income. Kansas Department of Wildlife and Parks (KDWP) initiated a pilot program to lease land and make it available for public hunting. In 1995 KDWP leased 10,345 acres of land from 46 different landowners at a lease cost of \$20,400. This lease program follows a simple concept by which landowners receive a fee from the Department to allow people to hunt their land. The landowner receives assurances that hunting will be by foot traffic only, that the land will be periodically patrolled by conservation officers, and that they are still immune from normal liability under state law. A telephone survey was conducted of both hunters using the leased lands and the landowners to evaluate the program. The reports are very favorable. Ninety-three percent of the landowners enrolled in the program will continue next year. Of the 925 usable surveys received, 96% of the hunters recommend continuing the Walk-in hunting area program. Because of this response, KDWP plans to lease 100,000 acres for public access in 1996-97.

A TAX INCENTIVE TO ENCOURAGE WILDLIFE MANAGEMENT: THE TEXAS EXAMPLE

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A need for external incentives for private landowners to manage their lands for wildlife was identified and has been discussed for many years. As early as 1930, the Committee on Game Policy (Leopold Committee) stressed that incentives for private landowners were crucial to achieving public objectives in wildlife management on private land. Various forms of subsidies, regulations, and taxes have been proposed, tried, modified, perpetuated, or discarded. Incentives or disincentives commonly were directed to specific practices which impact wildlife.

Wildlife in Texas are dependent upon private lands for their existence. Over 90% of the land is privately owned and managed on the basis of individual landowners' goals. Agriculture, including timber production, is the prevailing use. So, many incentive programs directed to agriculture impact wildlife.

Federal farm legislation at least since the 1960s has included programs through USDA to cost-share specific land (habitat) management practices on private lands. More recently other governmental agencies and private conservation groups have offered cost-share, grants, or technical assistance to manage lands for certain species of wildlife. Thus, incentives to influence individual landowners' management of their lands have a full history. Measures of their success are sketchy.

Two different ideas are confounded in the recorded discussion of incentives for wildlife. One is the management of private land to benefit wildlife—a biological goal. The other is for the private landowner to provide public access to private lands for recreational purposes—a societal goal. The two ideas have been so intertwined at the governmental level that programs to establish the two ideas as society's goals have limited success because they fail to recognize what constitutes incentives from the perspective of the individual landowner.

An incentive is something which incites to action, but the crux of the statement is determining who is incited to do what. For example, technical assistance on game management does not address the landowner's problems of providing public access to a tract of land. Receipt of income from a hunting lease does not motivate or obligate a landowner to spend his resources to accomplish someone else's wildlife management goal—e.g., restoration of breeding habitat for neotropical birds.

Direct economic benefits to Texas landowners who have game species on their lands have been possible at least since the 1920s. In several areas hunters leased the right of ingress for hunting. "Hunting leases" became a significant source of income for many ranchers with large land holdings, and for farmers on whose land migratory

game concentrated. This opportunity was not available for landowners with little game whether due to small size or lack of habitat.

Hunting lease income is an incentive for some individual landowners to provide limited public access to their lands for hunting, but not to all. It depends upon the landowner's perspective of the significance of the lease income to his overall welfare. On one extreme is the perception that hunting lease income is not worth the adjustments and problems of having strangers on one's land. The contrasting view is that hunting lease income is the major component of net income for one's ranch and should be expanded. A common perspective held by Texas landowners is that management of access for hunting as an enterprise is an add-on appendage to the primary purpose of land ownership, that of agricultural production.

Landowners commonly view habitat management for wildlife in a similar way to hunting leases—an appendage to forage management for livestock. For example, in the 1960s and 1970s wildlife management practices authorized in federal cost-share programs administered through ASCS frequently were not included by State and/or county committees for local funding. Instead funds were included in production practices such as brush control. The point here is to indicate that habitat management for wildlife was not an integrated part of land management in landowners' thinking or priorities. Hence, cost-share was not an incentive.

