

This is an excerpt from the forthcoming book
Nature Rising: A simple guide to helping our planet

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more information can be found here: <https://www.wanderingdogcreations.com/p/nature-rising>

Chapter 2

Biodiversity

SAMPLE PAGES
EXPECT TYPOS &
OTHER GLITCHES



The main ingredient for a healthy planet is our dazzling assortment of plants, animals, and bacteria. Ultimately, we are worried about too much carbon in our atmosphere and pollution in our water, soil, and air, because they take away biodiversity, the foundation of life.

Beatriz Chachamovits • Brazilian artist and marine researcher
Megaptera perorno • Indian ink on paper

But before we get into biodiversity...

a note to those, often older folks, who think there is nothing we can do.

The older we get, the more we expect the road in front of us to resemble the road behind. We were taught that the world will, more or less, stay the same, and changes to government, industry, and human habits can only happen slowly.

Because of that, we cannot imagine the current speed at which our natural world is unraveling. It feels impossible for it to happen, and impossible to fix.

Our instinct is to deny it or ignore it. Sometimes we blame it on others. It's easy to point fingers at another country's pollution or rising population. But their circumstances should not affect our own actions. We can't fix everything by ourselves — it's hard enough even to change a few of our own daily habits — but we can do our best make changes because it's the right thing to do. It's a poor excuse to do something wrong just because other people are doing it wrong, or because the problems seem overwhelming. Surely, it's more noble to try, than to be an anchor dragging behind.

And it's not all bad news. There are a lot of things that we can do to turn this around. It will take courage to get over our fear of change, and some oomp to kick away our complacency, but with our great human inventiveness, we can create a world that is comfortable for us, and gentle and fair for all life on Earth.

These efforts do not have to be daunting, they can be fun. They will be worth it.



Now, on to biodiversity

In the race to deal with climate change, biodiversity often gets the short end of the stick. There is far more talk about fixing the carbon balance of the atmosphere than there is about rewilding our land and rejuvenating our waters.

But, biodiversity is the ultimate issue to solve. Climate change and pollution are causes of nature's collapse. Lack of biodiversity *is* nature's collapse.

So, to fix this, the first step is to try to understand the basics of biodiversity — the health of nature — and why it is important. Then we can better choose what individual actions and reactions will be the most helpful.

What is biodiversity?

Biodiversity is all of the bottle-nosed dolphins, crested porcupines, yellow-throated sparrows, flying squirrels, swamp oak trees, prairie sunflowers, rusty patched bumble bees, morel mushrooms, giraffe weevils, magnificent frigatebirds, and millions of other species that have evolved to fill particular roles on the planet.

In other words, biodiversity is the whole mixture of plants and animals on Earth, and how they work together to keep our world livable and stable. Collectively, they give us clean water, breathable air, tolerable temperatures, and food.

Ecosystems are the places where all of the plant and animal interactions happen, with added input from other forces, like air, sunshine, and rain. An ecosystem might be a stream, or a forest, or a coral reef.

The ecosystem webs of life are quite complicated, but on a basic level, for example, earthworms break down dead leaves, which fertilize the soil to make it possible for new trees to grow. Trees, in turn, provide oxygen for all of us animals to breathe.

As species die or become endangered, these life webs get holes in them. They become unbalanced, unable to support a diversity of plants and animals, and they collapse. This happens in localized areas, like coral reefs. But because ecosystems are connected, what happens to one will damage others, and ultimately our planetary life systems. Even if we appear separated, we are still animals. The nature on which a falcon or an elephant depend — air, water, and food — is the same for humans.



Drawing from *The Natural History of Carolina, Florida, and the Bahama Islands*, by Mark Catesby, 1683-1749, and George Edwards, 1694-1773.

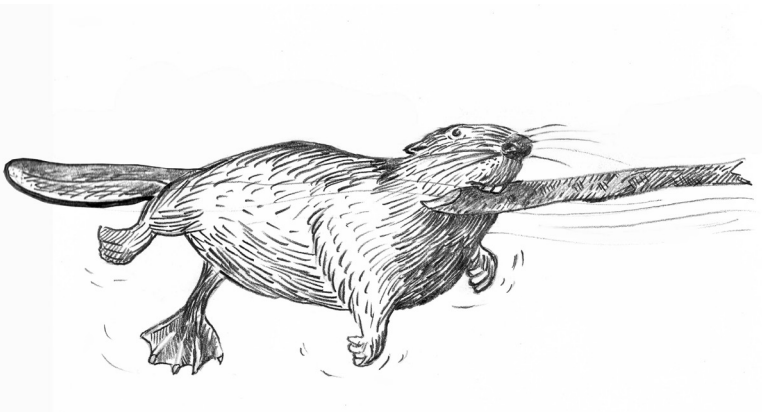
How diverse?

