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The Continental Divide Research Learning Center: The First Four Years

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Background

The Continental Divide Research Learning Center (CDRLC) was one of the first five RLCs funded. It was established to serve Rocky Mountain National Park, although subsequent RLCs were established to serve multiple parks. Efforts to serve other Colorado parks are ongoing, but will not be discussed in this paper. The first staff member arrived in June 2000. At the same time Rocky Mountain National Park received funding for CDRLC, it also received funding for a science officer position and some base funding to direct toward research addressing high-priority management issues. When the science officer position, the first position filled, was advertised, the duties included being the research staff member and director for the CDRLC, as well as the responsibility to issue research permits, oversee all research activities in the park, and function as the superintendent's science advisor. This allowed CDRLC to hire up to a total of three staff members (one from the additional funding and two from the RLC funding). Hiring three staff members produced a number of benefits (discussed below) to the oversight of research activities: by providing additional logistical support for research activities in the park, enhancing the ability to communicate the science occurring in the park, and ensuring that the findings of that research are rapidly integrated into park management.

There are a number of assumptions inherent in the discussion of the mission and activities of CDRLC staff. They include the following. The National Parks Omnibus Management Act of 1998 (the Thomas Act) told the National Park Service (NPS) to use good science in making its management decisions. The Natural Resource Challenge, including RLCs, was the NPS response to the Thomas Act. In funding the Natural Resource Challenge, Congress intended that NPS use the funding to include science in decision-making. NPS staff (including CDRLC staff) have a binding agreement with Congress to use the funding for the purposes for which it was provided.

Managing research

Because of the limits on staff time and the expectations of the taxpayers who fund our work, every action we take must be directed to our core mission. Every activity performed by CDRLC staff must answer one or more of the following questions: What research project does this contribute to? What research project results are communicated? What management decision does this affect? If the work does not address one or more of these questions, we simply do not have the resources to address it.

CDRLC staff issue and oversee all research permits for the park. This is a significant time commitment, given the park issues between 60 and 80 permits a year, the fifth largest research program in NPS. There are several advantages to having CDRLC staff issue

research permits. It keeps us current on what activities are occurring, thus helping us identify what to communicate about research. It eliminates duplication of effort because there are no additional permit staff members. It alerts us to research projects that need support and builds bridges to all park divisions because issuing permits involves negotiating a wide variety of activities with and obtaining support from other divisions. It helps us assure research results are used in the park's management decisions, because they are intimately familiar with the research. Finally, it helps us connect researchers with each other to improve project quality, help each other, eliminate duplication of research efforts, build on each other's work, and share samples when possible.

The research activities represented by the research permits require a substantial amount of logistical support. These permits represent about 400 people involved in research activities. CDRLC staff provide a variety of types of support, including housing, campsites, equipment loans, assistance in obtaining research permits, compliance (archaeological and National Environmental Policy Act), recruiting volunteers to assist with research projects, and a wide variety of other types of logistical support. The concept of "bunks for researchers," the logistical directive for the RLC program, has evolved into a wide variety of logistical support activities. Volunteer hours for research activities alone exceeded 6,500 in fiscal year (FY) 2004, the equivalent of three additional full-time employees—a substantial managerial workload for CDRLC staff.

CDRLC staff have a substantial time involvement in funding research. For every park dollar invested in research in FY2004 (about $185,000), partners provided approximately $1.22 in matches. In addition to park base funding, we were able to obtain $480,000 in Fee Demonstration funding to direct to research activities over a three-year period. We have also used the NPS-wide combined call, U.S. Geological Survey funding calls, and other funding sources to acquire an additional $100,000 to $400,000 per year to direct toward research activities. This translates to a substantial number of cooperative and interagency agreements to be overseen by CDRLC staff as well. The success of this effort has led to a workload in excess of the ability of staff to manage ,and will result in shifting emphasis away from acquiring funding toward more oversight in the future.

Communicating research

Once the research has been accomplished, CDRLC staff are actively involved in communicating the results to a variety of audiences. The target audience for communications activities is primarily an adult one, because adults are involved in management decisions, and including science in management decision-making is the core mission assigned by Congress. While this does not preclude serving younger audiences, the limits of staff time available force us to be focused on the highest priorities in our mission. Also, when CDRLC was created, Rocky Mountain National Park already had an active environmental education program addressing younger audiences. Thus, we focus our communication activities on park staff involved in management decisions; other participants in management decisions, including town, county, and state officials, as well as community opinion leaders; other researchers, in order to inform and improve their research; park staff and others involved in disseminating information; and members of the general public. Communications activities focused on spe-

cific research related to park management issues involve a science conference every two years, two public science days a year, special workshops for park staff targeted to specific questions they must address, press contacts, presentations to public officials, videos to explain specific research activities for use by local television stations, Internet-based articles and summaries of research projects, and a wide variety of other types of presentations less easy to categorize. Demand for special-emphasis science presentations is increasing, and we are looking for ways to improve efficiency while providing the level and quality of information demanded by a wide variety of audiences.