However, circumstances and attitudes were changing. The market value of open space land was becoming less related to its agricultural productivity and more influenced by other things. For example, agricultural practices such as removal of woody vegetation to improve livestock forage could significantly decrease the market value of a parcel of land by changing its aesthetic appeal.

As Texas became more urbanized, all land including land devoted to agriculture increased in value. Land which could be developed for a "higher use" increased dramatically in value and taxes even if the owner never intended to change his use of the land from agricultural. Increasing yearly taxes based on the land's potential for "higher use" could exceed the owner's revenue derived from agriculture.

The Texas Constitution states "taxation shall be equal and uniform....all real property shall be taxed in proportion to its value." The courts have held that "any method used to determine market value for purposes of assessing ad valorem tax which produces a substantially different figure than what property can be bought and sold for is fundamentally wrong and value thereby ascertained is

fundamentally erroneous;....” Thus, all land was taxed on its market value. Any tax incentive based on land use would have to be reconciled with this law and tradition.

As the public’s perception developed that land taxes could become so high that farmers and ranchers would be forced to abandon agriculture in some areas, the State Legislature moved to offer some tax relief. It submitted a constitutional amendment that provided for the land to be appraised on its capacity to produce agricultural products. Texas voters approved the amendment in 1966.

“‘Agricultural use’ means the raising of livestock or growing of crops, fruit, flowers, and other products of the soil under natural conditions...” However, accompanying criteria limited this appraisal to lands of families or individuals whose primary occupation and primary source of income was agriculture. This amendment substantially reduces taxation of land that qualifies, but the criteria for qualification are restrictive because they address both land use and landowner occupation.

Perhaps this was generally perceived as an effort to “save the family farmer” because it focused on the individual landowner as well as land use. However, the constraints of “primary occupation and primary source of income” were restrictive to many even at that time. “Primary occupation” means that if the owner conducts several different occupations, then agriculture must take more of the person’s time and effort than any other occupation. “Primary source of income” means that agriculture must provide more of the person’s gross income than any other business venture and it must be done for profit. Use of land for hunting (wildlife management) was viewed as a “non-agricultural purpose” even though the leasing of hunting rights had been in practice for 40 years. Relatively few landowners chose to seek to qualify under these considerations.

Ten years passed before sufficient interest developed in “promoting the preservation of open-space land” that the Legislature submitted another amendment to the constitution. This redefined use of open-space land for agricultural purposes, as well as included land devoted to production of timber. It provided for taxation of agricultural and timber land based on its productivity capacity. Another provision directed the Legislature to define by general law the criteria for taxing open-space land. This was approved by voters in 1978.

Subsequently the Legislature through the Property Tax Code defined the process for appraisal of open-space land. This law substantially expanded eligibility to land devoted to farming and ranching. The focus was on use of the land and not on the owner. The owner’s income and occupation tests were not included. Qualified land was defined as “land that is currently devoted principally to agricultural use to the degree of intensity generally accepted in the area.” Efforts were to give fair and equal tax treatment to those actively involved in production from their land. “Intensity of use” is an important concept since it helps define agriculture as the primary use.

Use of land for wildlife management again was viewed as a “non-agricultural purpose.” But, a hunting lease could be considered compatible with a primary agricultural use, e.g., grazing cattle. However, the intensity of use criteria did not allow a reduction in agricultural use to enhance wildlife habitat or favor wildlife species. As general public attitude became positive toward active wildlife management, some private interest groups lobbied for favorable tax treatment of land managed for wildlife.

In 1991, the Legislature responded by amending the Property Tax Code to include wildlife management as an “agricultural use,” qualifying land for agricultural appraisal and taxation. However, the Texas Attorney General’s office questioned the constitutionality of the action since land managed for wildlife was not a part of the definition of agricultural use in the 1978 amendment. Changing its status required yet another constitutional amendment.

The Legislature submitted “the constitutional amendment to allow open-space land used for wildlife management to qualify for tax appraisal in the same manner as open-space agricultural land, subject to eligibility limitations provided by the legislature.” In 1995 the voters approved.

