Native species

- **Definition:**

  In biogeography, a species is defined as native (or indigenous) to a given region or ecosystem if its presence in that region is the result of only natural processes, with no human intervention.

- Every natural organism (as opposed to a domesticated organism) has its own natural range of distribution in which it is regarded as native.
- Outside this native range, a species may be introduced by human activity.
- An indigenous species is not necessarily endemic.

(The terms endemic and indigenous do not imply that an organism necessarily originated or evolved where it is found)

Native plant

- This includes plants that have developed, occur naturally, or existed for many years in an area (e.g. trees, flowers, grasses, and other plants).

- Some native plants have adapted to a very limited, unusual environments or very harsh climates or exceptional soil conditions.

- Although some types of plants for these reasons exist only within a very limited range (endemism), others can live in diverse areas or by adaptation to different surroundings (indigenous plant).

Environmental conditions

- Native plants form a part of a cooperative environment, or plant community, where several species or environments have developed to support them.

- This could be a case where a plant exists because a certain animal pollinates the plant and that animal exists because it relies on the pollen as a source of food.

- Some native plants rely on natural conditions, such as occasional wildfires, to release their seeds or to provide a fertile environment where their seedlings can become established.

Invasive species

Invasive species

Synonyms:

introduced, neozoon, alien, exotic, non-indigenous, or non-native species

Definition:

- a species living outside its native distributional range, which has arrived there by human activity, either deliberate or accidental.

Not all introduced species are problematic.

- Mechanisms of invasion
  - Species-based mechanism
  - Ecosystem-based mechanism
- Species-based mechanism
  - Fast growth
  - Rapid reproduction
  - High dispersal ability
  - Phenotypic plasticity (the ability to alter growth form to suit current conditions)
  - Tolerance of a wide range of environmental conditions (Ecological competence)
  - Ability to live off of a wide range of food types (generalist)
  - Association with humans
  - Prior successful invasions
  - must survive at low population densities

- An introduced species might become invasive if it can outcompete native species for resources, such as nutrients, light, physical space, water or food.
- An invasive species might be able to use resources previously unavailable to native species, such as deep water sources accessed by a long taproot, or an ability to live on previously uninhabited soil types.
- "Allelopathy":
  - Ecological facilitation occurs when a species alters its environment using chemicals or manipulating abiotic factors, allowing the species to thrive, while making the environment less favorable to competitors.
- (a plant secretes chemicals which make the surrounding soil uninhabitable, or at least inhibitory, to competing species.)

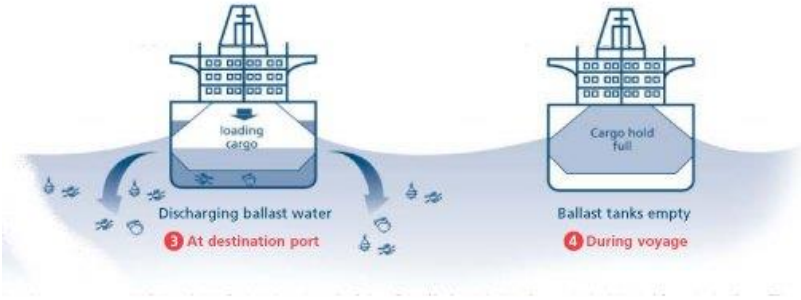
- Ecosystem-based mechanisms
  - Amount of available resources and the extent to which those resources are used by organisms determines the effects of additional species.
  - An introduced species that can spread faster than natives can use resources in some condition (after forest fire). Nitrogen and phosphorus are often the limiting factors in these situations.
  - Every species occupies a *niche* in its native ecosystem. Some invading species fill niches that are not used by native species, and they also can create new niches.
  - Ecosystem changes can alter species' distributions. Such as "edge effect"
  - Examples:
    - land is cleared for agriculture
    - boundary between remaining undisturbed habitat

Native “invaders”

- some native species can, under the influence of events, such as long-term rainfall changes or human modifications.
- Such as many plants grows in crevices of rocks, mountains and on house buildings.

