

## 10 Years of Conservation Science with the Diablo Trust By Tom Sisk

In 1996 I moved to Flagstaff to start a new job as an Assistant Professor at NAU. Right off the bat, I started working with the Diablo Trust, showing up at a meeting to propose an ambitious research project that would explore the scientific basis of differing claims about the effects of livestock grazing on grassland ecology. It could have been received as an audacious proposal, even a threatening request: will you work with me - a conservation biologist - to study the impacts of your grazing practices? But after a few long conversations the Diablo Trust signed on, and within a few months volunteers were putting up fences around our 2.5-acre plots, and the following year Kit Metzger was herding her cows into the experimental areas and helping gauge how long to let the herd graze to achieve appropriate animal impacts on different sites.

My involvement with the Diablo Trust has shaped my work as a professor as much as any other single experience, while the results of our collaborative research have deepened my understanding of the complex decisions required of ranchers and land managers. In most cases, it has also become clear that most of these folks share the conservation biologists' goal of integrating sustainable use of natural ecosystems within the larger objective of stewardship, including the conservation of wildlife and, in fact, all biological diversity.

I certainly can't summarize the results of our decade of research on Anderson Mesa in this article, and that isn't my intent. Instead, I'd like to share some insights on the role that science, and conservation biology in particular, plays in the Diablo Trust. Getting there, however, requires me to summarize a few key insights that have emerged from the research. First, it quickly became apparent that the short-term differences between grazed and ungrazed plots were not as great as I had expected. We excluded livestock from some plots, grazed some according to common livestock management practices, and simulated herding behavior with short-term, high density grazing on others. Yes, we found statistically significant differences among plots that received different grazing treatments, but the magnitude of the differences (the "effect size" to researchers) was modest, relative to the much larger year-to-year changes observed in all the plots. Climate was so variable that it overshadowed grazing effects, at least over this 10-year period. Grazing seems to cause important but relatively modest effects that are layered on top of the much stronger influences of climatic variation. Maybe this is not news to ranchers, but it was to me, and I think everyone has been somewhat surprised by and interested in the combined effects of climate and grazing, which often led to rapid changes in forage production, plant diversity, and the abundance of exotic species. Sorting through these interactions has occupied a great deal of my time, and making sense of it all was the work of Matthew Loeser, a student who earned his PhD doing the "heavy lifting" for this research effort.

For us and for our colleagues this is exciting stuff, and it has filled many pages of specialized scientific articles published in research journals. We have a deeper understanding of what is going on at the level of soils, plant communities, and important processes like plant growth rates, changes in soil moisture, and the spread of invasive weeds like cheat grass, a scourge of the West. And I think this understanding is important, not only for the Diablo Trust, but for ranchers and land managers working in other arid grasslands.

Nevertheless, I have been forced to ask, now what? What can we do with the science? Who cares? The answers are not as simple as I would have hoped. Many folks don't care at all; they question the relevance of research to land management. "We know what to do, just let us do it" is a common refrain. Others like the *idea* of science, but lack confidence that the *results* of research are relevant enough to influence the way they manage land. And, of course, most people are less excited about science when it challenges or contradicts what they think they know to be true. These and similar reactions often limit the influence of science when it comes to developing public policy and implementing land management plans. The management of public lands, particularly, has become so political that, in many cases, acting on science seems almost a naïve idea. We are accustomed to land management decisions being made either for political expediency or short-term economic reasons. Science-based stewardship is an elusive goal that everybody longs for, but too easily dismisses as impractical. Often, science is viewed as a nice peripheral activity, window-dressing that may add some legitimacy to the *status quo* management approach.

More than most organizations that I am familiar with, the Diablo Trust grapples with these issues on a day-to-day basis. Whether it is picking apart the complex swings in the abundance of invasive cheat grass or debating the pros and cons of different ways to estimate the per cent cover of bare soil, many members of the Diablo Trust regularly incorporate scientific findings and arguments into the deliberations that guide management. This is perhaps most evident in the issue of monitoring. Environmental monitoring is one of the most challenging issues in applied science. Without efficient and robust monitoring it is next to impossible to gauge progress toward the lofty goals of good stewardship, yet there are few examples of truly useful monitoring programs, efforts that collect sound data that actually guide decision making. Over a 2-year period, the Diablo Trust worked closely with Tischa Muñoz-Erickson, and others in my lab at Northern Arizona University, to develop an approach to monitoring that integrates many ecological measurements with social and economic indicators to provide an comprehensive approach for tracking progress toward the overarching holistic goals of the Diablo Trust, shared goals that have been endorsed to by ranchers, public land management agencies, conservationists, elected officials, and others. The resulting IMfoS (Integrated Monitoring for Sustainability) Program was first implemented in 2004 and represents, to my knowledge, one of the most comprehensive, scientifically grounded, and practical monitoring program for arid rangelands. It was a lot of

work to develop, involving many meetings covering topics as diverse as soil compaction, wildlife population trends, and economic development. Each of the many issues included in IMfoS required a protocol for data collection, and these too drew members of the Diablo Trust into scientific discussions, even debates over questions like the appropriate precision of plant cover measurements, or the best way to weight different indicators when compiling an overall measure of progress.

One of the interesting things I noticed as we worked on IMfoS was that it was very hard to predict who was going to become most deeply involved. Sometimes the busiest and least technically inclined folks became most committed to the effort, while others with a lot of background in science stayed quiet. Over time, a core group shaped IMfoS into an effective tool tailored to the needs of the Diablo Trust. After final tweaks and adjustments to the monitoring program were made at a final meeting, I was amazed to hear the representatives of state and federal agencies, ranchers, and others involved in the effort express their willingness to pool resources to carry out the plan. That vote of confidence epitomized, for me, the value of collaborative science. By addressing the monitoring issue in a comprehensive manner, everyone came to see that that it was more valuable to work together on an integrated monitoring effort, rather than continue pursuing small, independent projects that seldom generated results that were strong enough, scientifically, to guide management decisions. It is unclear whether this moment of consensus that grew out of a long, well organized effort, will really translate into action. Time erodes memories and enthusiasm; people change jobs and continuity is lost; and the real costs of collecting and analyzing monitoring data may cause people to reevaluate past commitments. So it goes with science-based management. It is unrealistic to expect that human behavior - in this case the adaptive management of public-private partnerships in land management and livestock production - will closely track the growth in scientific understanding. Change takes time. But through the development of a science-based dialog, the Diablo Trust has increased its capacity to entertain new ideas and incorporate ecological science into all aspects of its work. Everybody knows that there is much more to management than good science, but increasingly we all realize that without good science, it is difficult to make sound management decisions.

Often I wish that science played an even greater role in the work of the Diablo Trust and the management of its 426,000 acres of magnificent country, from the narrow curves of Diablo Canyon to the top of Anderson Mesa's rolling hills. After all, I am an ecologist, and we all wish others thought and acted as we do. But in my more self-aware and inquisitive moments, I am grateful for the depth of perspective, honest exchanges, and friendships that I have developed with this group over the past decade. It has made me realize that science does have a role to play, but that other factors - other ways of knowing the land - also have great legitimacy and are valuable in guiding human behavior and shaping good stewardship. I think this makes me a better and more effective conservation biologist, and I hope that

my honest participation and commitment to this diverse collaborative management group will earn ecological science a strong voice in the future of the land.

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