The Legislature in turn implemented the amendment through the Property Tax Code, by making wildlife management an agricultural use. This means that before being considered as land in wildlife management use it must first be qualified as agricultural land involving certain length of time and intensity of use criteria which were established in the 1978 constitutional amendment. Additionally this means that land qualified for timber appraisal is not eligible for wildlife management use at this time.

The Code specifies eligibility requirements for wildlife management focused on “active management, impacting a population of indigenous animals, and management of wild animals for human use.” Demonstrating “active management” requires activities in three of the following categories: “a. habitat control; b. erosion control; c. predator control; d. providing supplemental supplies of water; e. providing supplemental supplies of food; f. providing shelters; and g. making census counts.” The same legislation requires the Comptroller—with the help of the Texas Parks and Wildlife Department and the Texas Agricultural Extension Service—to develop guidelines for use by the chief appraiser in determining whether land qualifies.

Guidelines were developed by a group of 25 biologists, and reviewed by representatives from conservation groups, the Comptroller’s office and county tax appraisers. The guidelines expounded on the requirement of appropriate “active management activities” for each ecological region in the State. Development of a management plan by each landowner for his landholding was recommended.

It is interesting to note that it took over 30 years for common perception of wildlife management to progress from something apart from agricultural land management to a recognized part of the same. It is still unknown as to how many landowners will view this as a favorable incentive for their situation, but favorable votes on Constitutional amendments indicate significant interest.



General Session

Editor's Note: Four papers were presented in the general session, and two were submitted for publication in the proceedings.

The following titles were presented in the session but not submitted for publication:

Jim Knight, Montana State University—Addressing Controversy as a Wildlife Specialist: Building Bridges
Robert Ruff, University of Wisconsin—Balancing Split Appointments: A View from the Headshed

BALANCING SPLIT APPOINTMENTS: A VIEW FROM THE TRENCHES

MARGARET BRITTINGHAM, School of Forest Resources, Forest Resources Lab, Penn State University, University Park, PA 16802

The following comments primarily address the extension/research split but many of them are also applicable to the extension/teaching split.

CHALLENGES

There are many challenges associated with having your extension appointment split with research.

Time Demands of Extension

One of the largest challenges is the challenge of time management. No matter what your extension appointment is, extension can take 110% of your time. There are always requests for programs, phone calls to answer, individuals to assist, and administrative reports to fill out.

Tenure and Promotion Based Heavily on Research

Although this is beginning to change in some universities, in most the reward system on which promotion and tenure are based recognizes research above either extension or teaching. This does not mean that you don't need to have an excellent extension program, but it means that no matter what your research split is, you need to have an active research program to attain tenure and promotion. Extension faculty are often put in a particularly difficult situation because many non-extension faculty do not understand extension and therefore, do not understand how to evaluate extension. This becomes particularly problematic when you are being evaluated at a university-wide scale by individuals outside of colleges that have extension appointments.

As a consequence of these two factors: high time demands of extension and reward system based primarily on research, extension faculty with split appointments are

faced with a difficult challenge—the challenge of having an extension program while also being involved in and publishing research.

BENEFITS

Extension is research based and there are many benefits associated with being involved in the research process from obtaining grants to publishing results.

Keep Current

Conducting research helps you to keep current within the field. Although it is not necessary to conduct research to keep current, it makes it much easier because you become involved in reading the primary literature, determining what is known, and designing research to answer questions that are not known.

Target Research Programs to Address Extension Needs

Through extension we get a much clearer picture of what the needs of individuals or agencies are and can design research to answer these questions. We are not totally dependent on others to conduct the research.

Better Able to Evaluate Other Research

Conducting research helps you develop a critical eye and it helps you evaluate other research. This is extremely important because our job as extension specialists is to evaluate research and translate research into a form that can be used by the public.

Enhances Your Credibility with Colleagues

As I said under challenges, one of the challenges is getting recognition from other academic peers. By conducting research, you are able to gain this recognition.

In addition, although the public often doesn't care whether or not you conducted the research, I think this can raise your credibility particularly when you are conducting educational programs for other natural resource professionals.