Scientists estimate there are more than 8 million species of plants and animals on Earth, from redwood trees to octopuses, tigers to fungi. So far, humans have managed to record about 1.7 million of them.

That doesn't include all of the bacteria and viruses, which likely jump the kinds of life on earth into the billions. Bacteria might not sound important, but one spoonful of soil contains between 10,000 and 50,000 kinds of it. Healthy soil — which grows our food — depends on bacteria turning nitrogen into nitrates. Bacteria are also vital to recycling the carbon of dead organisms in ecosystems, a job which makes photosynthesis possible. In short, we can breathe because of bacteria.

Each form of life has evolved over thousands, millions, or hundreds of millions of years to play an integral role in the balance of its ecosystem. When we lose too many, things go awry.

For example, in the 1800s and 1900s when hunters, trappers, and ranchers killed the wolves and beavers, the elk herds in Yellowstone National Park got larger, and they ate more vegetation, especially along the riverbanks. This destroyed the willow and aspen stands, and wetlands, and drove away remaining beavers. Without beaver dams, the streams became straighter and faster, and not as good for fish, moose, or otters. Without the trees and fish, many birds could no longer find a habitat (a place to live) and they left. With wolves reintroduced in the 1990s, the ecosystems began to repair themselves, though they still have a long way to go, and could really use some more beavers.



Beaver need replacement image. Grasshopper, Kate Dolamore, Orlando, Florida.



Prairies

A deeper peek into biodiversity

At first glance, a grassy prairie ecosystem looks pretty basic. But it is actually intricate. Dozens of species of grass, hundreds of flowering plants, lichens and liverworts, and woody trees and shrubs make up plant life on the prairie.

The grasses, seeds, and flowers give food to prairie dogs, bison, grasshoppers, jackrabbits, mice, ferrets, birds, deer, and pronghorn. Snakes, foxes, bobcats, and coyotes eat the small mammals and birds. Birds eat the insects and spiders. Birds of prey eat smaller birds and mammals. Turkey vultures clean up some of the dead animals. Mushrooms, ants and other insects, bacteria, and fungus get the rest, decomposing dead plants and animals into soil. Bees, butterflies, and other pollinators help flowering plants reproduce, and also feed the birds. Grasses use sun, water, soil, and carbon from the atmosphere to grow.

But it is more complicated than that.

Prairie dogs make tunnels, which burrowing owls, snakes, weasels, and mice use for their homes. Grazing bison make it possible for new flowers and grasses to take root, because of what and how they eat, and also how their hooves churn and pack the soil. Their wallows make puddles for everyone to drink from, and encourage new kinds of plants to grow.

Skunks, foxes, and raccoons eat the eggs of nesting birds, like quail and pheasants. Coyotes eat foxes and raccoons. Wildfires enrich the soil, and ensure grasses are not overtaken by shrubs and trees. Fires also alter grass densities, welcoming more varieties of birds and other plant and animal life.

The more we learn, the more interesting it becomes. For example, bison dung and urine fertilize soil with minerals, which feed micro-organisms and insects, like dung beetles. Dung beetles bury manure below the soil's surface, putting nutrients just where the plants need them. But before the plants can use the nitrogen fertilizer in the dung, soil microbes must convert it to ammonium.

All of these pieces — and many others that we have not yet learned — are necessary, for a healthy prairie ecosystem.

What is left of our prairies today probably does not resemble what they were three hundred years ago, when tens of millions of bison roamed there, alongside wolves, mountain lions, bear, and elk.

Back then, prairies covered 170 million acres of North America, from the Rocky Mountains to the Mississippi, north into Canada and south to Texas. Between hunting and the pelt trade, people killed nearly all of the bison, and caused bears, wolves, and elk to retreat to the mountains. The rich soils made for good farming, so prairies were plowed over for wheat, corn, and other crops. Today only 1 percent of them remain.

We know that losing large predators and bison have hurt prairies, but not necessarily in ways that seem logical at first. For example, the more dung beetles there are in an area, the more deer and elk there also are. Dung beetles depend on bison. So healthy bison herds are needed for more elk. Similarly, coyotes are good for nesting birds, because they prey on smaller mammals that eat eggs.

