

Guild

Definition: A **guild** (or **ecological guild**) is any group of species that exploit the same resources, often in related ways.

Guilds are defined according to the

- locations
 - characteristics,
 - activities
- The number of guilds occupying an ecosystem is termed its *disparity*.
 - Members of a guild within a given ecology could be competing for some resources (such as space or light), while attracting pollinators, or detecting predators, such as happens among savannah-dwelling antelope and zebra.

- Example guilds

- browsers and terrestrial folivores
- forest canopy folivores
- forest floor scavengers
- grazers
- forbs
- grasses
- plankton
- Saprophytes (lives on dead or decaying organic matter)
- shrubs
- trees
- vines
- piscivores

Resource partitioning

- Definition:
 - When two species divide a resource based on behavioral or morphological variation, it is termed differential resource utilization or resource partitioning.
- There are three types of differential resource utilization.
 1. Temporal partitioning
 2. Spatial partitioning
 3. Morphological differentiation

- Temporal partitioning
 - When two species eliminate direct competition by utilizing the same resource at different times.
 - This can be on a **daily scale** (e.g. one species of spiny mouse feeds on insects during the day while a second species of spiny mouse feeds on the same insects at night
 - Can be on **seasonal scale**
 - It also would be **reproductive asynchrony** (separation of breeding periods) (Example: two competing species of frog offsetting their breeding periods. By doing this the first species' tadpoles will have graduated to a different food resource by the time the tadpoles of the second species are hatching)

- Spatial partitioning

- when two competing species use the same resource by occupying different areas or habitats within the range.
- Spatial partitioning can occur at small scales (microhabitat differentiation) or at large scales (geographical differentiation) of occurrence of the resource.
- Microhabitat differentiation occurs when **two competing species** with **overlapping home** ranges partition a resource. Two examples would be
 - Different species of **fish** feeding at different depths in a lake or
 - Different species of **monkey** feeding at different heights in a tree.
- Geographical differentiation is when two competing species have **non-overlapping** home ranges and thus partition resources.
 - An example might be given with monkeys again: two competing species of monkey using the same species of fruit trees, but in different areas of the forest.

- Morphological differentiation
 - When two competing species evolve differing morphologies to allow them to use a resource in different ways.
 - Example: bumblebee **proboscis lengths** and flower corolla lengths ,
 - long-proboscis bee species would preferentially feed on the long-corolla plants,
 - the medium-proboscis bee species would feed on the medium-corolla plants,
 - so several competing bee species are able to partition the available resources and coexist.

Ecosystem services

- Humankind benefits from a multitude of resources and processes that are supplied by natural ecosystems.
- Collectively, these benefits are known as **ecosystem services** and include products like clean drinking water and processes such as the decomposition of wastes.
- *Ecosystem services* as **benefits people obtain from ecosystems** and distinguish four categories of ecosystem services:
 - ***Provisioning services*** (such as the production of food and water)
 - ***Regulating services*** (such as the control of climate and disease)
 - ***Supporting services*** (such as nutrient cycles and crop pollination)
 - ***Cultural services*** (such as spiritual and recreational benefits)

Provisioning services (such as the production of food and water)

- food (including seafood and game), crops, wild foods, and spices
- water
- minerals (including diatomite)
- pharmaceuticals, biochemicals, and industrial products
- energy (hydropower, biomass fuels)

Regulating services (such as the control of climate and disease)

- carbon sequestration and climate regulation
- waste decomposition and detoxification
- purification of water and air
- crop pollination
- pest and disease control

Supporting services (such as nutrient cycles and crop pollination)

- nutrient dispersal and cycling
- seed dispersal
- Primary production

Cultural services (such as spiritual and recreational benefits)

- cultural, intellectual and spiritual inspiration
- recreational experiences (including ecotourism)
- scientific discovery

Ecosystem services and business

- Ecosystem **services degradation can pose a number of risks** to corporate performance as well as **provide business opportunities** through ecosystem restoration and enhancement. Risks and opportunities include:

Operational:

Risks such as higher costs for freshwater due to scarcity or lower output for hydroelectric facilities due to siltation.

Opportunities such as increasing water-use efficiency or building an on-site wetland to find a way for new water treatment infrastructure

Regulatory and legal

Risks such as new fines, **government regulations**, or lawsuits from local communities that lose ecosystem services due to corporate activities

Opportunities such as engaging governments to **develop policies and incentives** to protect or restore ecosystems that provide services a company needs

Reputational

Risks such as retail companies being targeted by nongovernmental organization campaigns for purchasing wood or paper from sensitive forests

Opportunities such as implementing and communicating sustainable purchasing, operating, or investment practices in order to differentiate corporate brands

- ***Market and product***

- **Risks** such as customers switching to other suppliers that offer products with lower ecosystem impacts or governments implementing new sustainable procurement policies
- **Opportunities** such as launching new products and services that reduce customer impacts on ecosystems or participating in emerging markets for carbon sequestration and watershed protection other products

- ***Financing***

- **Risks** such as banks implementing more rigorous lending requirements for corporate loans.
- **Opportunities** such as banks offering more favorable loan terms or investors taking positions in companies supplying products and services that improve resource use efficiency or restore degraded ecosystems.

HOW ARE ECOSYSTEM SERVICES “CUT OFF” ?

- Ecosystem services are severely threatened through
 - (1) growth in the scale of **human enterprise** (population size, per-capita consumption, and effects of technologies to produce goods for consumption) and
 - (2) a mismatch between **short-term needs and long-term societal** well-being.
- Many human activities disrupt, impair, or reengineer ecosystems every day including:
 - runoff of pesticides, fertilizers, and animal wastes
 - pollution of land, water, and air resources
 - introduction of non-native species
 - overharvesting fisheries
 - destruction of wetlands
 - erosion of soils
 - deforestation
 - urban sprawl

Competitive exclusion principle or Gause's Law

- It states that **two species competing** for the **same resources cannot coexist** if other ecological factors are constant.
- When one species has even the slightest advantage or edge over another, then the **one** with the advantage **will dominate** in the long term.
- One of the two competitors will always overcome the other, leading to **either the extinction** of this competitor or an **evolutionary or behavioral shift** towards a different ecological niche.
- The principle has been paraphrased into the maxim "**complete competitors cannot coexist**".

- Example:
- Russian ecologist Georgii Frantsevich experiments using two species of *Paramecium*
- *cium*, *P. aurelia* and *P. caudatum*.