Having a split appointment with teaching can also be beneficial. I have found the greatest benefit to be the continual contact with students that allows you to see a change over a semester. One of the frustrations of extension is we often have one-shot programs where people come in, we teach them, and we don't see them again.

SURVIVING THE SPLIT APPOINTMENT

Manage Your Time Wisely

This is an obvious statement but can be very difficult to do particularly in extension. Managing your time involves a number of factors:

- setting aside blocks of time to conduct research or to work on developing new extension programs;
- setting priorities of what you want to accomplish and what you need to do to get there;
- saying no. Just because a day is open doesn't mean you have to say yes to give a particular program. You also need to have time to think and write.
- controlling the phone. For many extension specialists, the phone can be one of the greatest obstacles to having blocks of time. If possible, have graduate assistants or other knowledgeable individuals handle routine phone requests. Answer phone calls a couple of times a day instead of throughout the day.

Link Your Research and Extension Program Together

If you have a research appointment, you will need to conduct research and write publications. The most efficient way to do this is to link your research and extension program together. To do this you can develop a research program that will answer specific extension questions and develop an extension program based on that research. It is almost impossible to have completely separate research and extension programs.

Develop Partnerships but Maintain Identity

A good way to multiply your efforts is to form partnerships in both research and extension. However, you still need to maintain your identity and have programs that you are the lead on.

Evaluate Your Extension Program and Present Programs That Are Being Reviewed in an Organized Way

In terms of surviving the system and also in terms of improving your extension programs, you should evaluate your extension programs in a systematic fashion on a regular basis. This will make it much easier for others to understand what you did and why.

Find a Mentor Within and Outside of Extension

It is helpful to have a mentor both within the extension system and also outside the system. These mentors can provide advice and help keep you on track in terms of what you need to do. An individual outside of extension is useful because they can provide insights into how your programs will be perceived by non-extension faculty.

Know What Is Expected

Finally, you need to know what is expected. This will vary greatly from university to university, so it is important that you find out what is expected in your particular situation.

FINDING YOUR SONG

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Planet Earth is a *magnificent* mix of things that make "living" possible. Delicate mixtures of chemicals, minerals, gases, and waters bathe us. Earth is just the right distance from our sun to provide the energy, driving all the systems—necessary for life—as we know it. Some refer to this as the Great Balance of Life.

How well are these systems balanced, and what would it take for the Planet to lose its ability to create and sustain Life?

We are all aware of the long list of environmental problems facing us. We are also aware of the scientific uncertainties that make it difficult to predict the seriousness of these issues. We debate whether the problems merit the seemingly drastic measures often prescribed to correct them.

Despite the uncertainties surrounding many ecological issues, it is increasingly difficult to deny that many of the imbalances are indeed serious. Ozone loss is greater than anticipated. Immense acreage of rain forests and wetlands are converted to a "higher human use," and we are losing farmland to erosion, salination, desertification, and urban growth at more than alarming rates. Over a billion people do not have access to safe water or adequate food, with 14 million children under the age of 5 dying each year. Yet our human population continues to grow.

Further, these problems are connected, often in ways that are difficult to predict. For example, atmospheric changes from the greenhouse effect may accelerate ozone depletion, and both global warming and ozone depletion may contribute to species loss. Steps to solve these problems are often connected, as well. Investing in energy conservation and solar energy to reduce greenhouse gas accumulation, for example, could ease our transition away from fossil fuels. Replacing chlorofluorocarbons will help reduce both ozone loss and greenhouse gas accumulation.

Environmental and economic problems are also connected. We have begun to realize the link between environmental degradation and worldwide economic disparities. A quarter of the world's people are rich (including America's middle class), enjoying the comforts provided by industrial technology. Another 20% are desperately poor, existing on the bare edge of survival. The Rich degrade the land by extracting, consuming and discarding at ever-increasing rates, contributing to the greenhouse gas accumulation,

ozone loss, and air and water pollution. The Poor degrade the land because they cannot afford sanitation and they cannot afford conservation. Their only choice is to farm or graze on land that can no longer support them, or move to sewage-filled urban slums.

