

Forum: United Nations Environment Program

Issue: Preventing natural food webs from detrimental collapse triggered by human intervention

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Introduction to the Topic

Food webs. A great map of many different food chains, showing which organism preys on another organism. A food web tends to contain many, interconnected food chains in a single ecosystem. Food webs are grouped into categories known as trophic levels, divided into 3 groups - producers, consumers, and decomposers. Every ecosystem has a unique food web, relative to the environment of the area and the creatures that live there. However, food webs are another thing on a long list that humans have touched and impacted in a negative way.

The human race has had an impact on food webs, for as long as we have existed. Early humans depended on the environment for food and certain resources that had led them to depleting prey and fish, land clearing, and agriculture. And as our technology improves and our population increases, so does our influence on these food webs. Declining cod populations is something of note, seeing as how the fishing industry expanded from just hooks and lines from simple, open boats, to these massive, strong trawlers that caused fish landings to go through a series of booms and busts before collapsing in the early 1990s.

It's clear that human intervention has negative impacts on ecosystems of the food webs, as well as individual species of the food webs. Humans can cause endangerment and extinction of species, and as a result, a collapse in these food webs and ecosystems. This can be caused in many different situations such as habitat destruction causing a loss of food sources for animal and a loss of a home, hunting and poaching mainly targeted at

apex predators and killing for sport, introduction of invasive species, and even the removal of the indigenous people from the area, such is the case of the relocation of the Martu hunter-gatherers by the Australian government from their western Australia lands, that resulted in a massive negative impact on the desert ecosystem they left.

This is a problem that runs far and deep and has many different niches, such as the organisms and environment of the region as well as how the food web has been impacted, that makes it an extremely hard problem to solve. However, ecological restoration is one way through which we can rebuild food webs. Although a very broad term, a simple definition would be the process of rebuilding natural sites that have seen ecological and biodiversity damage.

Key Terms

Food Webs

Food webs are a combination of every food chain found in a single ecosystem and consists of three levels, those being the producers, consumers and decomposers. These are known as trophic levels. These webs illustrate who eats whom and the food relationships in a specific environment between organisms.

Ecosystem

An ecosystem is a specific geographic location where organisms, the weather, and the natural landscape, co-exist and work with each other to support life. An ecosystem contains biotic and abiotic factors that are linked together mainly through energy flows and nutrient cycles.

Food Chain

A food chain is a series of organisms who are each dependent on another, as a source of food. Multiple food chains in a single ecosystem make up a food web.

Poaching

Poaching is both the illegal act of animal trafficking, as well as the unruly murder of animals with motivations to protect livestock and villages from predators, or more devious motives such as entering the animal in the illegal exotic animal trade, harvesting body parts and selling them on the black market, and killing animals for trophies.

Habitat Fragmentation

Habitat fragmentation is the breaking down of large habitats into not only smaller, but isolated patches resulting in the impediment of ecological decay throughout a landscape. Fragmentation can cause increased light levels, low humidity, faster wind speeds, and higher temperature.

Invasive Species

These are species that are introduced into a non native ecosystem and start to spread from the area of its introduction throughout the entire ecosystem, competing with the native species for food and habitable space as well as tending to prey upon native species causing ruptures in food chains and the food web.

Indigenous People

The indigenous people of a land are those who share distinct, collective, ancestral links to the areas and natural utilities where they live, or currently, used to be. They are often critical to the stability of an ecosystem in an area they are/were living in, seeing as thousands of years of living in those areas leads to them becoming naturally integrated to an ecosystem, and their removal can have significant impact.

Rapid Urbanization

Urbanization is defined as the increase in the proportion of people living in cities and towns, with rapid urbanization being a rapid increase of the same concept. In order to facilitate such a sudden population increase, cities and towns are forced to expand

causing an encroachment on natural land and ecosystems and thus, habitat loss. Furthermore, this expansion has poor planning, causing poor infrastructure leading to health and environment related problems.

