Guest Editorials

Quality Standards for Restoration Projects: One Manager's Experience

Karl D. Smith

In 1979 when I wrote the long-term objectives for the planting of the Tallgrass Prairie Ecosystem Restoration Project at the Cleveland Metropark System's Brecksville Reservation, I boldly used the term "high quality prairie." This article is a brief history of my subsequent struggle with the meaning of the term "high quality prairie."

In the summer of 1981, Tom Stanley, our natural resources manager, and I were looking at that year's planting, which I had pronounced a "high quality prairie," and he asked, "How do you know?" I replied, "That's simple! I can't put my foot down without stepping on several prairie plants." Our 1983 planting appeared not to be a high quality prairie, however, because I had to walk from one prairie plant to the next.

As I pulled and twisted my beard, I reflected back to where my values about ecosystems came from and why I was so troubled about the planting that lay before me. It finally struck me, this struggle was all Dr. Cottam's fault! Yes, it is his fault that I am not blissfully ignorant about what ecosystems are and their dynamics.

When I enrolled in Dr. Grant Cottam's plant ecology course at the University of Wisconsin–Madison in the early 1960s, I didn't have a clue that before the course was over I would be forever changed. The major change was that I learned to perceive differences between ecosystems and that I found ecosystems to be definable and recognizable. The "green blur" came into ever increasing focus. I was so excited about my increasing perception that I worked on my own with John Curtis' *The Vegetation of Wisconsin,* and I continued my trip into the wonderland of ecosystems. They have characteristics that make them sometimes easier to identify than species, but they are identifiable because they have recognizable features and they are dynamic.

My mind came back to 1983. I was looking at the planting, and I knew why I was troubled! This planting was not even a prairie, let alone a high quality prairie. It was a weedy field with some prairie plants in it—it was not dominated by tall grasses. Curtis wrote in *The Vegetation of Wisconsin* that "For the purpose of present discussion, a prairie is defined as an open area covered with low growing plants, dominated by grass-like species of which at least one-half are true grasses, and with less than one mature tree per acre."

The point is obvious. If you want to talk about quality, first you have to define what you are talking about. In this spirit we undertook a long-term study to monitor changes in our plantings quantitatively in order to gain insight into its dynamics—in other words, to replace the phrase "it looks better" with data. For four summers Naturalist Dave Dvorak of the Nature Center staff has been laboring with quadrats, determining the frequencies, densities, and percentages of prairie plants in our plots. Wow! Now we have the data to define "high quality prairie" quantitatively. And by comparing data from areas that appeared high quality with those that were obviously not, we set a standard.

Well here it is: for the purpose of managing the Brecksville Reservation's Restoration Project, I have decided that the quantitative definition of "high quality" as it applies to planted tallgrass prairies late in their second growing season is: the mean density of *Andropogon gerardi Vitman* per 0.25 m^2 will be 12.00 or greater, the frequency of *Andropogon gerardi* Vitman will be 90 percent or greater, and the percent of prairie plants will be 35 percent or greater. On the basis of this standard we have since judged some of our restoration efforts and some areas within our restored prairie unsuccessful and have tilled and replanted them.

Others may find our standards unacceptable. I would hope that others will be challenged to share their own standards so that a more satisfactory set of standards can evolve. But before the sounds of dissent get too loud, allow me to add that my own struggle with the phrase "high quality" is far from over. I am simply reporting to you my current position on what I hope is a growth curve that will not flatten out in my lifetime.

My plea to you is: let's start the agonizing process of quantifying ecosystem restoration. Reasons? Currently my strongest reasons are: I have a personal pride in my craft, only measurable objectives will clarify where we are headed and whether or not we have arrived, and one

of the functions of science is to quantify. Among the many other reasons are simply concern about the environment. If someone says, "We will rip out this relic ecosystem because we can build you another one," we need to be able to hand them a document that quantifies the standards they must meet in hope that they will realize the cost, difficulty, and long-term commitment of restoration. They may then prefer to change their plans and leave the relic system undisturbed. In any case, as we discuss restoration, management, and environmental quality generally, there is a real need to quantify at least the species diversity, genetic makeup, and dynamics of the systems we are talking about.