So, what can we do? Do extension specialists have a responsibility to tackle these immense problems on an individual level? How about together? You and me—US!

We have been degrading the environment since long before the industrial revolution. Prehistoric humans used fire to alter ecosystems, and over-hunting may have contributed to the extinction of some animals. By the 17th century, western Europeans had logged most of their forests. Despite the extensive ecological disruption and human suffering caused by these events, they pale compared to environmental problems of today. Humans are rapidly increasing in number, each individual seeking to consume more and dramatically modifying their surroundings. Western culture has accelerated our tendency to consume and modify our environment like no other people of the past.

How does this happen?

1. We are **ANTHROPOCENTRIC**—we believe the planet exists merely for our use.
2. We revere **INDIVIDUALISM**—downplaying the relationships between humans and nature—**ME FIRST!**
3. We are **HIERARCHALISTIC**—ranking teams, towns, and people from high to low, good to bad, rich to poor. We separate ourselves by class, race, gender, income, culture. We place ourselves above all other creatures.

This is western culture of today. So, how do we save ourselves from destruction? Perhaps we should hear the "Wisdomkeepers;" share the humanity of Native American Spiritual Elders—the "old ones" who are fragile repositories of sacred ways and natural wisdom going back milleniums...yet relevant...especially today.

- *Everything I know I learned by listening and watching. Nowadays people learn out of books instead. Doctors study what man has learned. I pray to understand what man has forgotten.*

~ Vernon Cooper, Lumbee

- *These days people seek knowledge, not wisdom. Knowledge is of the past; wisdom is part of the future.*

~ Vernon Cooper, Lumbee

- *All things are equal, because all things are interrelated and an equal part of the whole; we are like drops of rain, which will one day return to the ocean, we are like candles lit by the fire of the Sun, forever a part of it.*

~ White Deer of Autumn

- *Unless you respect the earth, you destroy it. Unless you respect all of life, as much as your life, you become a destroyer.*

~ Oren Lyons, Onandaga

- *Think not forever of yourselves, O Chiefs, nor of your own generation. Think of continuing generations of our families, think of our grandchildren and of those yet unborn whose faces are coming from beneath the ground.*

~ Peacemaker...Iroquois Confederacy

- *The Seventh Generation
In our way of life, in our government, with every decision we make, we always keep in mind the Seventh Generation to come. It's our job to see that the people coming ahead, the generations still unborn, have a world no worse than ours—and hopefully better. When we walk upon Mother Earth we always plant our feet carefully because we know the faces of our future generations are looking up at us from beneath the ground. We never forget them.*

~ Oren Lyons, Onandaga

- *I, myself have no power. Real power comes only from the Creator. But, if you're asking about strength...the greatest strength is gentleness and wisdom.*

~ Leon Shenandoah, Iroquois

- *We Chiefs are the keepers of the Central Fire. This is not just a fire of logs and flames...it is the fire within one's heart...and mind.*

~ Louise Farmer, Onandaga

- *Everyone has a song. This is the gift to each of us, from the Great Spirit. That's how we know who we are. Our song tells us who we are.*

~ Charlie Knight, Ute

So what is *your* song? How will you present it?

The melody of my song came from a chorus of three mentors:

My mom, Lydia, instilled a love of nature in me. Mom spent hours leading me through the woods and fields—teaching me about the natural world surrounding our farmstead. At 98 years and two months, together we kayaked—revisiting nature. *Mom gave the wonder to my song.*

Woody, my high school wrestling coach taught me patience, the value of listening, the fine art of fishing, the enormous power of dedication, focus, and “finishative.” *Thanks Woody, for the quiet crescendo of my song.*

My third mentor, (though our lifetimes never met) *Chief Seattle, gave me the message of my song as a Nature Missionary.*

Chief Sealth (or Seattle), leader of the Suquamish tribe in the Washington Territory, delivered a prophetic speech in 1854, regarding the transfer of ancestral Native American lands to the federal government. The speech was delivered during a meeting with Isaac J. Stevens, first governor of Washington Territory. Chief Seattle and about 1,200 of his people gathered on the shore of Elliott Bay, which is now a part of Seattle. Speaking in his native tongue, it was translated by an Indian interpreter into Chinook Jargon. Several people have translated this spiritual message into English. Though many writers have embellished Chief Seattle's speech, his song continues, more than a century later, sending a strong environmental message:

The Great Chief in Washington sends word that he wishes to buy our land....

