

Hal Salwasser, Past-president, The Wildlife Society, Boone and Crockett Professor of Wildlife Conservation, The University of Montana, Missoula, MT 59812

Key words: biologists roles, resource professionals

1995 TRANSACTIONS OF THE WESTERN SECTION OF THE WILDLIFE SOCIETY 31:1-6

The theme for this conference "Changing times for wildlife professionals—our roles in biodiversity conservation, ecosystem management, and sustainable development" contains two different ideas. Changing times is the first. Our role in dealing with new social goals is the second. The first idea is not new or unique to this time or this body of people called wildlife professionals. It has always been, and always will be, changing times for everybody. I'll point out some mileposts that bear witness to the role of wildlife professionals in previous changing times and also give some reason for optimism in the face of new challenges.

Mostly, I want to offer some thoughts on what makes this time different and what I think we should do about it. Specifically, I will direct these thoughts to the second part of the conference theme: our roles in biodiversity conservation, ecosystem management, and sustainable development. This, by the way, would be difficult enough if everyone understood what biodiversity conservation, ecosystem management, and sustainable development meant. But these concepts are not clear. Thus, I'll have to do a little defining of terms along the way.

Here's a road map for the talk. I'll start by describing some major features of the environment that we will operate in for the next decade: population growth, demographic change, the emerging knowledge society, tribalism, and the global economy. This context will identify some of the challenges we face; not all of them, however, because we will always encounter surprises. The identifiable challenges include open space, water, land health, land use patterns, community cohesion, and shifts in our society's cultures, attitudes, and values.

History tells us how we dealt with prior challenges and informs on whether there is any reason for optimism. So, I'll highlight why wildlife and related natural resources professions emerged as science-based disciplines, how they pursued their objectives and what they did well and not well. This will touch on science, management, politics, education, the ethics of fair chase, and sustainable use, and who lead and who followed.

Next I'll consider some current trends in natural resources professions. By this, I mean wildlife and its relatives in forestry, fisheries, hydrology, soils, range, recreation, and so forth. These trends are being shaped by

both internal and external forces and they portend a new model for the interdependence of science, management, politics, law enforcement, education, and ethics in wildlife and natural resources conservation. The new model, often identified with words such as biodiversity, ecosystem, and sustainability, is being shaped through continual interactions within the larger society. It begs the key question of this conference: what roles for wildlife professionals? In the words of Lee Iacocca, do we lead, follow or get out of the way?

So, there is our road map: context, challenges, history, trends, and future roles. In case you're wondering about my concluding pitch, let me just say that it is not within the conservation legacy of George Perkins Marsh, W.J. McGee, Theodore Roosevelt, Gifford Pinchot, John Muir, George Bird Grinnell, Aldo Leopold, Hugh Hammond Bennett, J. N. "Ding" Darling or Rachel Carson to suggest that we either follow or get out of the way. I am not ready to break ranks with the spirit of these individuals. Before we embark though, let me reiterate two points that I hope were not lost in my introductory remarks.

First, I talked about wildlife and natural resource professionals together. That is because we are allies in a similar cause: the conservation of healthy, productive land and the shared and sustainable uses of natural resources for all their values for many generations to come. We are not adversaries as some would have us believe. Second, I identified several different roles for these professionals—scientists, managers, politicians, law enforcers, educators, and ethicists. These are complimentary roles, all essential and none higher or lower than the others. I hope you leave this conference with these two thoughts firmly in mind: common mission and teamwork. Let us now examine the context of our lives.

CONTEXT: LIFE UNDER ACCELERATING CHANGE

During the past 40 years, just two human generations, the number of people in the world doubled. Since the dawn of the industrial revolution, 300 years ago, the number of humans has grown 11-fold, from about 500 million to 5.5 billion. This has rapidly changed what it means to be a human in the biosphere. It would not have happened were it not for improved agricultural production, industrial

¹Keynote speech delivered at the Annual Conference of The Wildlife Society Western Section, Rohnert Park, CA, February 3, 1995.

technology, and public health care, which collectively gave people a different quality, style, and quantity of life.

But not all of the people in the world have benefitted equally from these changes and the changes have had profound effects on the character of the environments and communities in which we live. The biodiversity crisis, the global atmosphere crisis, the groundwater crisis, the urban crime crisis, the "you-name-it" crisis of the day are all created by these realities. Global trends are repeated, if not lead, by similar changes in the U.S. and California. Simply put, we use more space and resources to live these days. We put more junk into the environment as a result. We live elbow-to-elbow with more people, some of whom make us very uncomfortable.

