

## Public lecture: ecosystems and their value

### Content

- What is an ecosystem?
- Food webs: how ecosystems are connected, and the other services they provide for each other as well as food.
- Species importance: the importance of having each species in a food web.
- Ecosystem services: what ecosystems do for us
- How we can protect the ecosystems to protect their services.

### What is an ecosystem?

- There are lots of different species of animals and plants around us in the environment.
- These different species interact with each other – for example, insects might eat a plant, and two different types of lizards might be in competition with each other for who eats that insect.
- These interactions aren't all bad: some insects pollinate plants, helping them reproduce by spreading their pollen to other plants so they can form fruits and seeds which will then grow into new plants.
- Together, all the different species in an area are called a community, a bit like the community you live in with your friends and family.
- When we think about the community of living things AND the habitat they all live in, we call this the ecosystem – so, essentially, an ecosystem is all the living things in an area plus their habitat.

### How are ecosystems connected?

- As I said, the different creatures in an ecosystem all interact with each other. They rely on one another for food, shelter, nutrients, and lots of other things. This means that ecosystems are tightly connected, with important links between different species that help the ecosystem function smoothly.
- In steppe ecosystems, we might have interactions like this:
  - Saxaul (Haloxylon) and Tamarix are sometimes pollinated by insects.
  - Some insects also eat the plants, as do other animals – big ones like the saiga and small ones like Severtzov's Jerboa, steppe tortoise and the Tolai hare.
  - Reptiles like the steppe agama lizard eat insects like beetles, ants, spiders and centipedes.
  - Other insect-eating animals include the saxaul jay.
  - These birds, reptiles and small mammals use the saxaul and tamarix for shelter or somewhere to build a nest.
  - They can be eaten by carnivores like golden eagles (tortoises and hares), caracals (small mammals and birds) and wolves (saigas and hares).
  - The dung of these animals, especially larger animals like the saiga and wolves, falls to the floor and is broken down by decomposers like dung beetles.
  - The beetles release the nutrients in the animal dung, which makes the soil richer and helps plants to grow.

Commented [1]: This plants better known by locals

Commented [2]: I deleted rodents because they are small mammals

### How we normally represent ecosystems being connected: food webs

- The main way scientists represent the connections between species in an ecosystem is by using food webs.
- These show which species eat what, and so show us what is reliant on what.

- The food web below isn't complete but shows a few of the different plants and animals in a food web you might see in Karakalpakstan.
- The black arrows mean 'is eaten by':
  - Saxaul is eaten by weevils, rodents.
  - Other plants eaten by rodents, hares, etc.
  - Weevils are eaten by lizards like the steppe agama, and saxaul jay
  - Steppe agama, rodents eaten by tartar boa
  - Hares eaten by golden eagle,
  - Saxaul jay, rodents eaten by caracal
- Dung from all of these is decomposed by dung beetles, etc. and returns to the soil as nutrients, which are then taken up by the plants to help them grow.
- It shows us how ecosystems are connected in a web, even without considering the other relationships to food like shelter and competition between species.
- If we add in these, it could look something like this:

**Commented [3]:** Maybe better to give tartar boa as its area located in Northern Ustyurt and Resurrection more close to project area. Sand boar inhabits in Southern Ustyurt far from our settlements

### Species importance

- This web-like relationship means every species has an important role in the ecosystem. If you take one out, effects can be seen across the ecosystem.
- For example, if people killed lots of this steppe agama so they disappear from the ecosystem:
  - There might be an increase in weevils eating saxaul.
  - Saxaul populations might shrink.
  - More weevils might mean stronger competition against this insect, meaning the species that eat it are affected.
  - There won't be enough lizard food for the bird, meaning the populations decrease.
  - The reduced numbers of saxaul then might mean there isn't enough habitat for saxaul jays, and they have nowhere to live.
- Every species is really important in the ecosystem they live in, so we should look after all of them.

### Example of species importance: the saiga

- To look at how important every species is in an ecosystem, we can use the saiga as an example.
- Saiga feed on grasses and shrubs in the steppe. They might get seeds of these plants stuck to their coats, and can then disperse the seeds over large distances as they move around.
- When digging around for food with their noses and hooves, they disturb the top of the soil and make it easier for seeds to penetrate the ground and find a place to germinate.
- When they trample over this, they can push seeds into the soil and help this further.
- Their droppings also help to fertilise the soil: decomposers release nutrients from the saiga droppings which can then be taken up by plants to help them grow.
- They are important prey species for carnivores like wolves.

### Ecosystem services: what ecosystems do for us

- The species within an ecosystem aren't just important for the other plants and animals that rely on them for food, etc. – ecosystems also provide important benefits for humans.
- Plants:
  - Water storage/retention/regulation
  - Compact soil, reducing erosion and dust storms, as well as making land better for crops
  - Provide livestock food
  - Provide wood for fuel

- Saxaul provides fodder; used for range restoration and/or improvement, creation of long term pastures, fixes sand dunes and prevents dust storms; used to make coal; alcohol extracted from wood; used to dye wool dark brown.
- Medicine, alcohol.
- Remove toxins from the atmosphere.
- Carbon sequestration.
- Insects:
  - Some insects help decompose dead and decaying matter (eg. faeces), releasing nutrients into the soil to be taken up by plants.
  - Some insects dig in the soil, making it easier for seeds to get into the soil and germinate (1).
  - Compete with other pest species to keep population levels stable.
  - Pollinate some plant species, including crops.
- Reptiles:
  - Some lizards and snakes eat pest insects that could damage crops.
- Large mammals:
  - Droppings help fertilise the soil.
  
- For the ecosystem to provide these services, it needs to be intact and healthy – if we damage the ecosystem by allowing populations to decline, the services provided by the ecosystem will be reduced.

**How can we protect ecosystems to protect their services?**

- Ecosystems are very important to humans because of the services they provide (water regulation, carbon sequestration, erosion and pollution control, biological resources) – thus, it is important to protect them to maintain these services.
- There are many ways we can do this:
  - Not overexploiting biological resources – sustainably consume plants for fuel, animal feed, etc. Do not hunt protected species, and legally hunt in a responsible manner.
  - Conservation measures
  - Establish protected areas