Extinction

It is the process of a species (or any other group of organism) no longer existing, due to various factors such as natural selection, hunting, habitat loss, climate change, etc.

Nature Reserves

Nature reserves are protected areas, set aside with the goal of conserving organisms with their sole purpose being that of protection of nature. They tend to be a bit smaller than national parks but have regular patrols by rangers to ensure no illegal activity is happening in the reserves.

Key Issues

Poaching of native fauna

It's no secret that wild animals are being poached and hunted at a huge scale. Millions of animals from thousands of species from all around the world are being either killed or taken from their natural habitat. Poaching is performed in order to sell these animals or their parts on the black market, with primates, reptiles, and birds commonly being sold as exotic pets whereas animals such as scales from pangolins, ivory tusks from elephants, as well as powdered insects for their remedial properties and meats from many animals as they are considered a delicacy in many places. Poaching is also performed in order to prevent death of livestock and destruction of agricultural land, as well as for trophies.

Being such a global problem, this issue tends to have a great impact both for the animals and its surrounding ecosystem. Poaching can be the leading reason for an animal's extinction, such is the case with the African elephant of which 100,000 were

killed between 2014 and 2017 for their ivory. Wild rhinos in Africa have seen a 97% decline over the last century while tigers in Asia have seen a 93% decrease of their wild range. (“Impact of Poaching | International Wildlife Defense Foundation”) Furthermore, sturgeon and paddlefish are threatened with extinction, being frequently poached due to the demand for their caviar and meat.

This tends to result in a major negative impact on the ecosystem. Seeing as the ecosystem is always in a rather delicate balance, a minor disruption can lead to massive problems. Such disruption could be a depletion of a species. A depletion of predatory animals can lead to an excess of prey animals that would lead to an extreme fall in the amount of vegetation. On the other hand, a reduction in the number of prey animals can lead to a reduced supply of food for predators leading to their decline. Additionally, the removal of a ‘keystone’ species, an animal whose role is vital to the functioning of the entire ecosystem as a whole, can result in a total food chain collapse. A simpler explanation would be the loss of any species, predator or prey, would have a chain effect on the ecosystem leading to negative impacts, and a loss of a keystone species can cause an entire ecosystem collapse.

Habitat loss

Habitat destruction is the simple act of destroying a habitat through means such as bulldozing trees, filling in wetlands, mowing fields, and the well-known, simple cutting down of trees. It is primarily done for agriculture, for creating farmlands, and we tend to get many different by-products, primarily timber and wood from cutting down trees. About 177,000 square kilometers of forests are cleared every year for the above 2 reasons. Companies also clear land for industrial reasons, to make space for urban development, as well as areas for resource exploitation (oil rigs).

As a result of this destruction, there is a significant impact on wildlife and ecosystems with the IUCN estimating about 2,000 mammals being impacted by habitat loss with the issue of habitat loss being the leading threat to 85% of species on the

IUCN's Red List. Australia is a place where this issue hits hard seeing as the continent has lost more mammal species in the last 200 years than the other continents combined. 78% of all plant species and 73% of all terrestrial animal species have deforestation (and the resulting habitat degradation) noted down as a threat. Furthermore, the country's Great Barrier Reef is another one of the habitats seeing great destruction, this time due to coral bleaching as a result of climate change. It's clear that a loss of habitat can lead to a collapse of an entire food chain and ecosystem, seeing as it directly threatens the livelihoods of many creatures giving fewer resources for organisms to consume, creating a chain effect similar to that of the result of poaching, albeit on a larger scale seeing as every organism is affected here.

Relocation of indigenous people

Indigenous people of lands are the people who have been living in an area for a long time, having both social and cultural groups that harbor a joint sense of ancient ties to the land they live in. And yet, indigenous people are forced to move out of these lands they have lived on for centuries due to the interests of governments, wanting to urbanize areas and use the land for other purposes. These people are moved to places that are more vulnerable to climate change, have more infertile land, and are in general a bit more unsuitable for a population to inhabit. This has led to indigenous people losing 98.9% of all their historic land from around 1492.

