

A COMPUTERIZED SYSTEM FOR RECORDING AND RECALLING GRIZZLY BEAR REPORTS

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Abstract: Reports of grizzly bears (*Ursus arctos horribilis*) from throughout the Border Grizzly Area were collected, verified, coded, and stored in a computerized file called the base data bank. Each report included four primary categories of information — report type, date, location, and source of information. Depending upon complexity, additional data were either stored in the base data bank using secondary information categories or were recorded verbatim in a narrative file that was cross-referenced from the base data bank. Applications of the system and its further development are discussed.

Collection and storage of information concerning the occurrence, habitat use, and life cycle necessities of the grizzly bear have become particularly important with the inception of the Endangered Species Act of 1973 and the subsequent listing of the grizzly bear as a threatened species in 1975. These circumstances have provided a formidable challenge to administrators and managers in the Border Grizzly Area (BGA) of Montana, Idaho, and Washington (Fig. 1). Although the grizzly bear requires large tracts of relatively undisturbed terrain, managers and governments must

nonetheless guarantee (1) grizzly survival, (2) an increase in grizzly range and numbers, and (3) no detrimental changes in grizzly habitat. The range of the grizzly must therefore be identified and quantitatively analyzed to determine what constitutes detrimental modification or destruction of habitat. Simultaneously, population levels and changes, needs and habits of bears, and basic biological parameters of the border grizzlies must be determined. These are complex and extensive tasks for a long-lived adaptable species such as the grizzly bear.