Humans have caused other changes that hurt the prairies. Ten billion locusts once traveled the Great Plains. But in the 1800s settlers turned their breeding grounds into farmland, and Rocky Mountain locusts went extinct. We don't know how losing them affected the ecosystem, but it probably didn't help.

Despite all of this, the prairies are still here, kind of. They have adapted to changes, and continue as an ecosystem. So why worry now?

We recently realized that we are in a crash of biodiversity. Birds and insects are dying off quickly. The speed of changes is too fast for many to adapt, and so ecosystems are supporting less and less life. Many species are becoming extinct.

The climate of the prairie is also changing. Hotter, drier summers, and more severe storms, wildfires, and flooding are altering the landscape. Changes in the growing season make it difficult for farmers to figure out when to plant and harvest their crops. These changes also make it hard for birds to time their nesting, in order to give their chicks the best chance of surviving with the right combination of food, water, and weather. Migrating birds and butterflies also need to time their migrations with food, and some are struggling.

Will there still be prairies in the future? Perhaps, but just as ours today are not as rich as they were a few hundred years ago, without us making changes, the ones of tomorrow will have less life than today.

Imagine cresting a hill and seeing a herd of bison stretching to the horizon, hearing the chuckle of grouse wildly dancing to find a mate, or a field of butterflies on purple and yellow wildflowers. Let's aim to make the future a place where we see more of this than we do today, not less.



Today's Mess

In 2019, scientists published the most comprehensive study of biodiversity humans have ever done. It shared alarming news:

Humans have plowed, cleared, paved or otherwise altered over 75 percent of all of the forests, prairies, deserts, mountains, jungles, hills, marshes, and other lands on Earth. We have also significantly altered 66 percent of the ocean environments. Only 3 percent of the world's oceans are free from pressure.

Just 13 percent of wetlands remain worldwide.

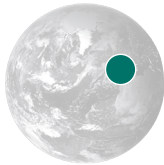
The world population has doubled since 1970, and urban areas since 1992.

Plastic pollution has increased ten times since 1980.

The global biomass of wild mammals has fallen by 82 percent.

Humans and farm animals, by weight, make up 97 percent of the world's land animals. Only 3 percent are wild.

As a result, more than a million species of plant and animal are at risk of extinction in the next few decades, or less.



The size of all land and oceans not seriously changed by or under pressure from people.



Gone since 2010.
53% of all butterflies on Earth.



Wild land mammals alive today compared to humans and farm animals.



Gone since 1970.
29% of all birds in North America.

What's causing the collapse

These are the main culprits, in order of concern.

- habitat loss from human development, like deforestation
- overfishing
- hunting and poaching, especially bush meat
- climate change
- pollution
- invasive species

Though scientists placed climate change lower on the list, they expect it to play an ever-increasing role in biodiversity loss in the coming decades.

Why is it suddenly a big deal?

Instead of giving nature space to flourish, we push it beyond its boundaries. If someone wants to clear land for a hotel, or a shopping complex, we usually let them. Our fishing nets get bigger. Our yards and farms use more chemicals. We even subsidize companies fracking for natural gas in city neighborhoods, though we know it's contaminating our own drinking water. We are a species who takes more than we need, with little thought to the consequences.

Perhaps we assumed nature would compensate, and everything would be fine. We now know that is not the case. We have pushed too far. According to scientists, “the foundations of our economies, livelihoods, food security, health and quality of life” are rapidly deteriorating.

Can we survive in a world with less biodiversity? For a while, but nature will look a lot different, a lot more bleak. The more species we lose, the more unpleasant changes we face. For those of us in this country, the first problems we notice might be mourning a world without monarch butterflies, orangutans, coral reefs, redwood trees, and elephants. But for many others, the early stages of biodiversity crash already mean failed crops, starvation, and war.

Eventually, with enough loss, humans will hit the tipping point out of our “safe operating space,” which is the planetary conditions in which we can survive. Then basic systems, like clean air and tolerable temperatures will cease to exist.

Or, maybe we will choose to fix our ways sooner, rather than test that theory.

Habitat Loss

Think about your neighborhood. Maybe it is in the city, or in a subdivision. Chances are there are trees, grassy lawns, a city park, sidewalks, roads, and houses. A little ways away, there are probably farmers' fields or cattle ranches.

A lot of this might seem like nature, but most everything there has been planted by humans or altered by livestock. Very little wild, natural habitat remains. Some animals can live here, but only a very few, compared with what survived off of that land before our "civilized" society moved in. As once the prairie was a wild place before it became a farm field, the land under your house and yard were once home to forests or cacti, yucca, or prairies, all of which held a more complex community of plants and animals.