If we do not own the freshness of the air and the sparkles of the water, how can you buy them? Every part of this earth is sacred to my people. Every pine needle, every sandy shore, every mist in the dark woods, every clearing and humming insect is holy in the memory and experiences of my people.

So we will consider your offer to buy our land, but it will not be easy. For this land is sacred to us. This shining water that moves in the streams and rivers is not just water, but is the blood of our ancestors.

This we know....Earth does not belong to man; man belongs to the Earth. This we know. All things are connected, like the blood which unites one family. All things are connected.

*Earth is our Mother ~ Sky is our Father.
The Eagle that soars
and the fish that swim
are our brothers and sisters.*

We know that the White Man does not understand our ways. One portion of the land is the same to him as the next, for he is a stranger who comes in the night and takes from the land whatever he needs.

There is no quiet place in the White Man's cities. No place to hear the leaves of spring or the rustle of insects' wings. The Indian prefers the soft sound of the wind darting over the face of the pond, the smell of the wind itself cleansed by a mid-day rain, or scented with a pinon pine. The air is precious to the Red Man. For all things share the same breath—the beasts, the trees, the man.

What is man without the beasts? If all the beasts were gone, men would die from great loneliness of spirit, for whatever happens to the beasts also happens to man.

The Whites, too, shall pass—perhaps sooner than the other tribes. Continue to contaminate your bed, and you will one night suffocate in your own waste. When the buffalo are all slaughtered, the wild horses all tamed, the secret corners of the forest heavy with the scent of many men, and the view of the ripe hills blotted by the talking wires, where is the thicket? Gone. Where is the eagle? Gone. And what is to say goodbye to the swift and the hunt, the end of living and the beginning of survival?

This we know. All things are connected. Whatever befalls the Earth...befalls the sons of Earth. Man didn't weave the web of life, he is merely a tiny part of a single strand of the web. Whatever he does to the web....he does to himself.

And we must teach our children of these things.

I thank my mentors....for helping me find my song.

Among us, others have found their song and shared through their giving, during the past Extension Wildlife and Fisheries Specialist Workshops:

December 1972 **Estes Park, Colorado**
Theme—Educational Challenges and Opportunities for Extension Wildlife and Fisheries Programs—John Schmidt, Colorado

April 1977 **San Antonio, Texas**
Theme—Extension Education and Legislation to Expand Natural Resources Program Delivery—Milo Shult, Texas

November 1981 **Baton Rouge, Louisiana**
Theme—Strengthening Educational Program Delivery Through Improved Cooperation and Coordination with other Natural Resources Agencies and Organizations—Jim Fowler and Larry de la Bretonne, Louisiana State University

October 1984 **Madison, Wisconsin**
Theme—A Focus on Improving Private Land Stewardship Through Expanded Extension Natural Resource Programs—Bob Ruff and Scott Craven, University of Wisconsin

October 1987 **Jeckyll Island, Georgia**
Theme—Extension Resource Programs in Changing Times—George Lewis and Jeff Jackson, University of Georgia

September 1990 **Monterey, California**
Theme—Future Directions for Cooperative Extension Wildlife, Fisheries and Aquaculture Programs—Lee Fitzhugh, University of California

May 1993 **Kansas City, Missouri**
Theme—Fish and Wildlife Stewardship for the 21st Century: Integrating People and Wildlife—Bob Pierce, University of Missouri; Jim Pease, Iowa State University; and Robert Henderson, Kansas State University

June 26-29 1996 **Bellingham, Washington**
Theme—Educational Challenges for the 21st Century—Dan Edge, Oregon State University and John Munn, Washington State University

*So, from this day forth, what will be your song?
Will you play a larger part in developing public policy?
~ restoring wetlands
~ preserving endangered species
~ promoting biodiversity*

Will your messages be directed to the easy to reach....easy to teach....or will it include the young, the seniors, and cultures difficult to reach, but so in need to hear your song?