Seeing as indigenous people have become part of an ecosystem and thus a food web, since they have lived in an area for so long, their removal creates a large impact on the ecosystem of an area they have left. An example of this is the relocation of the Martu indigenous people from Western Australia by the Australian government in the 1960s with their absence having a massive impact on the desert ecosystem. The Martu lit fires to locate prey, creating fire breaks every winter protecting their land from summer lightning fires while their hunting methods helped plants and animals thrive, dampening predators and reducing the population of invasive species. Their removal resulted in more

wildfires, a decreased biodiversity, and growth of invasive species, completely disrupting the food web.

Introduction of invasive species into an ecosystem

It's no secret that, all around the world, there are things that are in places that they are not meant to be in. This includes animals in the form of invasive species, found in habitats they are not supposed to be as a result of being brought by humans from other nations. These species often tend to compete with the existing species and tend to have features that help them outcompete the native flora and fauna and driving them to extinction and endangerment.

Invasive species have caused 42% of either threatened or endangered species to be at risk. They tend to be introduced into an ecosystem both intentionally and unintentionally. Ballast water is a common way aquatic species can be introduced into new habitats while ornamental plants can spread into the wild and compete with the local flora. Furthermore, animals are brought intentionally in the form of pest control, or as exotic animals.

Examples of invasive species affecting another region include the Cogongrass, an Asian plant introduced in the United States of America and now is spreading, through the Southeast, displacing the native plants. Cats were brought to the Marion Islands to deal with the pest mice population, but by 1977, 3,400 cats were on the island endangering the local bird population. There is also the introduction of the Burmese Python into the Everglades, feasting on many local wading birds. And on the aquatic side, bighead and silver carp escaped from fish farms into the Missouri River, competing with a fellow plankton eater, the paddlefish, outcompeting it since the paddlefish's eating cycle is much slower.

Major Parties Involved

Australia

Feral camels cover more than 40% of the land area in the Northern Territory (NT). Camels were initially imported to Australia around 1840 from the Canary Islands. Australia already has over one million feral camels, with the population potentially doubling every nine years. Feral camels in Central Australia consume more than 80% of the available vegetation. There are more than two camels per square kilometer in areas of NT, which has a major impact on local vegetation. They are especially damaging to curly pod wattle, bean tree, quandong, plumbush, and supplejack. This harm has gotten worse in dry years. Camel grazing has a negative impact on important food plants used by Aboriginal people. Feral camels cause problems on fragile salt lake ecosystems and pollute waterholes, both of which are vital sites for Aboriginal people and natural vegetation. They also contribute to erosion by causing dune crests to become unstable. Camels cause extensive damage to stock fences, typically spanning hundreds of meters, as well as infrastructure around cow drinking locations.

Feral camel management is inconsistent and has little overall impact on populations. Management employs three primary strategies. The first approach is to fence off crucial regions to keep feral camels out. The next is to harvest and export feral camels for commercial sale, which now amounts to roughly 5,000 camels per year. The third strategy is to conduct both ground and aerial culling; in the Northern Territory, aerial shooting is performed by Parks and Wildlife contractors, with the property manager footing the expense of helicopter hire and ammunition.

Although aerial shooting of large animals such as horses and camels is an emotive topic, it is the most effective and humane method of culling large feral herbivores in remote and difficult-to-access locations. Because wild camels roam huge areas, buffer zones are required in arid places to safeguard environmentally sensitive areas.

South Africa

The current rhino poaching issue began in 2008, with a rising number of rhinos being slaughtered for their horn across Africa until 2015. Fortunately, poaching has

declined across the continent from a high of 1,349 in 2015. Nonetheless, at least one rhino is killed every day. South Africa is home to the bulk of the world's rhinos and has been the heaviest hit by poachers, with over 1,000 rhinos murdered each year between 2013 and 2017.

