friday, november 21

1. 5cr: olympic f/t write-ups due today
2. 1st warning:
   final exam 2 wks from Monday (dec. 8) 2:30p HERE
   we will have a review session on 12/5, the last day of class

the next few days:

1. today: wrapup of human impacts on rivers
2. mon: river, beach & oceanic deposits
3. wed: resources associated with deposits
human impacts on rivers

dams/levees

artificial channelization

a review of LWD
Human Impacts to Rivers

Sediment

Water

Wood

Confinement

Valley slope

Channel morphology

Bank material

Flow obstructions

Riparian vegetation
dams

More than 80,000 dams affect > 90% of the nation's 5.8 million km of rivers.
dams

construction leveled off in 1980s

nearly 900 million acre feet of storage

storage/runoff ratio:
dams

timing of dam construction varied regionally, but was fastest between 1940 and 1980.
colorado r.
a tour...
hoover dam
hoover dam

1931 - 1936
4.36 million $yd^3$ concrete
  2 lanes between SF & NY
  water cooled & still setting today

Lake Mead:
  28,537,000 acre feet

power:
  ~25 % nevada
  ~19 % arizona
  ~56% southern california
hoover dam
lake mead water levels
July 14, 1999
Reservoirs often trap 40% to >80% of the sediment carried by large rivers reduces sediment delivered to coastal environments despite increased soil erosion in upland environments.
agriculture & forestry increased annual sediment delivery to rivers by 2.3 billion tons, from about 6.5 billion tons to almost 9 billion tons
Dams decrease annual sediment delivery to oceans by 1.4 billion tons, from about 6.5 billion tons to about 5 billion tons.
Less sediment reaches the coast in Asia and parts of the Americas due to dam construction. More sediment reaches oceans where dams are less common.
human impacts on rivers

dams/levees

artificial channelization

a review of LWD
Los Angeles River at Vernon

Los Angeles River at Canoga Ave.
sedimentation patterns

artificial channelization -> increased bed sedimentation
Port of Seattle
circa 1870

Lower Duwamish River
and estuary

rtem: riverine tidal emergent
rtss: riverine tidal scrub shrub
rtfo: riverine tidal forested
Lower Duwamish River today
human impacts on rivers
dams/levees
artificial channelization
a review of LWD
Few of the worlds forests retain “frontier” conditions
Log jams were significant obstacles to navigation and land development in the western U.S.
Thousands of snags were removed from Puget Sound rivers between 1880 and the mid-20th Century.
LWD can control the formation of pools and bars, and thereby channel reach morphology.
The “key member” logs that anchor log jams tend to have a diameter $\geq$ half the channel depth and a length $\geq$ half the channel width.
mississippi/atchafalaya/red rivers mess

a case of LWD removal

henry shreve →
old river history

15th century:
  turnbull’s bend captured the red river as a tributary → Atchafalaya becomes distributary

by 1778:
  Atchafalaya blocked by 30mile log jam

1831:
  shreve shortens navigation time by cutting off meander

1839-1840:
  Atchafalaya log jam removed to provide alternate route to ocean

1950:
  30% of Miss flow captured by Atchafalaya
old river history

1963:

1st version ‘old river’ control structures completed
old river history

1973:
‘lower sill’ structure undermined by major flood.

1985-1986:
auxiliary control structures added
and the levees:
subsidence:

Subsidence Rates (ft/century)
- Stable
- Stable/Low
- Low 0 - 1'
- Low/Intermediate 0 - 2'
- Intermediate 1.1' - 2'
- High 2.1' - 3.5'
- Very High >3.5'
Mississippi Basin Trends
1956 - 78 loss rate = 4.8 Sq Mi/Yr
1978 - 90 loss rate = 1.3 Sq Mi/Yr

Legend:
- Orange: 1956 - 78 Loss
- Yellow: 1956 - 78 Gain
- Green: 1978 - 90 Gain
- Red: 1978 - 90 Loss

NWRC Open File Report 94-01
Atchafalaya Basin Trends
1956 - 78 loss rate = 0.1 Sq Mi/Yr
1978 - 90 loss rate = 0.1 Sq Mi/Yr

Legend
- Orange: 1956 - 78 Loss
- Yellow: 1956 - 78 Gain
- Red: 1978 - 90 Loss
- Green: 1978 - 90 Gain

NWRC Open File Report 94-01
caernarvon

Breton Sound Basin Trends
1956 - 78 loss rate = 2.6 Sq Mi/Yr
1978 - 90 loss rate = 1.9 Sq Mi/Yr

Legend
- 1956 - 78 Loss
- 1956 - 78 Gain
- 1978 - 90 Loss
- 1978 - 90 Gain

NWRC Open File Report 94-01
caernarvon

goals:
  enhance veg. growth
  reduce marsh loss
  increase productivity
Caernarvon Freshwater Diversion
caernarvon

it’s working, but...
projected land loss/gain by 2050