

More Biodiversity Means more Health, Economic and Social Benefits by Ole Hendrickson

Life is resilient. Left alone by humans, species - whether plants, animals, or microbes - pursue their innate tendency to grow and produce offspring.

This poses a question for humans as stewards of Nature: How much life, and how much variety of life, do we want in our immediate surroundings?

The short answer is "More".

More biodiversity provides more ecosystem services. This improves our lives and reduces social costs. Conversely, biodiversity loss impoverishes us all.

Three recent scientific articles illustrate this.

The first, published December 2nd in the journal Nature, deals with transmission of infectious diseases. The authors note that, in principle, biodiversity loss could either increase or decrease disease transmission. However, they describe growing evidence that biodiversity loss increases the spread of diseases, whether of humans, food crops, or wildlife.

Examples include West Nile fever, Lyme disease, schistosomiasis, malaria, and hantavirus. The pathogens that cause these diseases infect wildlife species and also humans. Overall pathogen numbers - and hence numbers of human infections - depend on the ease with which the parasite can find its preferred wildlife "host" species.

West Nile virus is most abundant where infected mosquitoes readily encounter a highly susceptible bird species (say, a crow). If many bird species are present, the chance that a virus-carrying mosquito will bite a crow is reduced. When non-crow species that are not susceptible or only weakly susceptible to the virus are lost from an ecosystem, virus populations and transmission to humans go up.

The authors point out that we naturally carry within our bodies a huge variety of microorganisms. Modern DNA sequencing techniques allow scientists to detect bacteria that cannot easily be grown in culture, and understand how changing microbial biodiversity in our bodies affects our resistance to disease. Two examples: patients with a lower diversity of intestinal bacteria are more susceptible to outbreaks of the bacterium *Clostridium difficile*, and reduced diversity in the vaginal microbial community increases the risk of HIV infection.

This knowledge can lead to medical treatments with fewer side-effects. For example, children with a history of ear infections who were given mixtures of five different strains of *Streptococcus* developed fewer subsequent infections.

A second article, "Biodiversity can support a greener revolution in Africa," was published November 30 in the Proceedings of the National Academy of Sciences of the USA. The authors explain that the "green revolution" tripled grain yields in Asia through chemically-fertilized monocultures of high-yielding varieties, but at a significant environmental cost. In a recent study in the African country of Malawi, some farmers grew corn in fertilized monocultures. Others grew corn and various legumes (soybeans, peanuts, pigeonpea, etc.) in rotations or mixed-cropping systems. The latter group of farmers used half the amount of fertilizer. While both groups produced equivalent quantities of grain, mixed cropping was more profitable and provided more stable yields.

Another study in the same journal looked at the economics of restoring forests in dry pastures in three Latin American countries. The authors compared costs (lost livestock production, tree planting) to benefits (hunting, timber, fuelwood and tourism). They found that "passive restoration" - removing livestock and letting trees regrow naturally - was cost-effective in all areas they studied. However, active tree planting involved higher costs that outweighed economic benefits.

Many such studies show that more biodiversity means more health, economic and social benefits. Interest in ecological restoration is growing, with a global target of restoring 15% of the Earth's degraded areas during this decade. If we let her, Mother Nature will do much of the work.

All that is needed is some planning and patience.

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