# Week 14 Lecture 2

Jared Brannan

December 10, 2021

## 1 Administrative drivel

- Final paper submission grades are on canvas
- Clicker points should be up tomorrow

## 2 Climate Change

- Most of the warming happens over land and at high latitude
  - This results in the north pole melting
  - Frozen water reflects more radiation back into space than liquid water
  - Melting increases the ocean volume – sea level rise
    - only from land ice melting, since ice in the water already displaces how much it would if it were liquid
  - Greenland has a lot of ice that's like 2 miles thick, and if it melts it will rise sea level by 6 feet – that's a lot
- The goal is too keep the temp bellow a 2.5 decrees C change from norm
- Glaciers not on the poles are also melting
  - most of the water that was in the glaciers ends up in the ocean (evenually)
  - e.g. kilimanjaro has lost most of its ice over the last 100 years
  - Ice and snow contributes a lot to economy (skiing seasons are getting shorter)
  - Rivers that are fed by snow and ice are losing volume, leading to water shortages
    - e.g. colorado river feeds arizona, california, etc.
    - If it rains instead of snows on the mountain in the winter, the summer melts won't be as big
- The sea level is rising 1.5-2.2 cm per decade (about an inch
  - this rate is accelerating
  - this will lead to people getting displaced
    - e.g. venice, london
    - There are entire countries where all people live at 6ft above sea level
- not only does increased temperatures melt land ice
  - warmer water occupies more volume than cool water – this increases sea levels as well
- The entire coast of florida will flood with a 1 meter sea level rie
  - further, huricane damage will be greater

- first world countries can deal with these problems (mostly) – 2nd and 3rd really cant
- most people live within 100 miles of a coast – humans like living near water
- Changes in precipitatoin due to increasing temps
  - Rainfall is increasing in some areas!
  - This can lead to flooding, mudslidess, etc
    - Elivated soil temps will make them drier, even though there is more rain, so crop raising will be harder
  - Storms will be bigger – Hurricanes and Typhons
    - More energy in the atmosphere leads too higher winds
- Species' Rnages
  - Climate change changes where species can survive
  - Butterflies and moths on the west coast are making mass migration out of their usual areas
  - This also applies to crop plants, farm animals, and other species that we are dependent on
  - e.g. sugar maple trees are having to be grown futher north with temp increase
    - This migration may require an assist
  - many species wont adjust fast enough, and will go extinct
    - e.g. polar bears and walruses are dependent on the water ice, so they will likely go extinct
- Desertification – iappropriate land use
  - compounded by
    - Overgrazing
    - poor aggriculture practices
  - increased temperature will reduce soil moisture retention
  - higher temps alone will reduce crop yeilds even if desertification isn't a problem, locally
- Human land use + climate change has massive ecological impact
  - Greater than their solo controbutions
  - There are interactoins (statistical sense), impact is more than an addition of two independent effects
  - Hbitat loss has been extensive – especially conversoin to agriculture and urban/suburban landscapes, especially near water
  - we're losing a lot of land area that could be used for agg to suburban sprawl
- These problems can be reversed:
  - IPCC – guidance on Climate change (replace most fossil fuels, change agg practices, change how we build and maintain structures, etc.)
  - BUT **TIME IS CRITICAL** – we need to act within the next decade or two to prevent irreversible damage
- Political statement from prof – the last 4 years where a real shit show as far as adressing climate change
- Nuclear is only a temp solution – if we switched to 100% nuclear we'd only have about 45 years of fuel
- There are many deniers, and people who are worried about the cost, but we won't damage the enviornment/society by fixing these things. The worst that will occur is some people won't be as wealthy

# 3 Biodiversity decline – the 6th mass extinction

- This is as big of a problem as climate change
  - There's a complex network of species dependencies, and if this network is changed too much, the castcade could be catistrophic
  - this includes humans
- The evidence is becoming grim
  - Fisheries in the Asia-Pacific will have no fish in the oceans by 2048...
  - More than half of the world's fisheries are harvestedd at or beyond capacity
  - We tend to harvest a desirable species until it declines or crashes
- This is a case of the "Tragedy of the Commons" – free resources tend to get over exploited by humans to outcompete each other
  - E.g.s
    - Pllution of air and water
    - depletion of auqifers
- HIPPO – categories of species decline ( in order of effect)
  - Habitat loss
    - Almost everywhere
    - bigest driver of drop in biodiversity
    - deforestization, ag, suburban
  - Invasive species
    - Compete with native species
    - invasive species tend to escape predators, so they outcompete native
  - Pollution
    - many forms
    - garbage in the ociean
  - Population – human (over population)
    - Growing rapidly
    - acceleration with little sign of slowing down...
    - 60 years ago we were at 3 billion people...
    - we have surpassed the sustainable number...
    - birth rates are coming down, but not fast enough...
  - Over harvesting
    - Cut too many trees, kil to many terestrial animals, ooverfish
- we are at 1k to 10k species lost per year
- Solution – spcecies area curve
  - function of the number of species and land available
  - Setting asside Half of all land and water area will save 85% of species
  - needs to be addressed at a governmental and individual level
    - individuals can set aside some of their land to run wild