Biodiversity on the Refuge

by Mark Laker

The Kenai National Wildlife Refuge came into existence in 1941 as the Kenai Moose Range. In 1980, the Alaska National Interest Lands Conservation Act (ANILCA) changed the name and shifted our focus from moose management to the very broad purpose of conserving all kinds of fish and wildlife populations and habitats in their full natural diversity. This was a tall order, much taller than being a just a moose preserve.

Natural diversity, or "biodiversity" as we say nowadays, refers to the number of species (and their genetic variation) in a given ecosystem. Biodiversity has become a key concept for managing the health of ecosystems, such as wildlife Refuges and national forests. Generally, we try to preserve biodiversity in ecosystems, even if means protecting some pretty minor players, that sometimes may not yet be been named by science.

If we are going to protect biodiversity, we have to know what creatures are out there on the landscape. We need an inventory of the inhabitants, before we can know if they are increasing or decreasing, and potentially in need of management actions.

Much like the stock market, we have to know the historical or present value of our stock to measure how well the investment is doing over time.

In a general way, plant and animal species are the currency of biodiversity.

If species are the currency of biodiversity, then genetic variation represents the value of the currency. Genetic variation is good because it allows a species to adapt to changes in the environment. As an analogy, think of clothes and gear as genetic variation. If the temperature stays at 80° F all year, all you need is a T-shirt and pair of shorts, but if the temperature goes from 80° F to -60° F, you need a closet full of gear. We can measure genetic variation directly by taking DNA samples, but this is expensive. A rough indicator of genetic variation is the variety of habitats in which a species lives. Just like having a closet full of gear and clothes, the greater the genetic variation, the more places a species can exist.

This leads us to the question, what is a species? Philosophers since the ancient Greeks and biologists have argued about the nature species. Even to the casual observer there are numerous forms of life surrounding us—both seen and unseen. Even more remarkable is the great variety, from large white spruce trees to little lichens, from big bears to tiny bees.

Given this great diversity, how can we organize all these organisms into a system that shows how they are related? In 1735 Carl Linnaeus proposed his Linnaean system of classifying organisms in his book *Systema Naturae*. Linnaeus divided organisms into two kingdoms (vegetable and animal) and five ranks (class, order, genus, species, and variety). The basic Linnaean system of naming is still used today and Linnaeus has often been referred to as the father of taxonomy (classification of organisms into categories).

It was no doubt easier to declare a new species a few centuries ago than it is today. Relying on appearance and physical characteristics is no longer sufficient since the advent DNA analysis. The process of declaring a new species had become quite rigorous and can require extended study to pass scientific scrutiny.

There are various concepts of what defines a unique species. A present-day definition of a species requires that the members share similar appearance, are able to interbreed, are reproductively isolated from other populations, and have genetic similarity due to a common ancestor. Currently about 1.75 million species have been identified (about 2/3 of these are insects). Some scientists estimate that the total number of species on Earth is in the 10 to 15 million ranges.

How much biological diversity exists on the Kenai National Wildlife Refuge? To answer this and other questions, we initiated the Long Term Ecological Monitoring Program (LTEMP) in 2004. This is a cooperative project with the U.S. Forest Service's Forest Inventory and Analysis (FIA). We have conducted surveys of plants, birds, and insect on 255 plots, distributed evenly across Refuge lands on a grid. So far, we have identified a total of 1,073 species on the Refuge, including:

- 602 Plants
- 155 Arthropods (insects and spiders)
- 151 Birds

- 97 Fungi
- 29 Mammals
- 20 Fish
- 1 Ice worms

How close are we to determining the full biodiversity of the Refuge? In comparing our count with a few other projects in similar ecosystems, we appear to still have a lot of work to do. The number of species on the Refuge is likely over 5,000—not counting bacteria. The majority of these unidentified species will be insects and plants such as mosses and lichens. There are likely over 3,000 insect species on the Refuge. Our technique of using sweep nets, though very quick, probably only captures a fraction of the insect species.

As a tool for measuring the heath of the Refuge, these efforts to assess the Refuge biodiversity have been beneficial. Though we don't have comprehensive list of historical species present on the Refuge, we at least know what is not here. A total of 71 exotic species have been identified on the Refuge, out of hundreds of exotics that could potentially survive here. Usually the introduction of exotic species into an ecosystem has a disruptive affect. In some cases it can lead to the decrease or local loss of a species and have significant economic impact to the local economy. One purpose of our inventory is to keep an eye out for new invaders, so that we can take early action against them before they get out of hand.

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