

REFLECTIONS ON THE RECENT HISTORY OF BEARS

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Abstract: During the 25 years from 1967 to 1992, public interest and environmental laws stimulated conservation efforts and provided a rationale for expanded scientific efforts relating to bears. As the years progressed, field technology advanced rapidly and knowledge emerged as a powerful conservation tool. A survey of colleagues with a professional interest in bears resulted in a reading list of 11 technical publications that were considered important contributions to the literature for the period. Historical trends are used to envision future conservation based on the concept that bears and humans are biological competitors.

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There is good reason for beginning a contemporary history of bears in 1967. During that summer, 2 wilderness campers were killed by grizzly bears (*Ursus arctos*) in Glacier National Park, Montana. Much was written, opinions and truths merged, and the foundations for a continuing debate cast from the few facts that surrounded the incidents. Some spoke through the scientific literature to question the value of dangerous species; others wrote emotional stories that predicted a grim future for grizzly bears. In turn, conservation interests awoke and along with the mass media, generated a worldwide interest not just in grizzlies, but for other bear species as well. Interest in bears continued to escalate as the twentieth century entered its final decade.

My career was shaped by the events of 1967. I had arrived in the park just 2 weeks before the incidents and grizzlies were quickly added to my research responsibilities. As I entered the world of national park bears, science and management were indistinguishable. Every shred of information, regardless of source, was a valuable contributor to the learning process. With this lesson in mind, I would like to share some observations made during 25 years of thinking about bears. Knowledge emerged as a powerful tool during the period; I will present literature judged by peers to be major contributions to our understanding of bears. Among the interesting phenomena of those years was their dynamic nature; I will discuss some of the trends as I saw them. And finally, I will attempt to mold knowledge and dynamics into some views of the future.

Many of the thoughts in this paper originated with colleagues who unselfishly responded to questions and correspondence. I thank them for providing the substance required for an exploration of history. However, the synthesis should be considered a personal perspective rather than an authoritative history, a point underscored by the absence of references. I fully agree with 2 anonymous referees who identified my bias toward grizzly bears and emphasized the legitimacy of other viewpoints.

THE EMERGENCE OF KNOWLEDGE

Bears have attracted the attention of explorers and naturalists for several hundred years. Their observations and journals have added an invaluable dimension to our thoughts about bears and their response to encroaching civilization. Earlier in this century, the development of wildlife science led to the beginnings of modern technical literature about bears. *Wildlife Review* published by the U.S. Department of the Interior, Fish and Wildlife Service, provides a singular and complete source of wildlife literature citations from 1935 to present.

A tabular analysis of the wildlife literature revealed a progressive increase in annual publications from 588 during 1935-51 to 12,597 during 1981-90 (Table 1). Citations that included bears as their primary subject contributed to less than 1% of the total listings. However, the annual production rate for bear publications increased more rapidly than for other wildlife publications; its share of the total wildlife literature nearly doubled over the 1935-90 period.

The volume of bear literature remains unusually tractable for a diligent scholar with relatively narrow interests. Those with broader interests are more likely to be selective in their reading with no assurance that important contributions are easily recognized. With this

Table 1. Bear research contributions to the wildlife literature as determined from an analysis of *Wildlife Review* 1935-90.

Period	Years	Total citations ^a	Papers on bears		
			Number	Per year	Percent
1935-51	17	10,000	17	2	0.4
1952-60	9	14,481	85	9	0.6
1961-70	10	24,440	157	16	0.6
1971-80 ^b	10	54,802	309	31	0.6
1981-90	10	125,967	905	91	0.7
Totals	56	229,690	1,493	27	0.6

^a Estimate or count published in summary volumes.

^b Citations from international bear conferences held in Calgary and Binghamton added for comparability with 1981-90 information.

in mind, I enlisted the help of colleagues to create a list of important contributions to the bear literature with an emphasis on the period 1967-92. The concept was similar to that recently used to create a list of biology books that every scientist should read (Carter and Mayer 1988).

I initiated the process with a letter to 98 colleagues with a professional interest in bears. Selection was based solely on my knowledge of individuals through working relationships or professional activities; bias was introduced through weak international representation. Each was asked to provide a list of 5 technical papers that they considered to be outstanding contributions to the bear literature over the past 25 years. There were 64 responses to the original letter or a reminder: 52 included lists of 1 to 8 usable citations. Unpublished reports, graduate dissertations, and ambiguous citations were excluded.

The 52 respondents listed 76 publications that included books, chapters, monographs, journal papers, and conference proceedings. Author(s), characteristics, and rank of 11 citations that were listed in 5 or more of the 52 survey responses are shown in Table 2. I propose that the list represents important background reading for those with a professional interest in bears. Here is a full citation for each entry:

1. HERRERO, S. 1985. Bear attacks—their causes and avoidance. Nick Lyon Books, Winchester Press, Piscataway, N.J. 287pp.
2. BUNNELL, F.N., AND D.E.N. TAIT. 1981. Population dynamics of bears—implications. Pages 75-98 in C.W. FOWLER AND T.D. SMITH, eds.