451 rhinos were killed in South Africa in 2021. The country has seen an increase in rhino poaching instances for the first time in six years. The shift is most likely the result of the Covid-19 pandemic. Because lockdowns were in effect around the world, including curfew restrictions in South Africa, it would have been far more difficult for poachers to enter a reserve, kill a rhino, and then sneak its horn out of the nation without being noticed. Unfortunately, once those limits began to be lifted, criminal syndicates began to grasp their opportunities to discover rhinos again, resulting in a 13% spike in poaching since 2020. Regardless, the general trajectory for the rhino poaching in South Africa remains to be a downward trend.

The 'Save the Rhino' foundation is a non-profit organization that works to tackle this issue in Africa. Secure habitat and excellent rhino monitoring are important, so we know the rhinos are and how they're breeding. Another essential component in preventing individuals from turning to poaching or intruding on rhino habitat is ensuring that the communities living near the habitats understand the importance and the advantages of conservation. Education is critical, not only in rhino-inhabited nations, but also in Asia, where consumer demand for rhino horn is highest. Captive breeding or intense management of the most endangered species is also critical to preserving genetic diversity and preventing extinction.

Ukraine

Russia's invasion of Ukraine in late February exacerbated the already bleak picture for global food prices. Following the commencement of the conflict, the Food and Agriculture Organization's (FAO) food price index, which tracks international prices of the most widely traded food commodities, reached its highest point in March since records began in 1990. Russia's invasion of Ukraine, termed a "special operation" to

demilitarize its neighbor, is the most recent step amid a rising global food crisis. While post-pandemic global demand, extreme weather, shrinking food stocks, high energy prices, supply chain roadblocks, and export restrictions and taxes have all been straining the food market for the past two years, the recent convergence of all of these factors following Russia's invasion is unprecedented, sending food inflation rates soaring around the world. The Consumer Price Index for food has grown considerably in all of Europe's main economies, while the CPI in the United States has risen by more than 14 percentage points since January 2020.

Sustainable Wildlife Management Program

While the exact origins of COVID-19 are uncertain, most theories point to an animal source. Although illness transfer from animals to humans is not uncommon, this epidemic has heightened controversy over the widespread use of wild meat. This huge multinational endeavor to boost wildlife protection and food security is being co-funded by the EU.

Millions of people rely on wild meat for sustenance and a living. For indigenous peoples and rural communities in South America, Africa, and Asia, wild meat is a significant source of protein, fat, and micronutrients. The demand for wild meat is increasing, particularly in urban areas. Wildlife populations will fall if hunting for wild meat is not maintained at sustainable levels, and people would face increased food shortages. According to recent research done by , overhunting for food is now risking the extinction of hundreds of wildlife species. The Sustainable Wildlife Management (SWM) Programme is a large multinational initiative aimed at increasing wildlife protection and food security. They are developing new ways that are inventive, collaborative, and scalable in order to conserve wild animals and protect ecosystems while also enhancing the livelihoods of indigenous people and rural communities who rely on these resources.

Timeline

Date	Event	Outcome
1760 - 1840	The Industrial Revolution	The sudden boom in population as well as development of many different technologies had resulted in rapid urbanization and the creation of more factories seeing the transition from an agricultural based economy to an economy dominated by machines, technology and industry. This resulted in more occupation of land and what came is a destruction of ecosystems, not to mention the mass amount of environmental pollution all this created.
1810s	The westward expansion of the United States of America	The United States' westward expansion led to a period of growth and expansion for the country, coupled with the forced relocation of the Native Americans as well as the mass wiping out of numerous species causing ecosystem collapse. Not only this but there was a massive change in the landscape as a result of settlement, which included soil erosion and depletion of forests, further contributing to the ecosystem and food web collapse.
June, 1938	Yellow River Flood	The 1938 Yellow River flood was caused by the Nationalist Government in central China during the early stages of the Second Sino-Japanese War in an attempt to prevent Japanese forces' rapid progress. The environmental consequences of the dike break were disastrous. The Yellow River temporarily split into a variety of distinct channels. These canals linked