Aldo Leopold stated in *A Sand County Almanac,* "In our attempt to make conservation easy, we have made it trivial." If we quantify ecosystem restoration, it will be clear that it is not easy and thus not trivial. It will also communicate the complexity of all ecosystems.

Have you begun to develop quantitative standards for the ecosystem restorations that you are working with? If you have, will you share your results and your views?

Karl D. Smith
Senior Naturalist, Brecksville Nature Center, Cleveland Metroparks System, 9305 Brecksville Rd., Brecksville, OH 44147 (216) 526-1012

Researcher Argues Craft Needs Firmer Foundations

The applied biological sciences have in common a similar framework for addressing the problems with which they are concerned. One integral aspect of this framework is that it is goal directed—that is, there is some particular state desired for the biological system under consideration. The science is concerned with the development of techniques for manipulating biological processes in such a way that the system is shifted toward the desired state. Scientific assessment of the capabilities of different techniques to shift systems toward desired states is conducted through evaluation programs in which systems are monitored to determine the effectiveness of prescribed techniques. Obviously, a close relationship between theory and practice is involved, since practical efforts based on fundamental ideas often provide critical tests of the basic paradigms upon which the practical efforts are based.

Restoration and management of ecological communities or habitats clearly is one of these applied biological sciences. Two characteristics of restoration and management become apparent upon examining the literature relevant to this field. First, though efforts in this area are invariably goal oriented, there is no generally accepted goal (or sets of standards) that guides practical restoration and management. For example, the goal of assembling a system that will persist on bare soil or in a newly created body of water differs greatly from the goal of creating replicas of presettlement habitats from degraded systems already present on a site. The diffuse nature of goals in restoration and management contrasts with those that have been developed in other applied disciplines such as agriculture or medicine. These applied sciences have rather well-defined sets of goals and hence are more focused as applied sciences than restoration and management.

A second generalization that emerges from a survey of the literature of restoration and management is that theory pertaining to how ecological processes affect the condition of systems present on a site and to the establishment of goals for restoration and management have repeatedly been found to have little value for guiding management of real biological systems. Instead of ecological theory providing a framework for successful restoration and management, it is the inability of this theory to guide restoration and management that has, in effect, revealed that the emperor has no clothes.

Similar failures of theory, revealed by work in other applied sciences, have resulted in the reformulation of the basic science upon which the applied science is based. Presumably this can happen in our field as well, and it seems to me the results would be extremely beneficial.

In the absence of a useful set of guiding principles, practical decisions tend to be made "by the seat of the pants," with the personal biases and experiences of decision-makers strongly influencing the course of action taken. Frequently, "Let's get something done," or "Go ahead and try it" becomes the sole rationale underlying the decision-making process. The result is a plethora of independently derived techniques, each reflecting a different set of assumptions about the processes influencing the current state of a given habitat, as well as the unorganized body of information that currently characterizes the field. It is true that the uniqueness of local conditions, as well as potential confounding effects of uncontrolled (and uncontrollable) variables, make this a complex field in which it is difficult to construct useful generalizations. In the absence of such generalizations, however, the effectiveness of management is likely to depend upon the intuition, insight, and accumulated experience (in other words, the craftsmanship) of the person or persons making decisions about the course of action on a site. The problem is that all too often the background and training of the people involved are inadequate, and the result is ineffective management or even mismanagement. Lastly, there almost never is a built-in procedure for evaluating the results of management programs; this essential component of any goal-directed activity is almost always dispensed with as being too costly.

What is needed is a way of providing training and discipline such that managers can make enlightened decisions—that is, decisions with a high probability of achieving well-defined restoration and management goals. This training in the science of ecological restoration and management clearly has to have some sort of foundation in the biological sciences. The spectacular