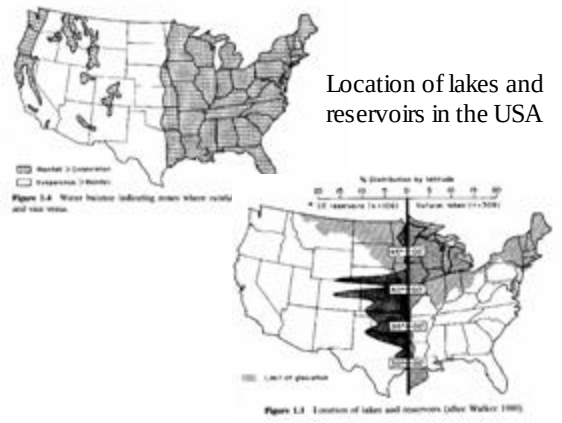
Why are Reservoirs constructed?

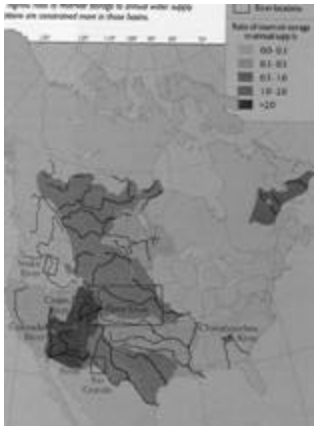
- "In the simplest sense, we build dams for the same reason we wear coats in the winter: to exert control over an aspect of an environment that would otherwise make living difficult or even impossible. If a valley is subject to destructive flooding, we dam its river. If the desert is dry, we build a lake."
- Many reasons to build a dam:
  - Water storage to quench municipal, agricultural, and industrial thirsts
  - Flood control and improved navigation
  - Sediment trapping
  - Water quality improvement
  - Electrical power generation
  - Recreation, aesthetic, and wildlife considerations

General Facts

- Most dams were build during the 1900's
- There are more than 75,000 dams in the US over 6 feet high
- 3% of land is covered by reservoirs
- Dam building in the US has slowed because few good sites remain
- Worldwide, there are over 36,500 dams over 15 meters high
- The environmental impacts of reservoir creation are large, but poorly understood
- Dams fragment rivers and streams, alter the environment, and impede migration
- BUT dams create reservoirs which can provide new aquatic habitats



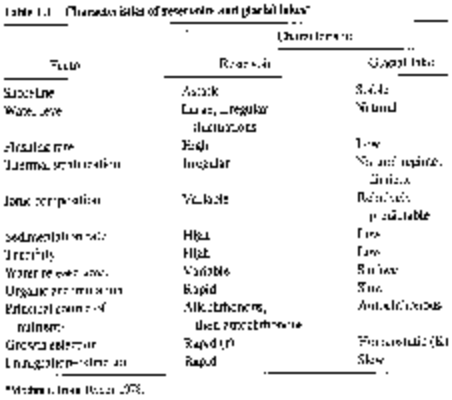
Location of lakes and reservoirs in the USA



Age of water

Ecology of Reservoirs: a hybrid of lentic and lotic systems

- Rivers and streams (lotic systems = freshwater habitat characterized by running water)
- Lakes (lentic systems = freshwater habitat characterized by calm or standing water)



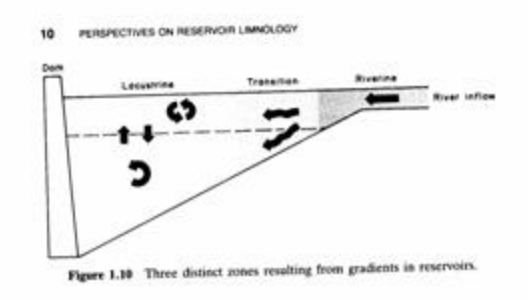


Figure 1.10 Three distinct zones resulting from gradients in reservoirs.