		<p>to other rivers including the Ci and Sha. These and other rivers were unable to accommodate all of the water from the Yellow River and spilled as a result. For years, the river would not return to its regular flow. A highly rainy summer in June and July exacerbated the problem. In the flood-affected areas of eastern Henan, 32 percent of the cultivated farmland was submerged. In addition, the flood dumped a staggering 100 tons of silt on farmland, rendering it unfit for cultivation.</p>
1946-1964	The Baby Boom	<p>Increased population often increases food consumption resulting in increased use of fertile land and water. This is especially true in the absence of suitable food production technologies and coordinated programs that address community food and reproductive health needs at the same time. While the baby boom had no influence on the food supply, having another one like it could have a negative impact. The United States have been dealing with a baby formula shortage in recent weeks as a result of supply challenges. According to data from the week ending May 28th, the nationwide out-of-stock percentage for baby formula among US stores hit 74%.</p>
1960s	The starting of large-scale deforestation of the Amazon Rainforest	<p>Not much needs to be said about this problem, with the Amazon's deforestation leading to the destruction of habitats, and as a result, food sources</p>

		<p>for the millions of species in the rainforest, not to mention the estimated 100,000 species that go extinct each year. A loss of just one species creates a massive impact on the food web as each animal plays a pivotal role in an ecosystem. This deforestation has also led to endangerment of much of Amazon's species, some of note being the Jaguar, Hyacinth Macaw, and Giant Otter.</p>
<p>January, 1998</p>	<p>Beginning of Great Barrier Reef bleaching, with a mass bleaching event</p>	<p>The bleaching of the barrier reef has led to the degradation of all reef building corals found in the reef. The Great Barrier Reef is home to 8% of the world's fish species, 700 coral species, and about 4,000 species of mollusks, and a loss of its habitat has massive consequences. With 98% of the reef being affected since the first bleaching, there has been a reduction of fish population due to their habitat and any other species that both depend on fish and coral, and leaving the barrier vulnerable to an ecosystem collapse.</p>
<p>January 12, 2010</p>	<p>Haiti Earthquake</p>	<p>Haiti was devastated by a magnitude 7.0 Mw earthquake. The epicenter was in the town of Léogâne in the Ouest department, some 25 kilometers west of Haiti's capital, Port-au-Prince. Many landslides occurred, destroying natural landscapes and cutting off rural areas. Important natural and human landmarks were also destroyed, including the presidential palace. Tidal</p>

		waves caused flooding in coastal areas as a result of the earthquake. The immediate consequence of the earthquake has been a decrease in market demand for food, owing mostly to decreased purchasing power as a result of the loss of work and property.
2013	Poaching Crisis	2013 was maybe the worst year in modern history for South Africa's white rhinos. Poachers killed over a thousand animals, the most since records began in the early 1900s. This is also 1.5 times the number of white rhinos slain in 2012, when 668 were slaughtered for their horns, which are highly sought after as luxury items in parts of asia. Poachers in Kenya killed twice as many Kenyan rhinos in 2013 than the previous year. About a hundred elephants have been slaughtered in 2013 but conservationists believe the amount is much higher. This has a negative impact on the food chain since it is causing an animal that is vital to the ecosystem to become endangered and possibly extinct. This could have a tremendous impact on the food chain, potentially causing it to fall apart.

Previous Attempts to Solve the Issue

Ecosystem restoration program

An Ecosystem Restoration Program (ERP) is intended to preserve, repair, and expand aquatic and terrestrial habitats, as well as improve ecological services, in order to

support long term populations of diverse and valuable plant and animal species. The ERP is also intended to aid in the recovery of at-risk species reliant on the area, as well as aid in the recovery of at-risk species. Tree planting, coral rehabilitation, woodland rewilding, invasive species eradication, natural ground-water filtration introduction, and green space construction are among the most prevalent restoration efforts.