And will you reach the high notes? Higher than you could possibly imagine when you were a kid....hunting, fishing, and dreaming, while watching the dragonflies along a stream?

Can you vision what your capacity to give and lead actually are? Is your song good enough?

Opportunity time ~ to be what you dream to be ~ is rapidly being taken up by what you are settling for.

Dan and I thank you for joining and participating in this Workshop, in our beautiful Pacific Northwest.

To be here, you have given. We thank you! Here's what we wish to give in return, if we could:

We'd give you the gift of childhood, so that you'd never lose your Sense of Wonder—of the natural world.

We'd give you a sense of humor—a life of laughter and joy.

We'd give you the gift of tears—to wash away sorrows—and celebrate joys.

We'd give you the gift of love and friendship, so you would never face life alone.

We'd give you the gift of solitude—time alone to explore your thoughts, to understand who you truly are, and to learn to love and accept yourself.

We'd give you the gift of dreams, for in dreams we find hope and challenge.

We'd give you the drum song of Cha-das-ska-dum Which-ta-lum.

But the most precious gift we'd bestow is the gift of passion. Not simply the passion between those we love, but the passion for life. The passion to feel deeply and act on those feelings. The passion to believe in yourself and others. The passion to stand up for what is right and just. The passion to watch the sunrise and feel its beauty and its promise; to walk along the beach and hear the pulse of the earth. The passion to live your life to the fullest, not to be a mere spectator.

All these gifts we would give to each of you—along with your unique heartsong—and we will sing with you.

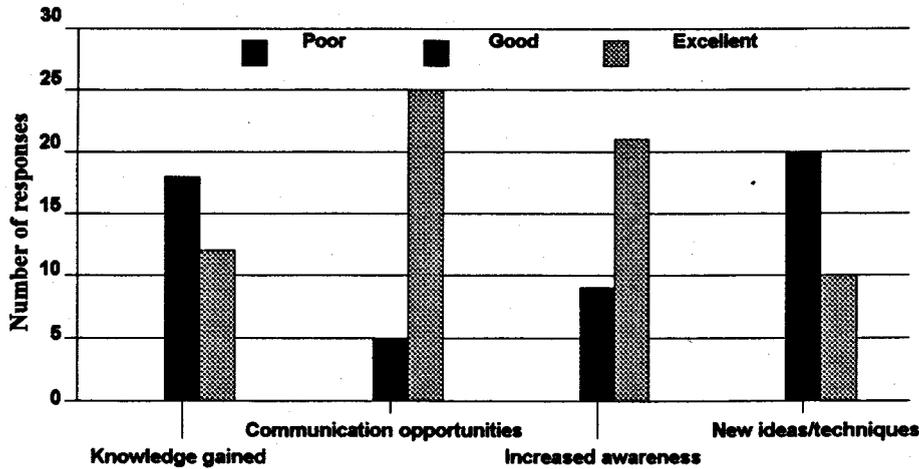
Au Uh Kasa Kasa
(Good journey, safe return, with love)

Workshop Evaluations

Thirty workshop evaluations were returned. the following graphs and tables summarize the responses.

WORKSHOP CONTENT

How would you rate this workshop in terms of:



In which subject matter areas in the workshop did you gain ideas or learn new techniques (check all that apply)?