Vectors

- Non-native species have many *vectors,* including biogenic vectors
- most invasions are associated with human activity.
  - plants or seeds imported for horticulture
  - pet trade moves animals across borders, where they can escape and become invasive.
  - Ballast water taken up at sea and released in port by transoceanic vessels is the largest vector for non-native aquatic species invasions.



Impacts of wildfire

- Large wildfires are capable of sterilizing soils, while adding a variety of nutrients.

- Economic benefits
  - Non-native species can have benefits.
    - Asian oysters, for example, better filter water pollutants than native.
    - They also grow faster and withstand disease better than natives.
- Economic opportunities
  - Some invasions offer potential commercial benefits.
  - For instance, silver carp and common carp can be harvested for human food and exported to markets already familiar with the product, or processed into pet foods, or mink feed.
  - Vegetative invasive such as water hyacinth can be turned into fuel by methane digesters.
- Costs
  - Production loss in agriculture and forestry, and management costs.
  - Economic losses can also occur through loss of recreational and tourism revenues.

- Plant Industry
  - Many weed species are accidental introductions .
  - Reduce yield in agriculture.
  - Some deep-rooted weeds can "mine" nutrients (see dynamic accumulator) from the subsoil and deposit them on the topsoil, while others provide habitat for beneficial insects and/or provide foods for pest species.
  - Invasive plant pathogens and insect vectors for plant diseases can also suppress agricultural yields and nursery stock.
- Aquaculture
  - The aquaculture is a very common vector of species introductions – mainly of species with economic potential.

- **Forestry**
  - The unintentional introduction of forest pest species and plant pathogens can change forest ecology and damage the timber industry.
  - Example:
    - The Asian long-horned beetle (*Anoplophora glabripennis*) was first introduced into the U.S. in 1996, and was expected to infect and damage millions of acres of hardwood trees. As of 2005 thirty million dollars had been spent in attempts to eradicate this pest and protect millions of trees in the affected regions.
- **Tourism and recreation**
  - Invasive species can impact outdoor recreation, such as fishing, hunting, hiking, wildlife viewing, and water-based activities.
  - They can damage a wide array of environmental services that are important to recreation, including, but not limited to, water quality and quantity, plant and animal diversity, and species abundance.

- **Health**
  - Encroachment of humans into previously remote ecosystems has exposed exotic diseases such as AIDS virus to the wider population.
  - Introduced birds (e.g. pigeons), rodents and insects (e.g. mosquito, flea, louse and tsetse fly pests) can serve as vectors and reservoirs of human afflictions.
- **Biodiversity**
  - Biotic invasion is considered one of the five top drivers for global biodiversity loss and is increasing because of tourism and globalization.
  - Invasive species may drive local native species to extinction via competitive exclusion, niche displacement, or hybridization with related native species.
  - invasions may result in extensive changes in the structure, composition and global distribution of the biota

- Genetic pollution
  - Native species can be threatened with extinction through the process of *genetic pollution*.
  - Genetic pollutions unintentional hybridization and introgression, which leads to homogenization or replacement of local genotypes as a result of either a numerical or fitness advantage of the introduced species.
  - Hybrids resulting from rare species that interbreed with abundant species can swamp the rarer species' gene pool.

Control of Invasive species

- **Prevention** is the single best way to limit impacts of nonnative species.
- **Eradication** may be feasible early in an invasion or in a restricted area.
- **Regular monitoring** programs to identify new exotics soon after they invade.
- **Containment** (preventing further transport of existing exotics within the US) is an important tool to reduce the impact of existing invaders.
- **Control** methods can include any of the following:
  - *Chemical control* (using pesticides, herbicides, or fungicides)
  - *Mechanical control* (physically removing the invasive species or changing habitat conditions)
  - *Biological control* (introducing a natural enemy – predator or parasite – generally from the invader's native range)
- **Restoration** of native communities is an important step to minimize the chances an area will be reinvaded.

Thank you


Invasive
Species
Alert
These waters are designated as
INFESTED WATERS and contain:
Zebra Mussels
Minnesota Department of Natural Resources