Dam it!

Why build a dam?—the goal of a dam is to store water. The water can then be released when it is most beneficial. Thus, dams change the *flow regime* of a river. Dams are thus a way to combat global water shortages.

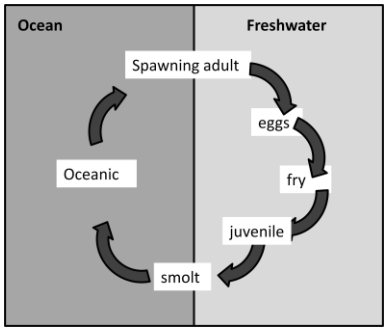
- Water—dams increase the ability of people to utilize run-off.
  - Agriculture
  - Human consumption
- Recreation
- Mine waste retention
- Hydropower—dams are a source of energy that doesn't directly lead to greenhouse gases. Thus, they are often labeled as clean energy.
- Flood control

What are consequences of dam?

- Creation—creates a reservoir upstream (changes stream to lake)
  - Increased surface area-> increased evaporation
  - Floods terrestrial areas
    - Displace people
      - E.g., three gorges dam in China displaced ~1 million people
    - Displace animals
    - Flood plants, leading to decomposition -> high carbon input to atmosphere
      - *In some cases, this production of atmospheric carbon can exceed that of the equivalent oil plant.*
  - Big dams can trigger earthquakes through increased weight on tectonic plates
    - *Reservoir-induced seismicity (RIS)*
    - E.g., 7.9 earthquake in Sichuan 2008, killed 80,000 people, linked to Zipingpu dam.

- Fragmentation—isolates upstream and downstream habitats
  - Block migrations of mobile animals
    - Fish "ladders" can allow for some migration

Salmon life cycle



Dam it!

- Interception—dams prevent propagation of materials to downstream ecosystems
  - Water—dams change the downstream *flow regime*
    - *Flow regime*—magnitude and timing of river discharge
      - Riparian plants and aquatic organisms are adapted to the natural flow regime
  - Sediments—dams trap enormous quantities of sediment
    - Gradually fill up through time--the rate depends on:
      - sediment delivery
      - trap efficiency
    - Approximately 1% of reservoirs are filled with sediment each year (~50 km^3/year)
    - Altered downstream sediment dynamics—the downstream river is often "sediment hungry"
    - Coastal erosion—lack of replenishment of sand
    - Sediments often contain contaminants, posing problems for dam removal
  - Organic matter
  - Woody debris

- Status of dams
  - In United States—
    - Average dam is 40-50 years old
    - 80,000 dams >3m tall
    - Unknown number (but ~1million+) of smaller dams
  - In British Columbia
    - ~2000 dams
    - Have kept dams off the mainstems of biggest rivers (Skeena and Fraser Rivers)

Dam removal of Elwha River

- Two dams (built 1913 and 1927) that are 64 and 33 m tall
- Largest dams ever removed in the US
- Began removal this fall
- Open up ~77 miles of salmon spawning habitat
- Exposure of 14 million m3 of sediment -> what happens with that sediment?

Condit dam, another dam story with amazing footage

http://news.nationalgeographic.com/news/2011/10/111028-condit-dam-removal-video/