Workshop Session	Number of responses	Rank
GPRAs Evaluations and Accountability	8	11
Extension Technologies for the 21st Century	21	1
Ecosystem Management	10	10
Public Issues Education	20	2
Wetlands	11	8
Aquatic Exotics	3	14
Biodiversity and Endangered Species	13	6
Animal Damage Management	11	8
Pond Management	4	13
Continuing Education for Adults and Youth	11	8
Wildlife as an Asset to Landowners	15	4.5
Fee-fishing Enterprises	6	12
Addressing Controversy	16	3
Balancing Split Appointments	15	4.5

FIELD TRIPS

Did you attend a preworkshop field trip?
 8-Yes 22-No

If yes, how would you rate the experience?
 8-Excellent

How would you rate the Marine Ecosystem field trip?
 4-Good 23-Excellent

When should field trips be offered?
 10-Before 14-During 6-After

If pre- or post-workshop field trips are preferred, what duration?
 6-1 day 9-2-3 days

Which National Extension Specialists Workshops have you attended previously?

2-Estes Park (1st) 6-San Antonio (2nd)
 10-Baton Rouge (3rd) 12-Madison (4th)
 11-Jekyll Island (5th) 12-Monterey (6th)
 15-Kansas City (7th)

WORKSHOP FORMAT AND TIMING

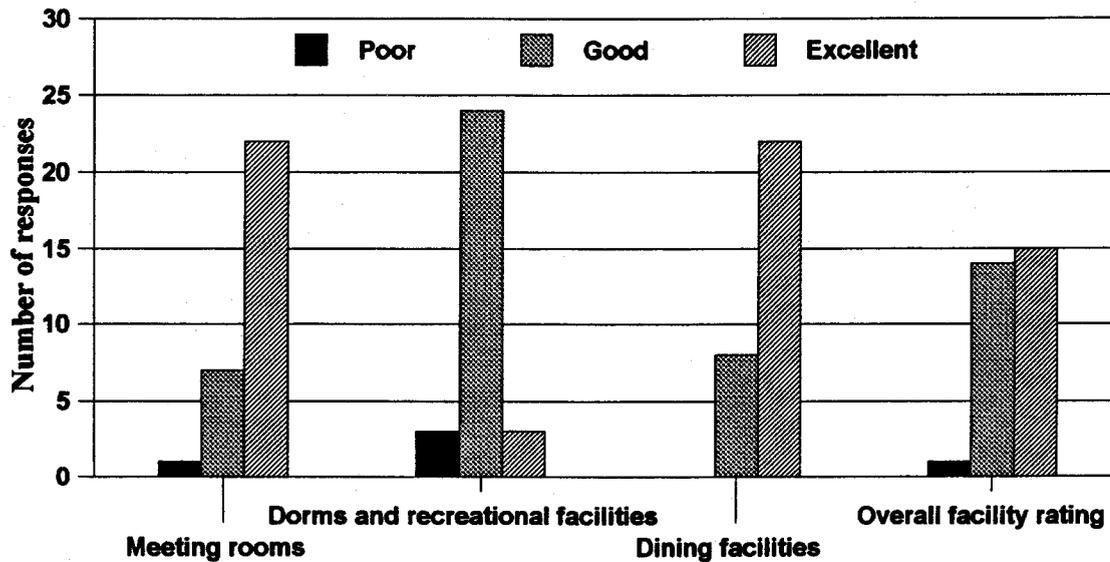
Length of the Workshop
 1-Too short 29-About right

Do you feel field trips should be an integral part of future workshops?
 27-Yes 0-No

Do you prefer meals being built into the registration fee, or would you prefer a lower fee and more flexibility?

27-Incorporate meals in fee
 3-No meals in fee

WORKSHOP FACILITIES



PARTICIPANT BACKGROUND

What is your professional affiliation (check one)?

- 24-Extension Specialist
- 2-Extension Administrator
- 3-Federal Agency

If Extension, characterize your appointment split.

Appointment	Number of responses	Mean FTE (%)	FTE range (%)
Extension	27	74.5	20-100
Research	12	39.9	15-65
Teaching	5	23.6	5-40
Administration	1	80	80

If Extension, characterize your duties.

Duties	Number of responses	Mean FTE (%)	FTE range (%)
Wildlife	21	78.1	15-100
Fisheries/Aquaculture	12	45.8	5-100
Other Natural Resources	11	33.6	5-100
4-H	9	24.4	5-60
Sea Grant	1	50	50

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