There are many Ecosystem Restoration Programs around the world, but the largest ERP is the Great Green Wall program. The Great Green Wall program is a massive African-led effort that began in 2007 with the goal of greening the entire length of Africa. Since then, the emphasis has turned to a more integrated strategy that includes sustainable land use, livelihood and employment creation, and peacebuilding. Landscape degradation, climate change, and fast expanding populations have all been important drivers of conflict in the last 50 years. The Great Green Wall aspires to unite people, restore degraded land, and promote long-term growth.

The plan is to build a Great Green Wall of trees 10 miles wide and 4,350 miles long, spanning a dozen countries from Senegal in the west to Djibouti in the east. The problem, however, is the spread of desertification across Africa along with little funding for the project. If they succeed, the population could reach 340 million by 2050, up from 30 million in 1950 and 135 million today. (Morrison)

Wildlife population management

Overpopulation of a certain species is one problem that can develop in nature. Animals suffer from starvation and sickness when their populations surpass the carrying capacity of their environment. Furthermore, when predators become rare as a result of overpopulation, weaker animal species starve or die in various ways. Wildlife population management entails any approach that aims to keep a target population at a level that the ecosystem can support. This can include preventing a threatened population from decreasing or possibly rebuilding a population. Many animal and fish species are managed through regulated hunting, trapping, and fishing procedures. State and federal wildlife authorities establish hunting, trapping, and fishing seasons, as well as

replacement limits. In 2010, excise taxes generated about \$473 million in apportionments remitted to states. The money goes toward wildlife restoration and educational projects at the state level. Furthermore, some states have implemented similar legislation, increasing the available resources for management. But even so, wildlife management might incur expenses such as agricultural or property devastation, lost opportunities (For example, wildlife habitat that would otherwise be converted agricultural or other production could be preserved), disease reservoir maintenance, or direct attacks on humans.

Wildlife management is a governmental function in most countries: wildlife exploitation is regulated by an agency with the legal authority to enforce wildlife laws. The central government may have primary management responsibility in many countries. In other countries, state or provincial governments are in charge of overall management. There is a combination of these two in North America. Wildlife is held in the public trust, and responsibility is shared by national, state, provincial, and tribal governments. In other countries, particularly South Africa, much management is devolved to landowners who own the wildlife on their lands. Little management authority may be exercised in countries with no strong central government, civil unrest, or poor food security, putting populations in serious risk.

Possible Solutions

Increase security of existing national parks/ nature reserves/ etc

National parks and nature reserves are protected areas, both helping to create safe havens for animals and plants as well as reducing the impact of poaching. However, the problem of poaching is one that still remains. An increase of security, such as increasing the number of rangers in an area and increasing the number of patrols, cannot guarantee the complete eradication of the problem but can lead to a mass decrease of poached animals.

Eradicating invasive species in the area they are alien to

Invasive species can create a lot of problems for the area those species are invasive to, and no more needs to be said about the impact they create. Methods such as rehabilitation and relocation of invasive species to different areas is too time consuming and is very cost ineffective, and a problem arises on where the species should be relocated to, and relocating them back to their home region will create an imbalance in the food web of said area.

Eradication is the most effective method, seeing as it would be quicker and easier, and more effective. Eradication can be performed in a multitude of ways, one being manually hunting animals or using chemicals, however the former would be really time consuming, and the latter can have negative impacts on the environment. What could be done is a method of “passive eradication” where you can train certain predators of the area to develop a taste for the invasive species, as well as urge local restaurants to serve the animal on their menu. A combination of passive eradication, and manually hunting animals would be effective.

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Supporting charities and organizations

Humans have had a massive impact on the ecosystem, one major way is through the impact we have had on animals’ natural habitats. From more direct ways like the felling of the Amazon rainforest to indirect ways like plastic ending up in the ocean. Reversing these impacts is pivotal and working with organizations as well as supporting charities can go a long way, seeing the impact they create. Charities such as Team Seas, which help reverse the impact humans have had on the natural habitats. A support to these ventures can result in more efficient work i.e. more restoration of ecosystems and reversal of human impact.

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