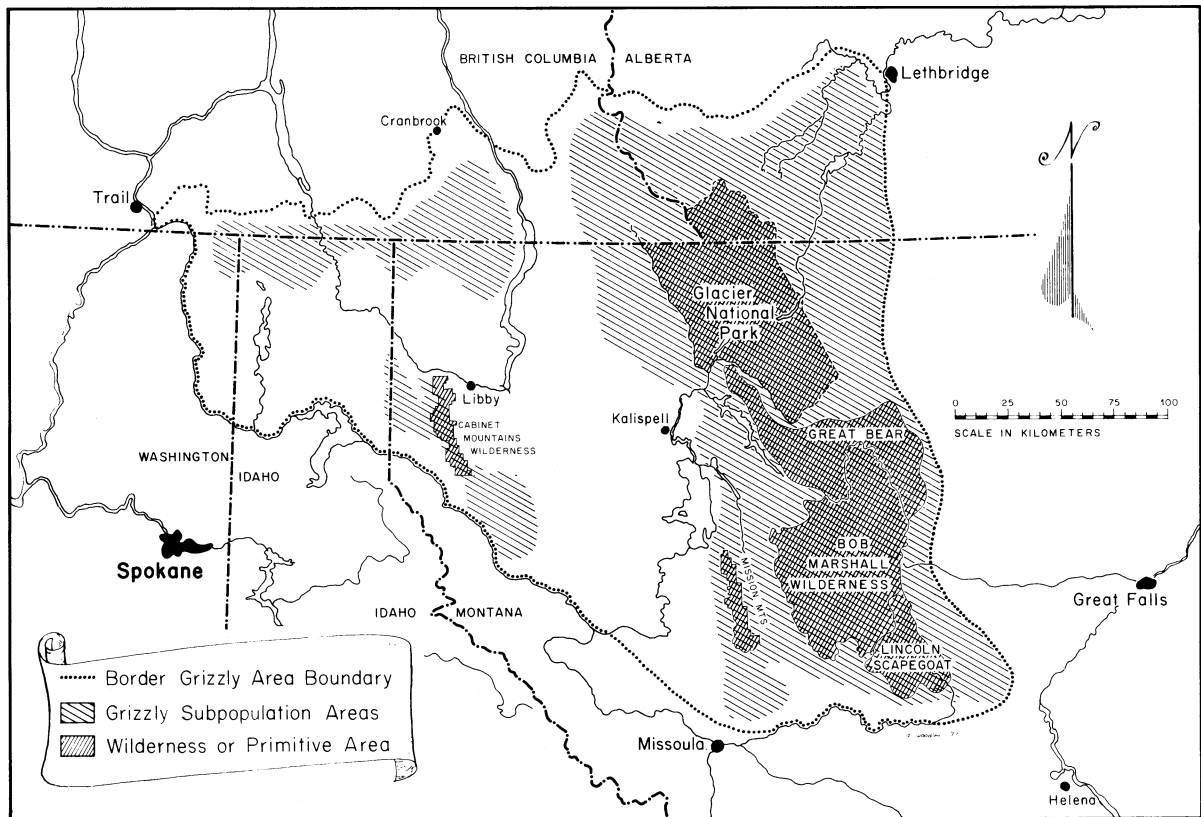


Fig. 1. The Border Grizzly Area.

Concurrently, the economic variability of the BGA is considered by many to be dependent upon the exploitation of timber, increased tourism, and intensive land development. These two broad goals — grizzlies and resource development — may simply be incompatible, but managers must search for solutions.

There has been an intense and increasing public demand for wise and immediate decisions concerning developments that might adversely affect the grizzly bear. Information on grizzly bears has always been difficult to collect and compile because the species is elusive and uncommon. Yet, reports of grizzlies were probably more often noted in historical journals than accounts of other animal species because they were a spectacular and unusual sight. Reliable old records, however, are scarce. Although reports are more available today, there is still a paucity of information.

Managers call upon biologists for direction and information when decisions regarding wildlife have to be made, but it often happens that biological research is not supported until the need for answers has already developed. The resulting sense of urgency can often prompt premature or unwise decisions. This paradox is even more acute in the case of the grizzly bear where industrial, environmental, and political factions are all deeply involved. Decisions, therefore, have not been easy for wildlife managers responsible for the bear population or for land managers responsible for the bear's habitat. A considerable amount of base-line information has been collected by private citizens and agency personnel, but its usefulness has been limited because it has not been readily available on an inter-agency basis nor is it complete for different users. Both problems could be remedied if standard information were collected and stored in a readily available data bank.

This paper presents a computerized system for recording and recalling grizzly bear reports. The Border Grizzly Project and Glacier National Park are collecting and recording reports from diverse sources to provide base-line information about grizzly bear occurrence, habitat selection, and population trends. Once historical or current reports have been judged for reliability and recorded systematically, this information file can be rapidly searched and summarized to help resolve questions about land management and recreational use and safety.

We wish to express our thanks to those people who have worked for years at recording information about wildlife and at solving the problems of organizing and storing records. We thank C. J. Martinka, C. Jonkel,

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METHODS

Grizzly reports today can be just as valuable as historical reports. Although it is important that each report be documented and readily accessible, reports are still being gathered in a piecemeal fashion, without documentation or follow-up, and important details are often lacking. Because of the vastness of the BGA, the Border Grizzly Project, in conjunction with Glacier National Park, developed a computerized system to record and store reports of grizzly bears from throughout the area. This system is designed to serve both managers and researchers at the field level. It can be used to answer immediate questions or to assist research and management planners.

The system works from a file of information called the base data bank that is composed of individual grizzly bear reports. Each report includes four primary categories of information — report type, date, location, and source of information. (The report type may be of a kill, sighting, track, scat, den, daybed, dig, marking, depredation, and other less frequent reports.) Additional data such as the bear's physical characteristics, its activity, or a description of its environment can be recorded in secondary information categories. Table 1

Table 1. Summary of types of information that can be included in the base data bank, Border Grizzly Project and Glacier National Park.

Information category	
Primary	Secondary (incomplete list)
Report type	Group size
Date	Group composition
Location	Food
Source	Elevation
	Habitat type

lists the types of information that can be included in the computerized file system. All information stored in the base data bank is coded in order to save storage space and to facilitate searches. Coded information can be located, tallied, and decoded for easy reading. A user can obtain a list of all reports fitting a particular search request by specifying a range of values to be sought for one or many categories of data. For example, if a re-

source manager requested legal locations of all observed grizzly bears or their sign, for a given area, during a particular season, over a certain time span, he might specify the North Fork of the Flathead River, fall, 1973-77. The printout would list (by legal location and report type) only those reports fitting the designated limits.