Table 2. Characteristics and rank of 11 bear publications listed in 5 or more of 52 survey responses.

Citation ^a	Type of publication	Nature of research	Times listed
Herrero 1985	Book	Synthesis	30
Bunnell and Tait 1981	Chapter	Synthesis	19
Jonkel and Cowan 1971	Monograph	Descriptive	16
Rogers 1987	Monograph	Descriptive	15
Rogers 1976	Proceedings	Synthesis	10
Pearson 1975	Bulletin	Descriptive	7
Miller et al. 1987	Proceedings	Technique	7
Craighead et al. 1974	Bulletin	Technique	7
Stirling and Derocher 1990	Proceedings	Synthesis	6
Bunnell and Tait 1980	Proceedings	Synthesis	6
Kemp 1976	Proceedings	Experimental	5

^a Full citation listed in text.

Dynamics of large mammal populations. John Wiley and Sons, N.Y.

3. JONKEL, C.J., AND I.M. COWAN. 1971. The black bear in the spruce-fir forest. *Wildl. Monogr.* 2. 57pp.
4. ROGERS, L. 1987. Effects of food supply and kinship on social behavior, movements, and population growth of black bears in northeastern Minnesota. *Wildl. Monogr.* 97. 72pp.
5. ROGERS, L. 1976. Effects of mast and berry crop failures on survival, growth, and reproductive success of black bears. *Trans. North Amer. Wildl. Nat. Resour. Conf.* 41:431-438.
6. PEARSON, A.M. 1975. The northern interior grizzly bear *Ursus arctos* L. *Can. Wildl. Serv. Rep. Ser.* 34. 86pp.
7. MILLER, S.D., E.F. BECKER, AND W.D. BALLARD. 1987. Black and brown bear density estimates using modified capture-recapture techniques in Alaska. *Int. Conf. Bear Res. and Manage.* 7:23-35.
8. CRAIGHEAD, J.J., J.R. VARNEY, AND F.C. CRAIGHEAD, JR. 1974. A population analysis of the Yellowstone grizzly bears. *Montana Wildl. Coop. Res. Unit Bull.* 40. 20pp.
9. STIRLING, I., AND A. E. DEROCHER. 1990. Factors affecting the evolution and behavioral ecology of the modern bears. *Int. Conf. Bear Res. and Manage.* 8:189-204.
10. BUNNELL, F.L., AND D.E.N. TAIT. 1980. Bears in models and reality—implications to management. *Int. Conf. Bear Res. and Manage.* 4:15-23.
11. KEMP, G.A. 1976. The dynamics and regulation of black bear *Ursus americanus* populations in northern Alberta. *Int. Conf. Bear Res. and Manage.* 3:191-197.

The list is unique not only for the fundamental nature of its contents, but also for a rather striking omission in publication format—that of refereed journal papers. Since most other formats were represented, the omission seems to convey a message of importance to the scientific community. From my perspective, the message is that many contributions required the intellectual freedom fostered by alternatives to technical journals. In this regard, the international conferences were especially important for timely presentations that included peer review prior to final publication.

In addition to the recommended citations, many responses included thoughtful narratives on the bear literature. There was concern that emphasis on conference proceedings was excessive and that too few

papers were being published in scientific journals. To address this issue, I tallied the publication format for all 76 citations listed in the responses and found that 25 (33%) were in fact refereed journal papers. The extensive presence of bears in the primary literature was further confirmed by a cursory survey of *Wildlife Review*. I conclude that the primary literature has established a foundation that lends credibility to continuing efforts to study and understand bears throughout the world.

CHANGING TIMES FOR BEARS

A unique characteristic of recent bear history is the dramatic change that occurred for a previously neglected group of wildlife species. In just a few decades, expanding public interest, new conservation laws, and advances in field research technology propelled the issue of bear conservation worldwide. Our ability to learn from these changing times helped us to innovate bear management concepts that are now beginning to blend existence, aesthetic, recreational, and economic values on our public lands.

The events of 1967 were followed by what at times seemed to be an explosive interest in bears. A sense of urgency was added to questions that were no longer dormant in the minds of their originators. Certainly, human injuries and deaths attracted an important share of this new interest in bears. But concern for the welfare of bear populations also grew rapidly as they were studied in more and more places. And the unique combination of aggressive behavior and unexpected vulnerability quickly led to bears being equated with wildness in North America.