Riverine Zone

- Narrow, channelized basin
- Relatively high flow velocity
- Productivity limited by light
- Relatively high nutrients
- Organic matter supply primarily allochthonous
- Nutrient supply by advection (movement of materials via current)
- More Eutrophic

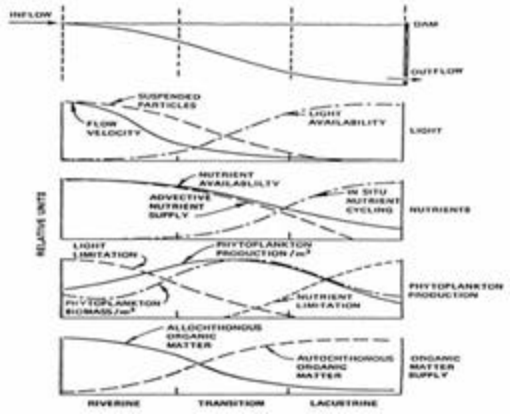
Lacustrine Zone

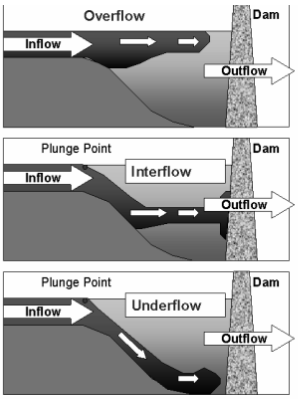
- Broad, deep lake-like basin
- Little flow velocity (flow spread over a larger area)
- Relatively clear water (low suspended solids)
- Productivity limited by nutrients
- Light more available
- Nutrient supply by internal recycling
- Organic matter supply primarily autochthonous
- More Oligotrophic (nutrient limited)

Transitional Zone

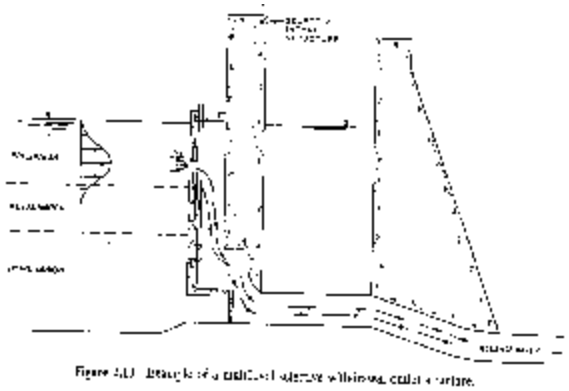
(in between riverine and lacustrine zones)

- Broader, deeper basin
- Reduced flow
- Sediment sinks to bottom
- Advective nutrient supply reduced
- Intermediate amount of allochthonous input
- Intermediate nutrient availability
- High primary productivity, b/c of good light and nutrient environments

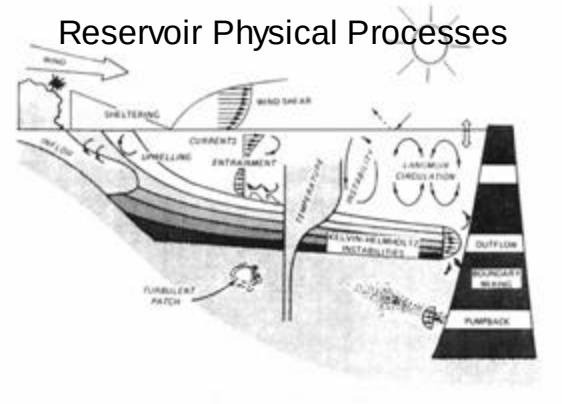




Types of density flows in reservoirs



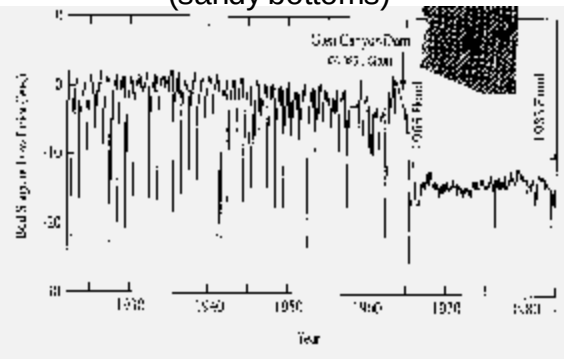
Reservoir Physical Processes



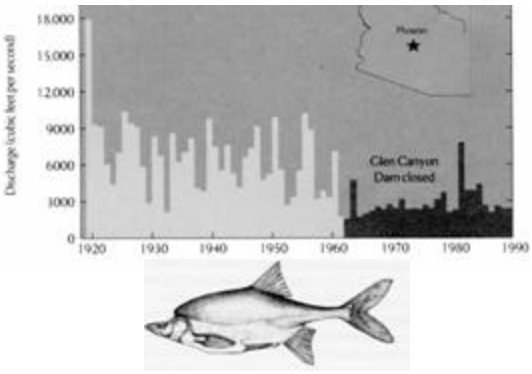
Platte River

- Video information (South Platte)
- North Platte, NE: 18,000 cfs to 2,500 cfs after dams built. Spring floods were removed.
  - w/o spring floods, plants colonize sand bars
  - Saw this on field trip
  - Plants trap sediment, resulting in aggradation
- Sandhill Cranes require islands separated by 500 ft of channel
- In 1866, 4-6.5 thousand feet wide channels
- By 1965, channels just 10-20% of their original width