Growth in numbers is not the only population change going on. Populations are getting older because of better nutrition and health care. In some developed nations they are getting more culturally diverse as immigrants from war-torn and less developed nations crowd in to find the better life." Furthermore, people are shifting from rural to urban lifestyles. Farmer/author Wendell Berry cites U.S. census data on farm families to illustrate this latter point. In 1920, 32 million people lived on farms or ranches. At the time this was 30% of the American population. By 1950, the number had fallen to 23 million; 15% of the population. By 1990, they had fallen to 4.6 million, about 2% of the population and the Bureau of the Census declared that it would no longer distinguish an agricultural population. In 1990, 32% of U.S. farm and ranch managers and 86% of farm workers no longer live on the land they farm. Together with immigration, more than 900,000 people in 1993 alone, these demographic trends change the perspectives and values in our communities, often creating growing intolerances.

If these population and demographic trends were not enough of a new context, Peter F. Drucker (1994) tells us that society is in the midst of a social transformation the likes of which has not been seen since the industrial revolution. He calls it the transition to a society where knowledge rather than land, labor or capital will be the most valuable resource. Because knowledge is carried by individuals and must be used in organizations to be effective, people will be more mobile and work in groups that are constantly undergoing change. Schools will become the central institution because education is the source of knowledge. Individuals will simultaneously be under pressures to function in the global marketplace of ideas and products and pressures to retain the identity and quality of life in local environments and communities. I cannot envision exactly how this is going to work: being competitive in response to global forces while holding on to local community cohesion and traditions when demographic turnover rates of 20 to 30% per decade occur in some neighborhoods

and communities. I can, however, envision that people in this knowledge society are even more likely than recent generations to lose their sense of connectedness to a particular place and to the land and natural resources that secure their well being.

Well, that is enough context. There, obviously, is more but this gives you the general idea of the rapid change which will dramatically alter our lives but the specific nature of which is only partially predictable.

CHALLENGES: DOING MORE WITH LESS

The challenges presented by the changes I have just noted can be summed in just a few words: we will have to do more with less. Recall the data on global population growth over the past 300 years. They translate into a 90% reduction in the earth space available per person from 1700 to 1990. Sandra Postel (1994), in a recent State of the World report, cites data showing that global water use has tripled since 1950; wood removal from world forests has doubled; economic throughput has quintupled; and oil use has grown by six times. All of this from a planet that has remained the same size; thus, people are consuming and producing more resources from less per capita space.

The simple effects on space are all around us, even in such rural states as Montana. But here in California they are most dramatic. Houses push into forests, deserts, and shrublands creating an urban-rural interface that affects fire policies, local biological diversity, water quality, police services, school programs, and scenery in one fell swoop. Houses crowd agriculture off the most naturally productive farm soils in the world. Agriculture then pushes up hill sides and into deserts to bloom under massive infusions of genetically engineered plants, water is moved with fossil fuels, and petrochemical fertilizers and pesticides are applied in ever increasing amounts until the soils and waters are poisoned with salts. There are also other effects on water. Most, if not all, major American rivers have now been dammed for irrigation, flood control, hydropower, and drinking water. Diversions from historic channels have completely dried up some watercourses in the West — the Colorado Delta being the most egregious example. Return flows to the channels now carry nutrients and pollutants the aquatic systems cannot handle. Our society is draining the groundwater at non renewable rates all over the west.

You might ask what about forests which provide a third of the wildlife habitats in the world and United States? It's a mixed story in the U.S. Here, we've lost a lot and we've recovered a lot (Salwasser et al. 1993). The U.S. now uses a third of all the industrial wood products produced in the world each year (that is lumber, paper, packaging, furniture, and so forth). Yet we produce only 25% of the world's annual supply. So, we are a net importer of wood despite

the fact that we have much of the world's most productive forests. California leads the way on wood use and forests. California, with about 12% of the nation's population, uses about 25% of the nation's wood, yet produces only 50% or less of the wood which the state's forests could produce. California imports wood from the Northwest, British Columbia, the South, and other less developed sectors of the world. The rub is that our consumptive lifestyles drive the production of resources while our aspirations for a quality backyard environment force that production to other places. We are world masters at the game of NIMBY. As one person recently posed in an E-mail piece on the linkage of global forest issues: how many orangutans is a spotted owl worth? This is not a trivial question because it points out the limitations of local or regional solutions to problems that are being driven by global forces. How, with such globally connected issues as forests, wood, atmosphere, and biodiversity conservation, does one decide what is environmentally ethical behavior at local scales? The answer is not as easy to find as some would have us believe.