But interest in bears was only one part of a more general expansion of concern for the environment. In a democratic society, the enactment of law is the primary means of formally expressing public will. While it is arguable whether laws always express a majority opinion, there is little doubt that environmental statutes enacted after 1967 were unprecedented. The National Environmental Policy Act of 1969, Endangered Species Act of 1973, and Marine Mammal Protection Act of 1972 along with others such as the National Forest Management Act of 1976, were especially important as legal foundations for the conservation of bears. These laws also highlighted important issues such as the rights of states to manage certain wildlife species and the role that private lands play in protecting species of national interest.

Public law strengthened efforts to conserve bears throughout much of the United States. Laws provided

the legal framework for conservation organizations to activate their ethical resolve to protect and perpetuate bears. In contrast, economic interest groups envisioned a threatening element within the new laws, resulting in the formation of new organizations. Fracturing and polarity among the proliferating groups reduced opportunities for compromise and consensus. In turn, bears became symbols rather than objects for conservation and the challenge for public servants became even more complex.

Natural resource management agencies implemented their expanding environmental responsibilities through the planning requirements of the various laws. However, implementation was slow and lagged well behind public interest levels in bears. As one result, the symbolic status of bears, especially the legally threatened grizzly, frequently became a controlling element in the planning process. As another, it became increasingly difficult to distinguish between biological experts and environmental advocates. The planning experience thus established and emphasized the value of credible knowledge about bears.

An important trend occurred as public interest and the law moved bears into prominence during recent decades. Its origin was in civil law and accompanied a more general pattern of settling claims and disputes through litigation. Essentially, when bears caused injuries or damage, some of those involved elected to place blame on others, especially management agencies. Most of these cases have been judged in favor of the defendants, but it does seem that the language of specific decisions has influenced bear management in general. This was especially true for information programs that greatly enhanced public knowledge about bears and their management.

The litigation process also contributed to the development of standards and protocols for bear management programs. In doing so, it helped to break the inertia of agency traditions that impeded changes required for enlightened conservation. One especially innovative program was the interagency organization that emerged to address the complex requirements for managing grizzly bears as a threatened species. In essence, a formal group of representatives from the managing agencies was created to provide the strategy, direction, and consensus needed for population recovery south of Canada. And while the management authorities of the individual state and federal agencies remained intact, the emphasis on common goals was a distinguishing feature of their charter.

Many view the interagency committee concept as an innovative model for fostering the recovery of

threatened or endangered species. Others sense drift toward isolation as a separate entity out of touch with its parent organizations and the responsibilities they retain. Regardless of these viewpoints, the formal committee structure does appear to provide a forum for integrating politics with the biology of bears. The effectiveness of the process is most apparent in the greater Yellowstone ecosystem where grizzly bear recovery is often mentioned as a major conservation success of the twentieth century.

Another more recent trend occasionally enters my thoughts about bears—maturing interest. While the explanation may lie in my narrow geographic perspective, it is also possible that more subtle factors are at work. For example, sport hunters have not been especially visible in bear conservation efforts, perhaps because bears were considered little more than pests during much of this century. In their place, broadly based conservation organizations, many of which oppose sport hunting, have been influential in placing high values on bears. Perhaps these groups are becoming more comfortable with the current status of bears or the ability of agencies to provide for their conservation. Or with programs in place for bears, other species are receiving attention and there is even some likelihood that complacency is developing after many years of unusual intensity. Should maturing interest be a reality, then it is likely that bears will be conserved at current levels, a point that in some cases provides little margin for management errors.

The past 25 years also witnessed the rapid advancement of wildlife research technology and the manner in which it was applied to bears. In 1967, the little that was known about bears was primarily descriptive—certainly less than adequate for answering the myriad questions that were generated by the public and scientific communities. The combination of probing questions, exploding interest, and new laws prompted field research unusual for its geographic breadth and scientific intensity.

Radio telemetry was distinct for its contribution to the study of wild animals. When applied to bears, reclusive behavior, remote settings, and large home ranges were no longer seemingly impossible deterrents to the gathering of important knowledge. Telemetry initially helped us to discover and describe movement patterns, habitat relationships, and population characteristics. As more sophisticated equipment was developed, descriptive field research shifted to the exploration of specific questions about the population ecology of bears. I note here that the development of effective capture methods and chemical restraints was

a part of and critical to the success of radio telemetry.

The acquisition of new knowledge fostered the application of modeling concepts to bear populations. While slow to gain acceptance, models helped us to understand the complexity of bear population dynamics, the sensitivity of small or isolated populations, and the additional information required for accurate prediction of population change. Models initially provided the incentive for innovative research and conservative management programs. More recently, cumulative effects models that include both habitat and population variables have been applied to the planning and evaluation phases of bear management.

