

# The Principle of Diversity

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What is the Principle of Diversity? It is quite simple. In my experience in working with several thousand farmers and ranchers across a wide variety of environments and landscapes, I have found that plant species complexity and diversity are critical to building positive compounding and cascading benefits. In that regard, I have concluded that all pastures or rangeland need to have the three primary plant classes represented. These include grasses, legumes, and forbs (broadleaves). Additionally, it is desirable to have a number of species of each of the three primary plant classes. Not just one grass present, or one legume, or one forb. Rather, I strive to have at least three or more of each plant class present in significant quantities in each pasture.

## Microbial Species Array

There are a number of reasons for wanting three plant classes and multiple species of each present in our pastures. First, each plant class, and even individual plant species, attract different arrays of microbial species. If we have monoculture or near monoculture pastures, then we are seriously limiting our microbial species that can be present and active in our soils. Complexity and diversity in plant species results in complexity and diversity in soil microbial species, and significantly increases total soil microbial biomass. We have to remember that most soil microbes live and thrive in the root zone. Greater complexity and diversity in plant species results in greater root diversity --- root depth, root mass, root exudates. This fuels the underground livestock – soil microbes.

## Secondary and Tertiary Compounds

Second, greater complexity and diversity in plant species results in greater numbers of plant secondary and tertiary chemical compounds. These are a host of nutritive compounds produced by plants that are often ignored by conventional science. We all know the primary nutritive compounds that comprise a typical forage analysis. These include crude protein, TDN, NDF, ADF, and mineral profile. However, there are hundreds of other compounds that are present in plants that have a profound impact on animal health, plant health, and human health. These secondary and tertiary compounds help plants protect themselves from disease and pests, feed an array of soil microbes, produce medicinal and anti-parasitic benefits in livestock, and provide human health benefits.

In Dr. Fred Provenza's *Foraging Behavior: Managing to Survive in a World of Change* (2003), he details the impact of why encouraging rich plant species diversity results in significantly better animal performance and health. Fred's research has shown that livestock grazing on pastures with few plant species perform far below that of livestock grazing on diverse pastures. He notes that nature constantly alters the nutritive value of specific plants, resulting in shifts in the quantity of available energy, protein, minerals, and secondary & tertiary compounds. Our livestock have to deal with these shifts by recognizing the nutritional deficits in their bodies, and in the plants they eat. If they are relegated to monoculture or near monoculture pastures, then our livestock have no way to balance their own diet and correct these deficiencies.

We must consider that all our animals are individuals, just as we humans are. Therefore, the common "scientific" approach to livestock nutrition of treating all animals within a herd or flock as needing the

same nutrition each day is simply erroneous. We have animals at very different stages of growth, lactation, gestation, ages, sexes, etc. Even different species of animals within the same pastures. Their daily nutritional needs are going to vary widely. If we have monoculture or near monoculture pastures, then we are not allowing these individuals to select what they need to satisfy their distinct nutritional and medicinal needs.

### **Insects & Birds Galore**

Another benefit we see from the Principle of Diversity, and corresponding plant species diversity and complexity, is the return of a wide array of insect species, earthworms, spiders, and pollinators. The vast majority of these insects are beneficial insects and not pests. They are kept in check by spiders, birds, and other predators. When walking through healthy pastures, we should be kicking up clouds of insects before us. In the early morning light, especially when there is dew on the ground, we should see fields that have a seemingly unbroken array of spider webs. Likewise, as we dig down into the swards of grass, legumes, and forbs, we should see earthworm castings littering the ground, sitting just on top of the soil surface. Well managed grazing also encourages the return of dung beetles. Pollinators should be everywhere, from honeybees, to bumblebees, to various species of butterflies.

Why so many insects? They are a direct indicator of the status of our soil's health. These insects and other macro-organisms do a tremendous job of starting the plant litter degradation process required to turn it into new soil. They are also important to a thriving ecosystem. More insects attract more predators in the form of spiders, birds and other species. On farms and ranches that have implemented good adaptive grazing practices, I have witnessed an explosion of bird populations, from ground nesting birds to migratory birds, to song birds.

### **Extended Grazing**

Increased plant species diversity also creates a natural extension to the grazing season. One major drawback with monoculture or near monoculture pastures is that we have a definitive peak growing season, with only highly vegetative production on the front end and reproductive stage growth on the back end. The period of peak production for any one plant species is limited. However, with a rich array of plant species present, these peak periods of production are spread out over an extended period. While some species may be in a distinct reproductive phase, with highly lignified plant material and lots of seedheads, when you dig down through the sward, you will find a multitude of other plants that are still quite vegetative and nutritious.

This results in a host of benefits that favorably impact our bottom line. First and foremost is significantly greater forage biomass production on an annual basis. More grass, legumes, and forbs equals more carrying capacity. Second, we naturally extend the grazing season, resulting in lower hay and feedstuff supplementation. Third, we expand the palate of our livestock. They learn to eat a much wider variety of plant species. This helps improve their own health status and body condition, but also teaches the offspring to be less picky and to eat as their mothers do.

### **How Can We Develop?**

We will explore this in greater detail in the Principle of Disruption article, but there are several keys to developing a far better array of plant species diversity and complexity. First, we must stop using herbicides on our pastures. Herbicides always trend us back towards near monocultures and never

towards diversity. We will significantly set back our forbs (what many call weeds) and reduce legume presence. This takes us back to a reduced array of primarily grasses.

Herbicide use always creates a series of compounding and cascading effects that are not beneficial in the long run. First, herbicides never actually get rid of “weeds”, they simply set them back. The “weed” seedbank is always there and ready to express itself again when the conditions are right. Second, herbicides damage the soil microbiology. When this happens, then our soil health status suffers. Third, plant resistance to specific herbicides develops over time. Fourth, herbicides create a per acre cost (cost of product plus application cost) that is wholly unnecessary when we employ the proper grazing practices.

In working across the U.S., Canada, and Mexico, I have yet to find an area where there is not a fairly diverse latent seed bank. All we have to do is tap into this seed bank. That requires a pulsing of stock density coupled with adequate rest periods. This will be the focus of the next article. I often hear producers say that, “I don’t have a good latent seed bank on my farm”. My first response is to ask them if they have any “weeds”. To a person, they all say “yes”. How did the weeds get there? From the latent seed bank. If weeds can survive in the seed bank, then so can a host of favorable plant species. You do not see them because you have not created the conditions conducive to their appearance and establishment.

## **Summary**

Our second principle, the Principle of Diversity, allows us to build on the Principle of Compounding. The multitude of benefits derived from a far greater array of plant species creates greater microbial species diversity, significantly more secondary and tertiary plant compounds, attracts more insects, pollinators, birds, and other wildlife, and extends our grazing season. What’s not to like about this?

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