The last point I want to make on challenges is the overwhelming effect that cultural, attitudinal, and value shifts will have on our professions. These challenges go deeper than the surface polarizations that occur from time to time between sectors of society that claim different rights or interests. Two examples are between people who want to cut trees in roadless forests and those who wish to preserve unspoiled nature, and between people who wish to manage mountain lions to reduce human vulnerability to attacks and those who believe that the lives of wild lions have more value than those of domesticated humans. We will always have these kind of differences over flash points in our society, be it wolves in Wyoming, salmon in Idaho, riparian habitats in Arizona, Indian treaty rights in Minnesota, or community stability in Alaska. They will rightfully occupy our attention and energy but we had better pay attention also to the strong currents that will cause complete course changes rather than just periodic rerouting. These forces include the:

- now nearly completed shift from a rural to an urban lifestyle for Americans,
- infusion of nearly a million people a year from less developed nations who will fight hard for their piece of the American dream (one-fourth of them settle in California),
- growing intolerance of existing citizens and property owners against actions which they perceive as a threat to their security or rights,
- growing disaffection that people have for govern-

ment solutions to problems,

- widening gap between "haves" and "have nots," and
- potential for social disintegration caused by growing terrorism and violence, such as the urban gang warfare and local warlords as discussed by Robert D. Kaplan (1993) in *Atlantic Monthly* last winter.

The upshot is that natural resource professionals will face the challenges of:

- (1) having to meet growing and more diverse needs and demands for resource uses and values, from
- (2) a shrinking and fragmenting wildland base with less water or less clean water, and
- (3) increasingly stressed populations of native plants and animals, with
- (4) the probability that the signals they receive from society about what they should be doing to protect and provide for all these needs, wants, and desires will be contradictory and inconsistent to say the least.

So, several key questions we should be asking ourselves at this point are:

What are effective ways for people to talk and receive signals on what should be done to satisfy environmental, social, and economic needs and wants? Is there an emerging role for markets to transmit information on wildlife values?

How can resource professionals gain efficiencies in providing for increasing needs and wants from a static or shrinking land base? Is this where ecosystem management fits?

How can the worst effects of unavoidable human impacts or of incomplete or imperfect knowledge be mitigated? Adaptive management perhaps?

How can communities temper the pressures that growth and changing lifestyles could put on space and resources? The "Z" word — zoning)?

How can we identify and set reasonable standards that acknowledge risk, uncertainty, and changing knowledge and technology for conditions and trends of essential resources such as water, air, native biota, soils, and human well being? Charting the vital signs of ecosystem health?

These questions are not merely scientific challenges,

solvable through infusions of more people and dollars to research and technology development. They do require information from science. But even more they require interactions between natural and social sciences, humanities, and regular citizens. That leads to the next stop along our journey: Is there evidence that resource professionals have confronted challenges such as this in the past, that they might be up to the challenge in the future?

WHERE WE'VE BEEN: RECOVERY AND SUSTAINED YIELD THROUGH SCIENCE AND ADAPTATION

We need to drop back in time to see where we've been. It never ceases to amaze me how many times I see or hear the reference point for resource management presented as pristine nature, or restoration of nature's legacy, or how things would have been if it just wasn't for people — as if that is where natural resource managers started. I've seen this reference point argued for biological diversity, old-growth forests, water quality, big game on private lands, and national parks and wilderness on public lands. I am sure you have had the same experience, maybe even indulged in such comparisons a bit yourself. But pristine nature is not where we started. Thus, pristine nature is not the correct reference point to judge the results of wildlife management, forestry, fisheries, range conservation or watershed management. None of the resource disciplines emerged to recreate nature, however that might be perceived. They were created to stop the devastation of nature caused by unregulated use of soils, waters, forests, and wildlife; as well as to restore and enhance the sustainability of natural resources through prudent use.

