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Abstract: The growth of the subdiscipline of wildlife damage research is producing a wealth of scientific information about methods of resolving conflicts between animals and people. Scientists working on these problems have, for many years, found difficulty in publishing the results of their applied research investigations in traditional scientific journal outlets, leading to a diverse information base that encompasses a variety of technical journals and a large "gray" literature in non-refereed publications. Although a number of current scientific journals welcome papers reporting the results of wildlife damage research, the identification of suitable primary outlets for such work, particularly for studies conducted to produce data for regulatory purposes, will likely continue to be perceived as a problem by scientists in this narrow area of applied work.

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Key Words: damage, control, research, publication

The publication of results in applied research has been a concern for scientists in many disciplines. Although the broad field of wildlife management is such an applied area, our specific research in vertebrate pest control or wildlife damage management has often been perceived as difficult to publish in traditional, refereed scientific journals. Historically, the reasons for this are many and varied. Perhaps, lack of journals willing to consider papers on methods development or product testing, changing editorial judgments on desired journal content, lack of current knowledge among scientists of available journals, the quality of science produced in our discipline, and the desire of some scientists to publish only in "status" journals are among them. Our own biases and those of our colleagues in ecology and wildlife biology about what constitutes "science" may mean that some of these data are never submitted for refereed publication. As a consequence, the field of wildlife damage management has been associated with a large "gray" literature, with many of the primary research data appearing over the years in non-refereed reports, conference proceedings, and extension bulletins. Pesticide and drug registration data and materials and methods evaluations may be especially difficult to place in refereed outlets if the procedures dictated by regulatory agencies are viewed as "cookbook" or if the research results are negative, in the sense that a product didn't work or a pesticide treatment had no significant environmental hazards.

Others have periodically examined the issues of publication and data accessibility in wildlife management research and related areas. Ratti and Garton (1996) recently recounted the emerging importance of the

scientific method and the peer-review process in wildlife science and the difficulties produced when wildlife administrators fail to assure that the final step in the scientific method, publication, is completed as part of the research effort. Moore (1980), in a comprehensive summary of wildlife literature, identified important serial publications related to wildlife management and the major index databases (then mostly in hard copy) that covered these journals. Wildlife Review, published in hard copy from 1935 to 1995 by the National Biological Service and its bureaucratic predecessors, was widely used by wildlife scientists as a means of identifying publication sources and accessing literature. Publication has been continued in CD-ROM, with plans for an on-line version by National Information Services Corporation (NISC.). This and other wildlife literature databases are combined and available with quarterly updates in Wildlife Worldwide, an indexed CD-ROM database also published by NISC. that, according to company literature, is approaching 500,000 bibliographic records of wildlife publications. Timm, Salmon, and Schmidt (1987) examined the use of key words in vertebrate pest control as a means of providing better access to indexed literature in our field. Kaukeinen (1987) reviewed the history of bibliographies in the specific area of rodent management and identified the primary periodicals -- both refereed and non-refereed -- where research findings were published. Because many of the primary research findings in our area of interest have been published or summarized in a relatively few recurring conference proceedings, such as the Great Plains Wildlife Damage Control Workshops, the projects undertaken by Paulik (1995) to produce detailed indices will be valuable in providing both access to specific information and as routes for researchers to identify potential publication outlets.

Clearly, there has been rapid growth of publication in wildlife damage management research as agencies, programs, scientists, and students respond to the kinds of concerns summarized by Ratti and Garton (1996). Much of this growth has been in the increased use of peer-reviewed scientific journals, which are universally viewed as means of validating scientific investigations. Nonetheless, we hear continuing concerns expressed by scientists that publication of research findings in our discipline is sometimes difficult. Do we have a problem? Are there enough journals? Do we need more? Can we access the information our colleagues produce? To examine these questions, we searched recent literature related to wildlife damage management to identify the publication outlets used by wildlife damage scientists and the relative importance of different serials as sources of information. Reference to commercial products for identification does not constitute endorsement by the authors or their agencies.

METHODS

We examined several possible literature databases to produce source material for our analysis. Because Wildlife Worldwide is indexed by “damage” and “control” and is corrected to reduce multiple entries when its source files are combined, we chose to work only with this material as a way to access a large body of published work conveniently. All of us working in wildlife damage management would readily note familiar papers that were not retrieved from the database when we conducted the search. This occurs if there are time lags in journal publication, such that a paper with an earlier date has not yet been indexed, if a paper was not indexed to "damage" or "control," or if the paper was not included in the bibliographic files used for compiling the database.

Using the terms “damage” and “control,” we searched Wildlife Worldwide for

the period, January 1992 through August 1996 -- approximately 4 1/2 years. The search produced 1969 citations published in well over 400 sources. We chose to work only with refereed journals. An initial examination of the search records indicated 598 citations in 170 serials that were possibly peer reviewed. Using two research libraries with excellent collections related to wildlife damage management, as well as our personal knowledge of this literature, we examined as many of these 170 serials as possible to determine their criteria for acceptance of research papers. We eliminated citations and serials that were not refereed and eliminated serials that did not publish in English. We were unfamiliar with and were unable to examine 23 serials. Based on appearance and subject of the citations and other available information, we judged that 10 of these were not refereed journals and included the remainder in our analysis.