Incorporating science into park management

All of this effort to encourage and communicate science reaches its fruition if high-quality science is accomplished—and it then informs park management decisions. CDRLC staff and the scientists with whom we partner have been very successful at incorporating scientific results into park management. A few brief examples include the decision to limit the use of magnesium chloride to de-ice roads in the park because of its effect on germination of native plants, the decision to limit the use of prescribed fire in shrub–steppe communities in the park because the combination of current levels of herbivory and use of prescribed fire would prevent recovery of these communities (this decision was made within three hours of the presentation of results by the researcher), the decision to close certain backcountry campsites to avoid negative impacts on state-threatened boreal toads, and the decision by park managers and the town of Estes Park to work toward a more integrated transportation plan based on a study of the projected effects of climate change on park visitation. These are only a few of the many examples that could be cited.

A more detailed example will demonstrate how CDRLC works to support research and assures that research results are integrated into management decisions. In 1967, chronic wasting disease (CWD), an invariably fatal brain-wasting disease, was first recognized in penned deer in Colorado. In 1981, an elk *(Cervus elaphus canadensis)* in Rocky Mountain National Park was diagnosed with CWD. For many years, CWD was known to exist in the wild with mule deer *(Odocoileus hemionus)* as the major affected species, but the implications of the disease were slow to be realized. During the 1990s, the spread of CWD caused growing concern. In 2000, researchers from Colorado State University and the Colorado Division of Wildlife requested a research permit from Rocky Mountain National Park to conduct funded research on mule deer movements and spread of CWD, as well as on a new diagnosis strategy involving the use of tonsillar biopsies. In my CDRLC research role, I reviewed the study design and suggested that while the overall statistical design was sound, the data generated for the work within the park would not provide us with statistically valid movement information for the park itself (CDRLC is responsible for research permitting and improving research design so that research is useful for park managers). That discussion led to the park funding intensified work on the movements of mule deer within the park from our base research dollars (CDRLC finds funding for important management-related research). The work on tonsillar biopsies was funded by Colorado Division of Wildlife, National Institutes of Health, and National Science Foundation award #DEB/0091961. To the alarm of both state and park managers, the research on deer movements revealed that a

small number of mule deer were crossing the Continental Divide and potentially mingling with deer on the west side of the park (CDRLC provides research results to park staff). The companion research demonstrated that the CWD prevalence in male deer was approximately 12–14%.

The pair of studies demonstrated the possibility for the movement of CWD into an area of the state of Colorado where it was previously unknown. This resulted in substantial management discussions between park and Colorado Division of Wildlife managers as to how to handle this problem (CDRLC communicates scientific results to help in management decision-making). The first suggestion, which was quickly determined to be unrealistic, was to kill any mule deer on the east side of the park that approached the Continental Divide. An alternative, to slaughter a substantial proportion of the mule deer population on the east side of the park to reduce densities and thus reduce the motivation for movement, was also quickly determined to be not feasible. Fortunately, park resource management staff were able to obtain funding to apply the results of the tonsillar biopsy research on a management scale (incorporating research results into management actions is a CDRLC function), and Colorado Division of Wildlife agreed that this would be a good test of this diagnostic tool, along with culling of infected animals, as a management strategy. While very expensive as a management strategy, tonsillar biopsy and culling of CWD-positive animals might be possible in areas such as national parks where untargeted culling might not be feasible.

While this work and additional work on CWD is still ongoing, these and other efforts have resulted in an archive of CWD-positive tissue maintained by Colorado State University under contract with the NPS Biological Resources Management Division. Most CWD management activities never test individual animals for CWD but simply slaughter a percentage of the population to reduce density, or they retain CWD-positive tissue for their own research activities. Thus the tissue in our archive is one of, if not the only, source of CWD-positive tissue for researchers trying to develop rapid field tests and/or vaccines to identify and combat CWD. To date, the park has issued six research permits for work with tissues from our archive in the hope of combating CWD (making research activities as effective as possible by encouraging sharing samples and research permitting are CDRLC functions). The results of this research have the potential to address this disease not only in our park, but also to provide information for managers facing this disease nationally. Clearly many groups deserve credit for the success of this effort, and CDRLC's role was not the largest. Nevertheless, we can point to real contributions to making this work more successful and effective than it would otherwise have been.

The future

Challenges to be faced in the future include the realization that there are limits on the amount and kinds of research that can occur, in addition to the limits imposed by the number of beds available for researchers. There are limits on staff time; thus only a finite number of researchers can be supported. There are also real limits to the number of research projects that can occur based on space to work without unduly interfering with visitor experiences, the number of collared animals visitors and park staff will tolerate, the number of visitors available to be surveyed without causing disruption, the number of permanent plots that can

be established in the park, the number of plants that can be collected without harming a population, and so forth. The park is wrestling with questions of what limits to put in place, how to coordinate research so that samples can be used by multiple projects, and how to deal with researchers with funded research for which the limit has been reached. These have not proven to be easy questions to answer, and will only increase as more researchers are attracted to doing research in Rocky Mountain National Park.

Often people unfamiliar with the Continental Divide Research Learning Center ask to "see" it. RLCs are programs, not facilities. Our efforts include assuring high-quality research is accomplished in the park by issuing research permits, funding research, and providing logistical support; providing research results to a wide variety of audiences; and assuring those results are considered when management decisions are reached.