The accumulation and processing of new knowledge led to significant changes in field research design. In one pioneering effort, an experiment was designed to test a hypothesis about population regulation. In others, specific questions about predatory relationships, mortality patterns, and population status were addressed. From my perspective, the emergence of research design complemented technology and models in a manner that now magnifies potential for important ecological contributions.

Changing times for bears were sometimes measurable in the bears themselves. For example, we learned from our national parks that protection of bears can lead to habituation, even where they are not attracted to garbage or handouts. In turn, we discovered that habituated bears have more opportunities to express their instrumental and aggressive behaviors toward people. All of this led to the recognition that the relationship between bears and people was appropriately viewed as biological competition. And while this presented a management dilemma, it also provided a defensible rationale for conservation programs that included control of people.

MOVING TOWARD THE FUTURE

Scientific research is a process of investigation that seeks predictability through observation and experimentation. Where bears are concerned, the emergence of knowledge during recent decades has carried research to the landscape level of complexity. It is true that the history of bears has been one of dramatic change, but one that is now more clearly understood as a framework of trends. In response, the past becomes a predictor of scenarios that can be tested by science and judged according to cultural values.

Bears compete with humans for portions of the environment that contain natural resources of common interest. For thousands of years, the relationship was

likely one of mutual avoidance. But then humans developed tools and weapons that led to dominance and extirpation of bears. The trend continued until recently when the scarcity of bears led to conservation efforts in many parts of the world. However, conservation of a competing species on landscapes with burgeoning human populations requires cultural acceptance and a public will to sustain their numbers, especially when those species are dangerous in close quarters. And even where public will is expressed through law, the promise for conservation of competing species seems to lie at the lower limits of long-term population viability.

Historically, separation of bears and humans has been accomplished largely by adjustment of their densities or distributions. In this regard, general extirpation, sport hunting, and protective sanctuaries have played important roles in a relationship that has generally favored humans. In a break with this trend, recent conservation efforts have begun the process of shifting the advantage back toward bears. There are limits to the restoration of competing species, not the least of which are the economic and cultural values of an increasingly urban society that is finding its way into bear habitat.

For those of the urban culture that choose to visit or settle in bear country, there will be attitudes and behaviors unlike those of earlier pioneers. Benevolence toward nature may be confounded by a lack of knowledge or experience that permits satisfactory resolution of conflicts with competing species such as bears. Conventional wisdom points to education as the most effective means of resolving the problem, but I submit that time and experience with the land will also be important teachers for the new pioneers.

In many respects, sanctuaries such as national parks provide a window for viewing a hypothetical landscape that is successfully inhabited by bears and where human culture values their presence. The most important feature of this landscape is the control that humans exert over their own distribution and behavior. Since the species remain biological competitors, interactions occur but at rates that are culturally and biologically acceptable. Selective removal of bears helps to maintain a generally wild behavior; humans also adjust their behavior as they learn from each interaction. Sport hunting continues as a legitimate pursuit where bear populations are substantially above minimum viability levels and where cultural values retain the hunting tradition.

Science will evolve and mature as this hypothetical landscape is created. Descriptive studies of today will be synthesized and new field research designed to test

hypotheses that originate from the synthesis. Experimental science will emerge as the most efficient means for understanding the relationships among bears, humans, and their environment. Experimental concepts will also provide the foundation for conservation programs. The maturation process will lead to organizational networks that recognize both the research and management functions as science; knowledge will serve as a common language.

Organizational networks face challenges that may require change from current procedural norms. Timely archiving and sharing of knowledge is an especially formidable obstacle since rights of discovery currently dominate a career system that is focused on individual scientists. At the same time, freedom to explore new ideas and concepts is often limited by the directive behavior of parent organizations. Resolution of this dilemma lies in a shift of the traditional paradigm to one that emphasizes cooperation as an important incentive for achievement and progress. In essence, a successful assault on current university and agency protocol will result in a new and more effective culture for wildlife science.

There is another issue that merits mention in relation to bear conservation strategy. Based on current knowledge, I suspect that there are limits to what we can learn about bear populations. Certainly, the bears have taught us not to place too much confidence in counts as the sole foundation for management. In response, the security of habitats has become a critical element of conservation programs. It seems to me that elusive knowledge provides another value—one of knowing that some mysteries continue to accompany a species of the wilderness.

More than a century ago, the western frontier vanished and in its place, the process of human settlement created a foundation for economic exploitation of the wilderness. Pioneers and their governments aggressively pursued mastery of nature; habitats were destroyed and bears exterminated. And now, with the challenge of conserving diminished populations, another critical point has been reached. In nearly every vestige of habitat, occupational limits for bears and humans are being approached and sometimes exceeded. The tradition of culture has brought us to this point—breaking with that tradition is my view of a future that includes both bears and people.

LITERATURE CITED

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