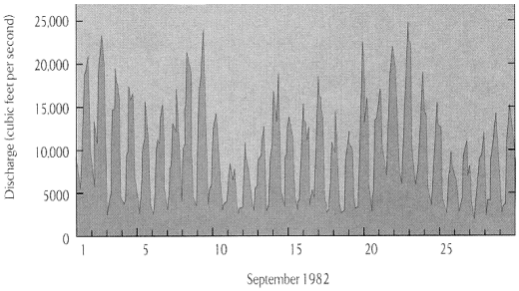
Effect of altered flow on bed stage (sandy bottoms)



Colorado River Annual Discharge



Colorado River Hourly Discharge



Damn Dams!

- The river emerging from a dam is not the same river that entered its reservoir.
- The new river may be hotter or colder.
- Its daily discharge may vary wildly, while its seasonal pattern of high spring floods and low winter flow may be inhibited (Altered hydroperiod).
- The clear waters of a river below a dam, suddenly starved of its sediment load, may scour its bed and banks.
- The new river may not experience natural floods and dry periods.
- Riparian vegetation can either be enhanced or degraded by dam operations (water discharge).

Negative Impacts on Wildlife

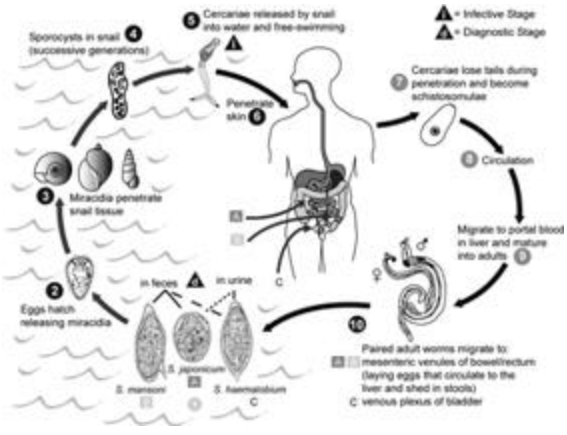
- Native fishes may die or be severely stressed in downstream regions.
- Many mammals are trapped and drowned during the filling of large new reservoirs.
- Many nests are destroyed when a reservoir is filled during the nesting season and the amount of suitable habitat for some species is permanently reduced.
- The impoundment often leads to changes in the kinds and numbers of fish parasites affecting those fish remaining in the reservoir.
- Many fish species spawn in nests in the shallow water near the shore, and these may be laid bare when the water level drops so that the eggs or young perish.

Reservoirs Are Not All Bad!

- There are some positive environmental (in addition to societal) aspects associated with the creation of reservoirs
  - Increasing numbers of people enjoy whitewater recreation; many classic whitewater boating trips are downstream from dams.
  - Some trout fisheries thrive in the tailwaters of dams.
  - Many regulated rivers flow through wild and inspirational landscapes allowing people to enjoy them.
  - Reservoirs provide significant new aquatic habitat in areas that might otherwise be dry attracting many migratory birds as well as other “watchable” wildlife

Schistosomiasis

- Also called the disease of hydroelectric projects in tropical areas.
- Schistosomiasis, also known as bilharzia (bill-HAR-zi-a), is a disease caused by parasitic worms. Infection with Schistosoma mansoni, S. haematobium, and S. japonicum causes illness in humans. Although schistosomiasis is not found in the United States, 200 million people are infected worldwide.



- How does one get schistosomiasis?
  - Infection occurs when your skin comes in contact with contaminated fresh water in which certain types of snails that carry schistosomes are living.
  - Fresh water becomes contaminated by Schistosoma eggs when infected people urinate or defecate in the water. The eggs hatch, and if certain types of snails are present in the water, the parasites grow and develop inside the snails. The parasite leaves the snail and enters the water where it can survive for about 48 hours. Schistosoma parasites can penetrate the skin of persons who are wading, swimming, bathing, or washing in contaminated water. Within several weeks, worms grow inside the blood vessels of the body and produce eggs. Some of these eggs travel to the bladder or intestines and are passed into the urine or stool.