This is not to say that pristine nature is not a useful goal or that natural resource disciplines have nothing to contribute to natural area protection, wilderness preservation, native biodiversity conservation or park preservation. But it does suggest that the appropriate reference point for evaluating the results of natural resource disciplines applied to their respective areas of focus is this:

What would things have been like under the human pressures that would have prevailed during the past 100 years had these disciplines not been applied to the problem of restoring and sustaining productive lands, waters and biota?

If this is the correct reference point, as I think it is, then to see what has been accomplished makes sense.

Before the resource disciplines, back in the late 1800s, many of the nation's forests, rangelands, waterways, and wildlife communities were in dismal shape. They were suffering the onslaught of human settlement and development moving like a wave across the landscape. The wave

was cresting on the Great Plains and heading west when the progressive conservation movement redirected it by initiating the resource management programs and scientific disciplines that gave rise to our current system of wildlands, conservation laws, and the institutions that support them. The results were nothing short of astounding.

Before conservation laws, public wildlands, and conservation institutions, forests were being harvested far faster than trees were growing. From 1850 to 1920, an average of 12,000 acres of forest per day were converted to farms. That's right, for 70 years nearly 18 square miles of forest were put under the plow every day. The country lost almost a third of its original forest habitat during that period. Wildlife were slaughtered for food, hides, feathers, and livestock security. Now common species of deer, elk, turkeys, pronghorn, and ducks were nearly wiped out. Some species were wiped out totally and many others were extirpated from the majority of their native ranges. Waterways were used as sewers and the air was a common receptacle for smoke and pollutants. All this was done by less than half the number of people that now populate this nation. Except in the still-pristine west this was the story. This is the reference point to judge the results of resource management.

From 1890 to somewhere in the mid-1900s, state and federal systems of wildland parks, forests, wildlife management areas, and natural areas were put in place. State and federal agencies were created to care for them. Research and education programs needed to feed knowledge to professional managers were built and fine-tuned. The sustained yield ethic was applied to multiple resource uses and instilled in citizens as well as resource managers. No matter what you think about the current applicability of this ethic, we could not even begin to contemplate ecosystem management and biodiversity conservation if not for the accomplishments of this period.

From the mid-1900s to somewhere in the last decade, the sustained yield model was refined through science and extended to virtually every resource field. Some sub-disciplines such as wood production forestry, game management, developed recreation, and sport fisheries took an aggressive lead. Others such as wildlife diversity, and habitat management, wilderness forestry, dispersed recreation, and native fisheries tended to react and follow. All the disciplines had their bias toward production through simplification and intensive management. Voices for "naturalness" and respect for nature were not widely heard. Aldo Leopold, for example, was not widely recognized for his contribution of a land ethic until well into the 1970s.

That's where we've been. Wildlife and other natural resource professionals accomplished some incredible feats during the past 100 years. During a period in which the human population of the U.S. more than doubled, they

brought back productive forests, restored native wildlife species to millions of acres, established wilderness areas, set up state wildlife management areas, refined sustained yield harvests of game and fish, and eliminated the worst of the known pollutants from our air and waters. None of these, however, were done to perfection or to pristine conditions. In exuberance some things were done to excess such as clearcut forestry, game and sport fish emphasis over native diversity, and rangeland reseeding with exotic grasses. In frustration, some things were not possible to accomplish such as riparian area restoration, cleaning up from mining and toxic dumps, and stemming the steady drift toward endangerment for many native species.

Now, here we sit in 1995. The world is changing at a faster pace than that with which resource professionals have ever had to deal. The human population is growing and changing in ways we cannot completely predict. We are being asked to provide more value — both natural and produced — for more people from a shrinking resource base of wildland, water, and native biota. How in the world can this be done? Well, using history as a lesson, we can and should say with candor that it cannot be done to anyone's ideal of perfection.

We cannot sustain pristine nature even if we think the reference point is the present. There are too many built-in lag effects of the existing population. But we can lessen their potential impacts. We will make mistakes and will not be able to tackle some of the problems we would like for financial or political reasons. But we can make a positive difference just as those before us have done for the past 100 years. We can help people understand the context and consequences of the choices they face. So, our road map now takes us to future roles.

WHERE WE'RE GOING: ROLES FOR RESOURCE PROFESSIONALS

The future for resource professionals, like other sectors in the knowledge society to which Drucker (1994) speaks, will call for people who can apply their special knowledge to the solution of complex problems on a case-by-case basis, working in teams that may come and go depending on the nature of the problem. Lines between who is responsible — government, social, or private sector — will blur. There is just a job that needs to get done. In the words of Applegate Partner Jack Shipley, there is no more they, only us.

