Oceanography of Puget Sound

Future of Puget Sound

Puget Sound Issues

- Puget Sound Partnership
  - $52 million to assess, restore and protect Puget Sound
  - Restoration plan estimated to cost $8 billion through 2020

- Action Agenda
  - Priority A: Protect the intact ecosystem processes, structures, and functions that sustain Puget Sound
  - Priority B: Restore the ecosystem processes, structures, and functions that sustain Puget Sound
  - Priority C: Prevent water pollution at its source.
  - Priority D: Work together as a coordinated system to ensure that activities and funding are
  focused on the most urgent and important problems
  - Priority E: Build an implementation, monitoring, and accountability management system
    - performance management system with adaptive management
    - sufficient, stable funding focused on priority actions
    - focused scientific program with priorities for research
    - coordinated efforts for communication, outreach, and education

How will funds be allocated in near term?

- Cleaning up contaminated sites and sediments ($57,205,000)
- Preventing toxic contamination ($19,430,475)
- Preventing harm from stormwater runoff ($29,759,300)
- Preventing nutrient and pathogen pollution ($76,831,744)
- Protecting functioning marine and freshwater habitats ($52,455,634)
- Restoring degraded marine and freshwater habitats ($54,427,000)
- Protecting species diversity ($4,970,000)
- Preparing for and adapt Puget Sound efforts to a changing climate ($124,000)

Water temperature changes

- 2 °F (1.1°C) increase in sea surface temperature near Victoria, B.C., mostly in last 3 decades (PSAT 2005)

Climate Impacts on Puget Sound

Rising sea level
Δ in stream flow
Δ in temperature

Over last 100 y, PNW has become warmer and wetter.
Average temperature has increased 1.5°F
Average precipitation has increased 3” (15%).
(Mote et al. 1999)

Climate projections

- By 2040
  - 3°F increase in temperature
  - 6% increase in precipitation
Predicted changes in fresh water flow

Spring freshet flow:
- Earlier
- Less water

Historical changes in PS wetlands

Effects of changes in land cover

Model simulations:
- Lowland urbanization results in greater flow during spring freshet, lower summer flow

Cuo et al. 2009
Hydrol. Process.

Precipitation variability projections

- Fewer, more severe storms
  - Impacts on circulation? Organisms?

Projected changes in sea level

Mid-range scenarios (from Snover et al. 2005)

Impacts of climate change on circulation and D.O. in Hood Canal

- Consequences:
  - Reduction in spring/summer runoff?
  - Increased stratification
  - Increased bottom-water residence time and reduced vertical mixing in summer?
  - How big a reduction?

Data from PSAT 2005
### Legacy of contamination

- With future reductions of contaminant emissions, sediments could become major source of contaminants to Puget Sound
- Contaminated sediments are isolated (e.g., Budd Inlet, Sinclair Inlet, Commencement Bay)
- What should we do with this legacy of past pollution?
- What controls the fate of buried contaminants?
Human population growth in Puget Sound region

• Consequences for:
  – Eutrophication
  – Shoreline alteration
  – Resource use (fish, shellfish)
  – Runoff

Key concerns for future

• Changes in circulation due to reduced winter snow fall
• Legacy of contaminated sediments and marine organisms (fish, shellfish, mammals)
• Watershed rivers altered by development
• Shoreline issues (increases in population size and sea level)
• Invasive species (e.g., green crab)
• Others?