The Global Village

Module 6 • i2P • Biodiversity



"Your descendants shall gather your fruits."

-- Virgil



OUT OF AFRICA

The Nile River flows from the wetlands of the East African Plateau, through the swamps of Sudan and the deserts of Egypt before spilling its waters, some 6650 kilometers later, into the Mediterranean Sea. The headwaters of this great river are home to a rich array of wildlife including elephants, gorillas and chimpanzees. These mammals, all now threatened in their native habitat (see: <u>wildlife</u>), would cause a great

commotion if they were found wandering free in the forests or plains of North America or Europe. Yet the introduction of foreign species of life to new habitats is not unusual.

The first North American case of West Nile Virus was reported in the New York area in 1999. Three years later the virus had found its way to Canada. No one is certain how this virus arrived in North America.

Did You Know?

A new mosquito species, the Asian Tiger, is believed to have entered North America about the same time as West Nile Virus. It is speculated that infected mosquitoes travelled in pools of stagnant water in old tires imported for recycling.

see: mosquito

The West Nile Virus is carried by birds and transmitted by mosquitoes. Some theorize that it was brought to North America by mosquitoes transported inadvertently on aircraft or on boats, while others suggest it was introduced by infected birds. Most authorities agree that without modern means of transportation resulting from human activity, the West Nile Virus would never have been introduced to North America. Now to become ill with an exotic tropical disease one need not travel to Africa, you can become ill in the convenience of your own home.

Figure 1: The entire course of the Nile River from the lush East African Plateau to the Mediterranean Sea (source: NASA)

EXOTIC TASTE

Viruses are not considered life forms, and consequently are not

considered a component of the sum of the Earth's biodiversity. Nonetheless the spread of West Nile Virus is emblematic of the manner in which exotic species of organisms are spreading around the world.

Species that are introduced or spread beyond their native habitat are termed exotic or invasive species. Exotic or invasive species are broadly defined as species whose introduction or spread to new habitats threatens the environment, the economy or society dependent upon that habitat (see: <u>invasive</u> and <u>exotic</u>). However this definition does not capture the fact that in some instances new or introduced species can have positive repercussions for an ecosystem.

There are many means by which exotic species can spread. The vast number of exotic species are introduced as a result of human activity, and most frequently this introduction is deliberate. The principal motivation behind introducing exotic species has been to increase agricultural production (see: <u>agriculture</u>).

Most of the commonplace plants and animals that make up the daily human diet were once introduced as exotic species. Wheat grown around the world and used to make bread was introduced from the Middle East. Corn and rice, which constitute major world-wide dietary staples, come from Central America and South East Asia respectively. The domestic cow comes from Eurasia, while the turkey is native to North America (see: food). These, like many other species, have been introduced, domesticated and cultivated across the world in order to provide sustainable food sources for growing human populations.



Others factors that have lead human beings to introduce new species to foreign habitats include efforts to improve hunting and fishing, the desire for decorative plants, and the plan (often misguided) to control an undesirable plant or animal by introducing a predator or competitor.

ACCIDENTAL SPREAD

The introduction of exotic species is not always deliberate. A proportion of exotic species are accidentally spread to new habitats via the global transportation system, which allows insects to ride on commercial jets, or marine life to cross the globe in the ballast water of ships.

Not every species that is introduced to a new environment prospers; conditions that favor the survival and propagation of the species must exist. Palm trees are unlikely to take to the Arctic tundra, and penguins to the jungle. A species is more likely to succeed in a new environment if they possess the following characteristics (see: invasive):

- They tolerate a variety of habitats
- They grow rapidly
- They compete aggressively for resources
- They lack natural enemies or pests in the new system

SNAKES & BUFFALO

A classic study of a successful invasive species is the story of the brown tree snake, accidentally introduced to the Pacific island of Guam. The Brown Tree Snake is native to the South Pacific and is thought to have been transported to Guam on a cargo ship just after the second world war (~ 1950). With no natural predators on the island of Guam, and with abundant sources of food (Brown



Figure 3: The brown tree snake, a very successful invasive species in Guam (source: <u>Onionhound</u>

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Tree Snakes eat birds and small rodents) the snake flourished. According to the US Geological Survey the

"...snakes caused the extirpation of most of the native forest vertebrate species; thousands of power outages affecting private, commercial, and military activities; widespread loss of domestic birds and pets; and considerable emotional trauma to residents and visitors alike when snakes invaded human habitats with the potential for severe envenomation of small children (see: <u>Brown Tree Snake</u>)."