To get the job done, professional managers must engage the public in a meaningful dialog and listen to their needs and concerns. One of the most effective biologists I have ever known did just that. He spent as much as 50% of his time interacting with his stakeholders, sometimes out in the mud, sometimes in their meeting halls. They understood

the nature of the problems he was trying to tackle for them. Bud Laurent is now a Supervisor from San Luis Obispo County. You're going to hear his thoughts in a few minutes. You need to listen closely because he is going to give you wisdom on what conservation leadership means.

The resource sciences will embrace both disciplinary and interdisciplinary knowledge, searching not only for cause and effect mechanisms of the parts but also for understanding of the linkages and relationships between them. The sciences will involve physical, biological, and social disciplines as full members of the team. If you see that the science part of ecosystem management does not involve social and economic disciplines along side the biophysical disciplines as equal partners, stay tuned — it means we haven't yet figured out integration of all disciplines.

Resource administrators will retain a focus on specific resources that have high value or concern at the same time they use whole systems as their planning context. This might be a surprise to those of you who thought we would no longer manage for species or outputs. We will still manage stands and sites and populations of species for specific outputs. It will just be done with a better consideration — often aided by new computer technologies and remote sensing — of how those specific pieces fit into the desired conditions and trends of ecosystems at scales from watersheds to landscapes to regions. Biological diversity will be seen as what enables continued resource productivity and renewability rather than as a constraint to immediate output. Sustaining or restoring desired conditions and trends in environments, economies, and communities — often called sustainable development — will set the aims and limits for resource conservation as well as for economic development.

Educators will aim for building responsible citizens through, as Garrett Hardin called for in 1985, literacy, numeracy, and ecolacy in all ages and economic strata. Education will not start and stop with school; it will be lifelong and will occur through non-traditional venues, some of which you will provide in the course of your interactions with citizens. Beyond building understanding of how life on earth works, one of your goals should be to instill a land ethic. A second goal is to instill a shared-use ethic under which individual citizens respect and tolerate the rights of others to enjoy the values they find in natural resources without excluding legitimate users from their rightful access to those resources. A prime example is the compatibility between fair-chase hunting under scientific regulation during certain seasons and watchable wildlife programs during other seasons based upon the same populations of species.

Okay, this is idealistic. It is perhaps what many of us would like to see when we peer into the crystal ball. But it

is not what will happen unless we take action to alter the current course of events. This is what makes the challenges we face like those faced by Roosevelt, Pinchot, and Muir a hundred years ago. What distinguished these individuals is that they used leadership skills to make the future different from where prevailing trends were going to take it without their leadership.

So, I close with a pitch for leadership. Engage the people. Be a catalyst in the process of bringing meaning and commitment to biodiversity conservation, ecosystem management, and sustainable development in your communities — whether mountain towns, groups of concerned citizens, big cities, universities, public middle schools, or seats of government. Bring your knowledge and skills to bear on helping people understand the nature of the choices they face regarding wildlife and natural resources.

At the start of this talk I said I would tie this leadership role to biodiversity conservation, ecosystem management, and sustainable development. It is now time to do that. Biodiversity, as we all know by now, is the variety of life and its processes in an area. Because this variety occurs in the context of ecosystems, biodiversity conservation and ecosystem management cannot be pursued independently.

Sustainable development is an attempt to blend environmental, social, and economic goals to sustain desired conditions of human well being through healthy communities, economies, and environments. Because people are integral parts of ecosystems wherever they live or influence — which is now just about everywhere on the planet — sustainable development, and ecosystem management cannot be pursued independent of each other. This loop, or triangle, closes with the realization that nature sustains itself through the continual creation process of adaptation/evolution, which is based on diversity. Thus biodiversity conservation, ecosystem management, and sustainable

development are merely different faces of the same thing. Together, they are critical to the future well being of people. Help people see this. It is not business as usual and that all by itself scares people.

I leave you with words used by Aldo Leopold in *Song of the Gavilan* to describe the role of people on the face of the earth. Think about these words as you contemplate your role in where we're headed:

“Whether you will or not
You are a King Tristram, for you are one
Of the time-tested few that leave the world,
When they are gone, not the same place it was.
Mark well what you leave.”

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