

# EFWG 2022-01-20 Meeting - Natural Ecosystems, Dr. Autumn Watkinson

## Meeting Schedule

- Bi Weekly at 11am EST /

## Attendees

- [Steve Magennis](#)
- Carly Huitema
- [Judith Fleenor](#)
- [ric Drury](#)
- Karen Hand
- [A Subrahmanyam](#)
- [Nicky Hickman](#)
- Trinh

## Agenda Items

### Presentation Files

- [Meeting Deck](#)
- [Presentation on Ecosystems by Dr. Autumn Watkinson](#)

### Recording

[Meeting Recording](#)

### Meeting Notes

Ecosystem - presentation Jan 20, 2022.

Dr. Autumn Watkinson

- Gold standard for an ecosystem - good question to think about because people first think of a pristine landscape but it is not exclusively picturesque but can still function well.
- Is the look as important as the function of an ecosystem
- Ecosystem - a biological community that interacts with itself and its physical environment. The physical environment is an important component (soil, air, water) and the biological component alone is just a community.
- General classification - Grassland, Montane, Badlands, wetland but we can further refine more and more detailed. Zooming in and zooming out can change the boundaries of where the ecosystem limits are.
- Eg zoom out terrestrial ecosystems. Scale helps us define the boundary of the ecosystem. So it is difficult to define where the border.
- Therefore the border decision is usually a consensus decision of the people who are investigating.
- Some ecosystems have lovely transition zones so it is difficult to say where the boundary is.
- Ecosystem - is self-sustaining in a way, with a biological component with physical interactions.
- Trophic level - the position of an organism in the food chain of an ecosystem. Guild level in the food chain of an ecosystem.
- Primary producers - foundation of ecosystems, they are the one who bring the energy into the system (typically sun) and harness it and turn it into biomass. The biomass energy as it is consumed travels up the food chains.
- Energy flows only one, up the food chain from one trophic level to the next. Dying things that aren't consumed, the energy goes back down into the bottom at the decomposers (energy not brought in, they just move it around)
- Think about - where is the energy coming into the system (like a primary producer). Where is it used, where is it lost? A lot of energy brought into the system is lost as it travels up the food chain. So a life strategy is to become more efficient with energy usage so you lose less heat etc.
- Components of an ecosystem - Individuals, population, community. Another way to talk about individuals, not just as trophic levels.
  - How do different units contribute to the whole
- Multiple communities make up an ecosystem, they are made of populations of the same type of individuals.
- The community is the biological component - it drives most of the change that you will see in an ecosystem. The drivers of change = community. Physical things influence.
- Idea - what is the population in an ecosystem?
  - multiple people/actors who do the same actions (e.g. 1000 people who are all holders of a credential)?
  - Essif Lab describe a community as an organization of parties that has a common objective - = function?
- Communities can be described many different ways - but many species are lumped together as their functionality in the ecosystem.
- Food web - analogy of network (similar to trophic levels function).
- How to attract more people into the community?
- Restoration ecology - big question how do you bring in species who aren't there right now?
  - We can have organic methods or maybe need external help to move in necessary organisms
- Discussion: we think about ecosystem but probably are thinking community of actors. What is the oxygen and sunlight, energy? Is it money that is the energy?
  - I think in our ecosystem, we can think of \$\$\$ in a progressive way, say CO2 and H2O cost of the system, because that's what \$\$\$ eventually comes to be.

- I would equate the soil, oxygen, sun as the foundation for the ecosystem(s) - in ToIP this would be Layer 1 and 2 (Utility and Agent)
- The capacity of the ecosystem to absorb new members - openings created (new ecological niche) a new environment that has the potential for a new species to come in that is adapted to the new position.
- How do ecosystems change - in a natural environment (void of disturbance) ecosystems change very very slowly.
  - Different actors in ecosystems. The biological community can take a barren ecosystem (e.g. bare rock) and force it into a climax (beautiful) community.
  - Primary succession from bare rock, with pioneer species that first appear, then intermediate species, and then onto climax community.
  - First species are highly tolerant to harsh environments and are the first colonizers, dispersed by natural processes, start to form a substrate from the rock that other things can grow on. Then plants can start to come in, with more carbon in tissues and the carbon gets added to the soil substrate and create a topsoil that becomes even more inviting for other organisms.
  - Increasing diversity
  - Even at a climax there is still change (e.g. a big tree dies and there is space for a colonizer).
- Secondary succession - the way a climax community can change is small things like a tree falls in the forest, or also a disturbance like a fire or other huge event that upsets the equilibrium of the ecosystem.
  - Again we move through pioneer species, intermediate species, climax community, you probably get the same thing back again without some other major disturbance because the inputs would be the same. The geographic area, sunlight, precipitation, etc are the same.
  - How do you force the processes in a different way - you need to change the inputs.
- How would you change things so that it doesn't all keep going back to the way it was before. The evolution to the new/next climax community? The way to not end up at the same place each time?
  - How things change - new technologies that weren't available before.
  - New regulation that presents barriers to returning to the original way of things.
  - Who are the predators?
  - The evolution to the new/next climax community? The way to not end up at the same place each time? - how would you change the inputs? The physical components of the ecosystem?
  - Evolution/speciation is not a major driver of ecological change because the time scales are so huge. Typically would have invasion from external.
  - Do digital ecosystems have an accelerated rate of change compared to natural ecosystems?
- Climax community
  - End point of succession. Will persist until disturbance occurs
  - Disturbances create opportunities for new species to occupy the space
  - Disturbance can be necessary to maintain a certain ecosystem types - like for example grasslands. Some ecosystems need disturbances to maintain biological community.
- How do we stop a single organism for taking over the the ecosystem?
  - Disturbance e.g. predation clears the space and prevents a single one from taking over.
  - Original thought was that predation would decrease the number of species, decrease diversity, but it increases because they create ecological niches.
- Quantification of ecosystems
  - Typically more species means more individuals doing different roles
  - Alpha = richness and abundance (spread of species)
  - Beta diversity -= change in diversity between environments
  - Functional redundancy as species do the same job
  - An ecosystem with keystone species will have less resilience because it depends so much on keystone species.
  - Species richness = # of species in a specific area or ecosystem
  - Diversity
  - Higher diversity is desirable
  - The function is not the same as a service e.g. nutrient cycling, the service would be food and timber. Services and functionalities are different.
  - Keystone species - a species that has a disproportionate large effect. Integral to the ecosystem.
- Ecological selection tends to select for the few and not the many
- Dispersal - the main way to move species into a new ecosystem.
  - Barriers exist to prevent the species from moving

## Task Force Updates

**Admin Reminder** : remember to re-subscribe to new meeting calendar

If you want your name on the invite, reach out to [Elisa Trevino](#) (on slack), she will put your name in the calendar invite to make sure that the invite is sent out each time.

\*\*\* Next presentation \*\*\* Autumn Watkinson: "Biological ecosystems - what can we apply to ToIP ecosystems"