Most of the detailed information included in reports can be incorporated into the base data bank by using the secondary information categories, but some reports include complex explanations that cannot be easily coded. In such cases, the information is recorded verbatim in a separate narrative file and referenced from the base data bank. Narrative information, too, can be recalled and printed on request, although it cannot be searched as comprehensively and economically as the base data bank. The coding system is designed to be comprehensive enough that only rarely would the original written report have to be consulted. Once the system is established, it can be searched, updated, and otherwise maintained from a remote terminal requiring only a telephone line for access. All programs have been written in FORTRAN IV. Computer programs that search the base data bank have been completed and are being tested. Programs for decoding base data, cross-referencing narrative data, and searching within a geographic area are written but not yet tested.

An auxiliary report-mapping capability provides another dimension of data analysis. Maps can be produced by the Montana Department of Community Affairs, Helena, to display any data set. This versatile service requires only the location coordinates of each report (preferably Universal Transverse Mercator coordinates) in order to map data summaries. Because color and symbol may be varied for each point, two variables can be readily displayed on a single map. For example, grizzly bear reports can be mapped to indicate season and report type by using a different symbol for each season and a different color for each type of report. Overlays can be produced for a base map of any scale. For any area within Montana, detailed base maps can be generated as well. For areas outside Montana, base maps cannot be produced, but data can be plotted given a reference point, scale and grid, or coordinate system. All locations in the current base data bank are recorded by one of three standard coordinate systems: Government Land Office, geodetic (latitude/longitude), or Universal Transverse Mercator (UTM). Coordinates can be converted by computer from one system to another. For mapping, reports must be recorded by the geodetic or UTM system.

DISCUSSION

This system is based on human involvement. It is a compilation of reports from people who discover and report grizzlies or their sign. The data bank depends first upon humans and grizzlies (or grizzly sign) occurring in the same place at the same time, and second, the conscientious effort by the individual to record the information. People today are well-traveled and widely dispersed, but unless their reports can be collected, verified, and entered into a standardized and widely available system, our knowledge of grizzly bear range and needs is hardly more advanced than during the pre-1900 era. The usefulness of this system depends upon the active participation of governmental agencies in providing detailed reports of grizzlies and in making full use of the system. Glacier National Park and the Border Grizzly Project plan to refine and maintain the system to the degree that finances allow, but the active role of other agencies is strongly encouraged for the realization of the system's full potential.

What are some of the potential applications of this system? Although the system cannot provide answers, once a question is posed, it *can* provide base-line information and a starting point. Federal agencies would find this system valuable in developing land management plans on areas designated as grizzly bear habitat. Summaries of grizzly bear information would be very useful from specific areas that require dynamic trail and human-use management or have pending timber sales, special use and grazing permits, exploration and development plans for energy reserves, and recreational and industrial construction and maintenance activities — to name just a few. State agencies and private citizens who are recipients of federal funds also find that they are legally responsible to uphold the intent of the Endangered Species Act. Specifically, utility siting leases and subdivision approval are involved. Known grizzly bear seasonal use and traditional travel corridors within an area must be considered in such developments, and in these instances the computer system could supply the requisite information. Management of and research on the grizzly bear itself might be facilitated if this system were utilized.

In addition to the base data bank and the narrative file, separate computer files are also being developed for specialized purposes such as storing telemetry information, den site information, and capture data. For even broader application, the system could easily be adapted to accommodate storage of data on other animal species. All files could utilize the codes already

developed for the base data bank. It is hoped that this project can be coordinated with agencies having similar systems or similar needs, and to direct further development to answer as many needs as possible. To realize the system's full capabilities, mutual contribu-

tions of information to the data bank and cooperative use of the system are vital. Fully supported and used, the system will help us maintain and use reports of grizzly bears for wise management of this threatened species and its remaining habitat.