The Brown Tree Snake in Guam illustrates the outcome of an exotic species that possesses all the qualities that predict success; it tolerates a variety of habitats, grows rapidly, competes aggressively for resources and lacks natural enemies or pests in the new system.

Similar success has been exhibited by the Water Buffalo, introduced to the Amazon Basin from Africa about 200 years ago. The Water Buffalo have proven to be very successful in their new environment and their numbers have grown rapidly. Amazonian ecologist Gil Serigue (who

Did You Know?

Since the 17th century, the introduction of exotic species has contributed to the loss of 40% of all animal extinctions for which the cause is known. In one area of South Africa the introduction of exotic species is threatening 80% of the native species.

see: extinction

will be accompanying the i2P team on the upcoming Amazon expedition) reports:

"They eat everything that is green including the giant water lilies and because they are very heavy they compress the soil which changes the drainage pattern." (see: <u>water buffalo</u>).

The increasing number of Water Buffalo are damaging the Amazon floodplain and



Figure 4: A water Buffalo (source: Steve Garvie).

altering the ecosystem.

HABITAT DEGRADATION

Sometimes a change in a local habitat can precipitate the creation of an invasive species. Habitat degradation usually the result of human activity - can alter the balance of the local ecosystem making it attractive to new species, who can migrate into the territory and profit from the changed environment. A simple example of this is growth of cities (urbanization) which causes the degradation of the pre-existing natural habitat. This displaces many animals that do not survive in a city environment and favors animals that function well in the urban setting like the rat, and the squirrel. Global Invasive Species Database.

The Global Invasive Species Database aims to increase awareness about invasive alien species and to facilitate effective prevention and management activities.

see: <u>GISDatabase</u>

The rapid growth of the human population is propelling further habitat degradation. Forests are being cut for lumber and to create more arable land to grow crops and graze livestock, and cities are expanding over pastureland. These changes will invite the migration of invasive species that can function in these new habitats.

ASIAN CARP

The damage caused by invasive species such as the Brown Tree Snake is widespread, and the costs associated with a managing such an infestation are significant. A study in 2004 estimated that exotic species in the United States cause \$120 billion in environmental damage per year (see: cost).

Figure 5: The Bighead Carp, one type of Asian Carp (source: <u>USFG</u>)

In June of this year a meter long Asian Carp was caught in Illinois' Lake Calumet. It was found beyond an \$8.5 million dollar electric barrier built six years earlier to prevent this very carp from invading the Great Lakes system. As Lake Calumet feeds into lake Michigan there is concern that the Asian Carp has already populated the Great Lakes.

The concern arises from the fact that the Carp, which can grow to 27 kilograms in size, are aggressive and voracious feeders that vacuum up large quantities of plankton, which form the bottom of the Great Lakes food chain. In addition the Carp grow quickly and breed prolifically. This means that native fish such as trout and pike which feed on plankton as young may have difficulty competing with the invading species and may

starve. The economic consequences of the loss of these fisheries could be significant. As reported by the Canadian Broadcasting Corporation,

"The Great Lakes Fishery Commission, a U.S.-Canadian partnership that manages fish stocks and fights invasive species in the countries' shared waters, estimates recreational, commercial and tribal fishing throughout the Great Lakes is worth \$7 billion a year" (see: <u>carp</u>).

The Asian Carp was introduced to some aquaculture ponds in Arkansas in the 1970's in order to control excess algal growth. They escaped into the Mississippi river system during flooding in the 1990's, and now account for almost 90% of all fish biomass in some stretches of the river. Some are predicting that the Carp will soon overrun the Great Lakes system.



THE ULTIMATE EXOTIC

Africa is the cradle of humanity, and until 60 thousand years ago all other continents were free of humans. Today we are found on all continents, including Antarctica, and are a dominant presence in all Earthly environments whether land, air or water. While The Asian Carp and the brown Tree Snake

are examples of successful exotic species, perhaps the most successful

invasive species of all is the human being. When one considers the characteristics that support the successful spread of an exotic species (listed earlier in the module) we possess all the traits but one, we do not breed rapidly.

We have enlisted technology to allow us to tolerate virtually all habitats, and medicine and equipment to fend off any potential pests or predators. In terms of competing aggressively for resources we are unprecedented, dominating all other life forms in our thirst for the raw material of the planet. Our success is evident in our population explosion. Humans are the ultimate invasive species.



Figure 6: An exotic & invasive species, the Human fish (source: Soliaguar).