

Conservation Genetics Research Finds Systemwide Applications

By Jean Matthews, *Park Science* editor

Editor's Note: For earlier reports and impressions from this rapidly developing field, see *Park Science* Fall 1982, pp. 5-6, and Winter 1983, pp. 3-5, where assessments appear by NPS research scientists Bill Robertson, Lloyd Loope, Chuck Stone and Jim Kushlan.

A mosaic of management needs and science responses that suggest a promising new, holistic approach in the area of conservation genetics can be seen developing throughout the National Park System. Badlands NP Supt. Gil Blinn, in a Superintendent's Corner (*Park Science*, Fall 1984, p.9) described how data from an NPS scientist helped him carry the day with a South Dakota state board that had resisted his efforts to introduce Colorado bison into his Badlands herd. Blinn's is only one of a rapidly growing number of applied science stories stemming from this new field of expertise and its prime practitioners in the Park Service – Christine Schonewald-Cox, J.W. Bayless, and Richard Baker.

These three, now stationed at the University of California-Davis's NPS Cooperative Park Resources Study Unit, have been responding on a piecemeal basis (see further on in this story) to similar calls for help from parks all over the System.

Attention to the systematic nature of the National Park System's growing problem with regard to small populations of threatened plants and animals and to the pertinent research for methods to deal with these situations was sharpened in 1982, with the NPS-sponsored Conference on Genetics and Conservation in Washington, D.C. At that meeting, leading geneticists from around the world met and discussed the rapid increase in the rate of extinctions, coupled with the whole panoply of emerging insights into the dynamics of genetic systems that are common to all living organisms. Too quote one NPS biologist: "Most of us were blown away by the advances in genetics, biogeography and evolutionary biology that had occurred in the previous handful of years."

Partly as a result of the information exchanges and insights engendered by that meeting, a strong new interdisciplinary approach to wildlife conservation has arisen. "I don't think many of the ecologists there had any idea, when they came, of the state of genetics knowledge and the tools for probing it," said Doug Houston, research biologist with the Pacific Northwest Region. Houston's recent review of the genetic differentiation of salmon stocks in the Olympic Peninsula waters further convinced him of the need for NPS to learn more and take more enlightened advantage of the gains.

"However," Houston added, "an enormous amount of work remains to be done in order to translate the new information on the genetics of populations into guidelines useful to the managers of natural areas."

Schonewald-Cox, who – with strong support from the Washington NPS office – arranged for and chaired the 1982 conference and who was lead editor of the 722-page *Genetics and Conservation* (Benjamin

Cummings, Menlo Park CA, 1983) that grew out of the meeting, has been attempting to organize her own work and that of her two colleagues – Bayless and Baker – so that their responses to management needs in this field take place within the context of the total National Park System.

"Instead of responding to a brushfire here and a conflagration there," Schonewald-Cox said, "we should be looking at the total situation. This is the sensible way to attack the various problems associated with small populations in limited areas and to make the most efficient, effective use of the new knowledge we have and are continuing to generate."

As a result of the calls for help from around the System and the hypotheses that are emerging from their efforts to synthesize and apply the new science, Schonewald-Cox and Bayless have proposed a seven-part research project aimed at providing specific answers to certain problems faced by management and guidelines and consultation services for others.

Starting with shoe-string funding contributed by the Western, Pacific Northwest, Southwest, Southeast, and Midwest Regions, the effort is entitled Inter-regionally Funded Project on Small Population Management. Although the project is necessarily exploratory in nature, the products are functional – each part designed to address a portion of the range of activities and information that managers must have if the degradation and extinction of local populations are to be slowed.

Emphases are on small population genetics and demography and on vertebrates, although not exclusively so. The seven parts of the project will be integrated to produce material on conservation techniques and to improve the quality of consultation available. The work is connected with ongoing research at other Universities and under State and Federal agencies, and thus a mutually beneficial process will ensue. Products of NPS research will contribute to the developing discipline of conservation biology, and developments in the discipline will contribute to the NPS-generated products.

Built into the project's seven parts is the tie-in to resource management. Training workshops are projected for selected resource managers and scientists who have not been directly involved in the project. The workshops will incorporate ongoing research results and will offer training on how to make use of genetics and demography in conservation and management.

The plan's seven parts are: I. levels of demographic complexity, II. relationships between population size and park size, III. factors contributing to the decline of local populations, IV. techniques for founding and restoration, V. comparative evaluation of laboratory techniques, VI. risk analysis (still awaiting funding), and VII. interactive data base for small population management.

The "deliverables" will include prototype guidelines for resource managers dealing with small populations. Throughout the project, consultation will be given to parks upon request; as funding is made available, workshops will undergird these spot efforts.

Working out of their U Cal Davis lab, Schonewald-Cox and Company have been responding piecemeal to calls for help from parks with small population problems. They must deal with each instance on an individual basis, but they are also uniquely positioned to see these problem areas as pieces of a larger picture – one that affects the overall condition of the National Park System and involves the overall mission of the National Park Service.

Progress already has been made in all seven project areas: e.g., collaboration is underway to test and continue to develop the Salwasser and Sanson system (USFS) for determining habitat and population size requirements of species of special conservation interest. Involvement from resource management at Sequoia-Kings Canyon NPs has been established informally for testing this system on bighorn sheep.

Also, a manuscript is in preparation analyzing the foundings of elk populations as part of restoration projects in California, Pennsylvania, and Texas. Of the populations for which data are available on founder group size, about 50 percent now are extinct. The remaining populations with only one or two exceptions are in desperate need of management, i.e. veterinary care, supplementary feeding, etc.

Morphometric analyses are underway to compare environmental versus genetic changes in cranial phenotype for elk. Collaboration has been discussed and is being solidified in North America and New Zealand, (the latter being home for transplanted Nelson's or Rocky Mountain elk). Use of the morphometric measurements of elk resulted in consultations with four NPS Regions – Rocky Mountain (Badlands), Pacific Northwest (Rainier), Western (Tule elk and coastal Northwestern Roosevelt elk populations), and Southwest (Guadalupe Mountains).

In addition, consultation has occurred with investigators at the National Institutes of Health, the zoological park community, and scientists at the University of Idaho. Possible use of laboratory analyses of genetic diversity is being explored for use with grizzly bear (in coordination with Chris Servheen, UFWWS chairman of the Interagency Grizzly Bear Team), with elk (in coordination with Wind Cave and Teddy Roosevelt NPS areas), and with bighorn sheep (in concert with J. Keay in Sequoia-Kings Canyon NPs).

Schonewald-Cox disavows any expectation that the entire seven-part plan be accomplished in the four-year time frame used to present it. "The proposal is the ideal," she said, "and few of us have the luxury of working out our fondest dreams."

"The enduring and wholly achievable element of our plan is its holistic nature," she said. "Our research will work its way through the complete design along the paths of greatest opportunity – the areas where scientific capabilities best meet management's information needs. The enormous benefit will be the fact that everything we do will be done within the context of the larger plan and the entire National Park System."

"In addition," she said, "possibilities abound for melding Park Service research with that of other agencies . . . further tightening the research effort and at the same time broadening both its scientific implications and its management applications."