We tend to think there are wilds outside of our cities and towns, but mostly that is not the case. A short drive from our neighborhood is someone else's. Most patches of forest or river are also recreation areas for humans. Even in the more uninhabited places, like the Arizona desert or the Rocky Mountains, the wild spaces are fragmented by roads, barbed-wire fences, mines, logging operations, and hiking trails.

Most animals do not do well with the agitation that comes from noise and being near humans, or human creations, like vehicles, oil wells, fighter jets, and street lights. They often can't cross highways, fields, and fences, which makes breeding and migration difficult for species like tortoises, frogs, bears, and even some insects.

We can fix some of this easily, when we work together to help nature. For example, when we stopped using sodium lights around sea turtle nesting beaches, it helped hatchlings find the ocean, and that has really helped turtles survive, so far.

Other problems are more complicated. We often think of habitat loss as cutting down trees, or building houses, but it also comes from filling in wetlands, dredging rivers, building dams, and diverting water. For example, often the Colorado River dries up before it reaches Mexico and the Sea of Cortez, because so much water is used for agriculture, lawns, and cities further north. This makes it especially hard for birds, who need places to rest and feed along their migration routes, fish who would have migrated in from the sea to spawn, and animals living along the river that need fresh water to drink.

Of course the reality is that humans are here, and our impacts are inevitable. But for longterm stability of the planet, we must also leave ample space for nature, free from human pressures. We must choose to give back as much or more than we take. We can use science to make the best decisions on which lands to preserve, by studying ecosystems and the needs of their plants and animals.

The bright side of calamity

When we leave nature alone, it can often do a good job of repairing itself.

After the Korean War, people created a demilitarized zone (DMZ) between the north and south. Humans have not been allowed inside the 155-mile-long, 2.5-mile-wide area for seven decades, and so nature has taken over. Plants and animals thrive, including red-crowned cranes, wild Amur goral goats, Asiatic black bears, musk deer, and spotted seals.

Similarly, after the Chernobyl Nuclear Power Plant exploded in 1986, the radiation was so strong it killed most trees and animals in the area. The Soviet Union created a thousand-square-mile Exclusion Zone, where people were not allowed to live because of the radiation danger (today this area is in the countries of Ukraine and Belarus). But while it will be too dangerous for humans to live there for several centuries, nature is adapting. The forests are regrowing, and many rare and endangered animals use the area, like bison, bears, wolves, lynx, Przewalski horses, and more than 200 species of birds.



Prawny, artist details to come.

Habitat Loss & the Border Wall

Animals do not know of international boundaries, only natural environments. In the case of the U.S.-Mexico border, ecosystems stretch seamlessly across the borderline, and the Rio Grande River (or rather, they did until recently).



Reaching the river means life or death in this desert land, but the wall cuts off water to half of the ecosystem. It separates hundreds of animals from the areas they need to live and travel. It breaks up their communities, and isolates them, making it impossible for some to find food and one another.

Unfortunately, because the wall is all about politics and fear, the scientific realities of how it affects nature are almost never considered.

The wall means death for far-roaming species, which are already endangered or struggling, like bighorn sheep, pronghorn, Mexican gray wolves, jaguars, ocelots, black bear, banded armadillos, and even Ferruginous Pygmy-Owls, who fly too low to the ground to get over it.

As animal migration halts, it affects plants, like mesquite trees, whose seeds can only germinate once eaten by javelinas and coyotes. Scientists do not yet know all of the complexities of the ecosystems that are being damaged, but in such an extreme environment, they know the ripple effects are serious.

Construction of the border wall is happening in nature preserves, like state and national parks, including Organ Pipe National Monument, the National Butterfly Center, and the Lower Rio Grand Valley National Wildlife Refuge. These areas have been bulldozed without basic environmental impact reviews, or cultural considerations, like Indigenous burial grounds. The design of the wall also came about with little advice on basic engineering designs that could help lessen the damage wildlife, such as birds getting stuck in its matrix.

This is a classic example on how our troubles with nature are getting worse. We chose the option with the least amount of hassle and the greatest perceived short-term gain, instead of taking a moment to study the complexities, and then work together with the interests of nature in mind, alongside those of people.

N.B., Russia, Watercolor, isolate on white background.

This chapter goes on for another 30 pages, and gets into forest, fishing, poaching, bees, and more.

Other chapters include other pressures facing nature: climate change, pollution, social inequity, population, consumerism and GDP, and more.

Then, the second half of the book gets into solutions, which are divided into chapters on general/national/global government, industry, community, and individual.

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