Ecosystem services of the beaver

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Pictures: Sari Holopainen, Petri Nummi, Antti Nykänen, Stella Thompson, Mia Vehkaoja
The beaver (*Castor spp.*)

- Ecosystem engineer
- Versatility
- Scale-dependence
- Population ca. 30 million
- ca. 25 million ha
Flood and drought mitigation

- Increase water retention time
- Increase flowage during dry periods
- Increase groundwater storage capacity, water table level, and aquifer recharge

→ extensive economic gain

Buckley et al. 2011
Biogeochemistry

• Both sink and source dynamics of GHGs → difficult to asses net effects
• DOC levels increase
• Emissions (esp. CH$_4$)
• Sequestration:
  28.7–35 Mg C yr$^{-1}$ (active dams)
  1150–1400 Mg C/ha (meadows)
• Wetlands/ponds function as depositories

Vehkaoja et al. 2015
Soil quality and nutrients

• Increased sedimentation and nutrient retention (2000-65000 m³ sediment retention = 15-487 billion m³ in total)
• Increased overbank flooding
• 18, 21, and 32% reductions in total nitrogen, total phosphorus, and dissolved silicate levels
Water purification and filtration

- Heavy metals, disease-causing agents
- Shallow water and increased evapotranspiration
  - Increased water quality
  - Decreased costs for wastewater treatment
  - Annually purify 20 billion m³ of water
Habitat and biodiversity provisioning

- New habitats (since 2000: ca. 1-4 million ha, value of 409 billion USD)
- Facilitation of several species/groups

![Bar chart showing abundance of Anura species](Vehkaoja & Nummi 2015)

![Box plots showing amount of deadwood](Thompson et al. 2016)
Recreational values

• Mental and physical well-being
  ➔ Improved hunting and fishing opportunities
  ➔ Opportunities for wildlife viewing, nature tourism etc. (e.g. ~3 million USD (Scotland))
Other ecosystem services

• Invasive species control
• Extractable raw materials
• Cultural = historical
Future implications

• Rapid population increase
• Mitigation of negative effects (GHG dynamics, flood and drought, habitat loss)
• Future as a recognized provider of ES and/or a method for wetland conservation and restoration
Conclusions

• Highly versatile species
• Possibilities vs. problems (scale-dependent)
• Efficient management and mitigation required

→ Careful planning = population growth combined with societal utilization of ES and successful wetland conservation
Thank you!

The bank downstream is flooding!

Well... Dam it!