**Activity 73: Introduced Species Name:**

**BACKGROUND INFORMATION**

Introduced Species

The concept of ***introduced species*** as an ecological issue is a relatively recent one. Previously, species were introduced into new regions without concern for their long-term impact; for example, wheat and cattle were introduced into new regions to provide food for people. The introduction of species by humans has caused major changes in ***ecosystems*** throughout the world. Such ideas can be explored together with other subjects, such as early civilizations or the migration of Europeans to the Americas. Discussing species introduced for agricultural purposes also provides a broader understanding of this complex issue.

It is sometimes very difficult to determine which species are not ***native*** to an area. The case of San Francisco Bay is an example. Species first arrived in the bay between 5,000 and 8,000 years ago, when the bay filled up with water as ice sheets melted at the end of the last ice age. About 100 years ago, many new additional species arrived as shipping between the East and West coasts of the United States increased. Recently, new species introduced from Asia and New Zealand have begun to affect populations of these organisms. Thus the definition of introduced species depends on how far back in time one goes.

Species migrations to new geographical areas are also a natural process that has been going on over evolutionary time, as species colonize new habitats (e.g., islands, the North American continent via the Bering land bridge, and Mount St. Helen’s after its recent eruption). What is different about species introductions in modern times is that:

 (1) species are being transported by humans to geographical areas so far from their original ranges that it is unlikely that they could have traveled those distances on their own, and

 (2) many more species are being moved around the globe as a result of international trade and travel than has been the case in the past.

Species are continually being introduced into new environments around the globe. Only a few of them survive and even fewer expand their populations to the point that they ***out-compete*** native species. Species that can out-compete native species are considered ***invasive***. These invasive species can cause the kind of extensive ecosystem disruptions and damage. And it’s not just in the United States – it’s a world-wide problem. For example, Leidy’s comb jelly traveled in a ship’s ballast water from its native habitat on the Atlantic coast of the Americas to the Black Sea, where it has caused major damage to the Black Sea ecosystem. Ecologists are now concerned that the species might spread into the Mediterranean Sea.

Islands that are fairly distant from the mainland tend to be more vulnerable to the introduction of new species. Understanding why islands are so vulnerable requires knowing about both ecology and evolution. The ease of invasion of island ecology stems from a number of factors. Geographically distinct islands tend to have native species that have evolved together over long periods of time. When a new species successfully competes with a native species, the population of the native species goes down fast as available resources decline and the initial populations of island species are small. When a native species’ population decreases to endangerment or extinction, this can devastate the species that rely on it within the ecosystem, each of whose populations are also small to begin with. Island species are generally not found anywhere else on Earth, so if they die out locally, no other population is available to replenish the island. Therefore, the introduction of new species on a geographically distinct island often causes significant changes in the entire ecosystem of the island, involving many species becoming extinct in very short periods of time.

Coastal regions, such as California, Florida, and Hawaii that have a lot of international traffic (via water, air, or land) seem to have a greater number of introduced species. This tends to be associated with human travel through the area because many organisms can travel in the holds of ships or on cargo.

Factors that make a species more likely to survive and succeed in a new environment include:

• for animal species, hardiness and flexibility in terms of requirements for food or shelter;

• for plant species, flexibility in soil requirements and method of pollination;

• a high reproductive rate (common but not universal among successful invaders).

Flexible species with high reproductive rates often do well in disrupted ecosystems, such as when humans settle an area. In the U.S., successful examples of these species include the European rat and the Oriental cockroach.

In general, when the new environment’s climate is similar to the species’ native climate, the ecosystem is more vulnerable to a successful introduction.

Damage Caused by Introduced Species

Introduced species are thought to be the second most important factor in species extinction, after habitat loss. In addition, introduced species cause billions of dollars of damage each year. For example, introduced forest pests, such as the Asian longhorn beetle, cause $4 billion in annual damages (such as timber loss) in the U.S. Other impacts include loss of livestock and crops, medical costs (when species infect humans), and damage to structures such as water pipes and power lines.

Strategies to limit future impact from introduced species are usually grouped into ***biological control***, ***chemical control***, ***physical control***, and ***prevention strategies***.

* **Biological control** measures include the secondary introduction of parasites and/or predators.
* **Chemical control** can include the use of pesticides and herbicides.
* **Physical/ mechanical control** includes the physical removal of the species with traps and baits or by cutting and clearing vegetation.

These control strategies themselves may also impact ecosystems in unintended ways.

* **Prevention strategies** to prevent further spread of an introduced species include inspecting cargo and luggage at borders and at airports, and using specially trained dogs to detect incoming species. International rules govern where and how a ship’s ballast water (water stored in big tanks to help make the ship float properly) 65is emptied. Educating the public to avoid the accidental release of exotic species, such as unwanted aquarium fish, can also reduce the spread of species.

REFERENCES

* Bright, Chris. Life Out of Bounds: Bioinvasion in a Borderless World. New York: Norton and Company, 1998.
* Diamond, Jared. Guns, Germs, and Steel. New York: Norton and Company, 1999.