Based on our finding that 11 journals accounted for nearly 50% of the papers indexed as "damage" or "control" in Wildlife Worldwide, we then chose 1995 as a "snapshot" year and examined all of the papers published in those journals. We identified papers that reported results related to wildlife damage management research and compared those with total journal content. We emphasize that our examination of literature sources was highly subjective and incomplete in many respects, including the use of a single database for a limited time period and our extensive use of judgment in what to include. Nonetheless, we believed this approach would help to develop a current overview of where wildlife damage management research results are published.

RESULTS

Our methods and criteria produced 524 citations of research papers in 135 refereed journals -- a truly amazing figure. Eleven journals accounted for nearly 50% of these citations, ranging from 10.5% of the papers published in Wildlife Society Bulletin to 1.9% in Oikos (Table 1).

Table 1. Publication of refereed journal articles in wildlife damage research. Eleven journals accounted for 46.4% of the 524 papers found in the Wildlife Worldwide database for the period 1992-August 1996.

Title	Percent
Wildlife Society Bulletin	l0.3
Wildlife Research	6.7
Journal of Wildlife Management	5.9
Biological Conservation	5.0
Journal of Applied Ecology	3.4
Journal of Chemical Ecology	3.2
Pesticide Science	2.9
Colonial Waterbirds	2.5
Canadian Journal of Zoology	2.3
New Zealand Journal of Ecology	2.3
Oikos	1.9
Total (differences due to rounding)	46.4

When we examined the content of these 11 journals for 1995, we found 92 publications that, in our opinions, related to wildlife damage management research. Some journals publish relatively few issues or papers each year; others publish a considerable number. Both the number of papers related to wildlife damage management and the relative proportion of these papers to total journal content (Table 2) provide indications of how readily such papers are accepted by journals and how scientists working in this area view a journal's importance. Content percentages ranged from 3% in Canadian Journal of Zoology to 32% in New Zealand Journal of Ecology. Wildlife Society Bulletin contained the highest number of papers in 1995 (12), accounting for about 10% of the total journal content.

DISCUSSION

Do we have enough journals available to us? Yes! One hundred thirty-five, plus all of the ones not detected in our search, must be more than enough. Can we access the information? Only with difficulty, a good computer with CD-ROM and Internet capabilities to use literature databases, and interlibrary loan access or a good research library nearby. Most scientists probably subscribe to fewer than one-half dozen journals; most managers, not more than one or two that they don't have time to read. Such arrays would reach only a small fraction of the current wildlife damage management literature. Clearly, the conferences and workshops that acquaint scientists and managers with the breadth of current work in our field and provide summaries and citations of the peer reviewed literature will remain highly important sources of technical information.

Table 2. Major journals used as research publication outlets by wildlife damage biologists. Journals with the highest percentages of citations in the Wildlife Worldwide database were examined for the year 1995 to determine numbers of wildlife damage management papers and the relationship of these to total journal content.

Title	Number of Publications	Percent of Total in Journal*
Wildlife Society Bulletin	12	l0
Journal of Chemical Ecology	11	8
Wildlife Research	10	18
Oikos	10	5
Journal of Wildlife Management	9	8
Pesticide Science	9	5
New Zealand Journal of Ecology	8	32
Canadian Journal of Zoology	8	3
Biological Conservation	6	5
Journal of Applied Ecology	5	6
Colonial Waterbirds	4	13
Total	92	

*Figures based on proportion of refereed papers published in 1995 related to wildlife damage problems.

Do scientists have a problem finding refereed outlets in which to publish wildlife damage research results? We did not attempt to answer this question in any systematic way. Clearly, some of our colleagues have perceived this to be the case. Ratti and Garton (1996) concluded, "Rarely would any research effort that is properly planned, designed, and executed (including a well-written manuscript) be unpublishable." While this is probably as true in wildlife damage science as in other applied research fields, perceptions are important. Wildlife administrators that encourage scientists to subject their work to the peer-review process have a substantial stake in assuring that professional publication outlets are available, that research budgets include funding for publication costs in preferred journals, and that the various support machinery and mechanisms needed to access information are in place and sufficiently maintained and upgraded to avail of current information technology.

Journals change. Ones that may be currently important to particular areas of research come and go, consolidate, get new titles or formats, and change editorial policies and personnel. A journal that disdained applied research in "vertebrate pest control" a few years may have discovered the growing interest and readership in "wildlife damage management" and now welcome such papers. Other specialized journals, that, overall, publish few papers in our discipline, may provide outlets for hard to place papers. For example, during the past three years we have worked with The Biodeterioration Society to produce special issues of International Biodeterioration and Biodegradation devoted to "vertebrate deteriogens," providing another refereed outlet for papers addressing the loss of environmental quality and deterioration of food supplies resulting from over-abundant vertebrate pests (Jackson 1995). A number of other journals have, from time to time, taken similar approaches to place special emphasis on narrow areas of applied research.

In our area of work, we have lost useful professional outlets -- organizations, conferences, symposia, and journals because leadership did not emerge from among us to do the organizational and editorial work necessary for such things to occur and be conducted or produced in a timely manner. If more wildlife damage professionals assume leadership roles in professional organizations (including the thankless roles of journal editors, reviewers, and conference organizers), we can expect, we think, to see continued improvement in the quantity, quality, and availability of technical information in wildlife damage management.

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