Forms of Maine Pollution

- Toxins (e.g., biocides, PCBs, trace metals)
- Biostimulants (organic wastes, plant nutrients)
- Oil
- Radioactive isotopes
- Sediments (e.g., erosion, dredging)
- Plastics and other debris
- Thermal (e.g., cooling water from power plant)
- Noise
- Human pathogens
- Alien species

Source: Boesch, D.F., R.H. Burroughs, J.E. Baker, R.P. Mason, C. L. Rowe and R.L. Siefert. 2001. *Marine Pollution in the United States*. Pew Oceans Commission. Arlington, VA.

Sources of Marine Pollution

Point Sources

- Sewage treatment plants
- Industrial wastewater treatment plants
- Industrial facilities
- Ships

Non-point Sources

- Land runoff (agricultural land and urban)
- Atmospheric depositions

Trend (1970-2000)

Direct discharges of pollutants from point sources have been greatly reduced over the past 30 years as a result if the Clean Water Act and other federal statutes.

Pollution from land runoff went largely unabated during this period; in some cases it has increased.

Over enrichment of coastal ecosystems by nutrients, particularly nitrogen, has emerged as the most widespread and measurable effect of pollution on living marine resources and biodiversity in coastal waters.

Source: Boesch *et al.* 2001

Nutrients from Non-point Sources

1. Non-point source pollution is hard to control.

Sources:
- Use of chemical fertilizer
- Intensive animal agriculture
- Combustion of fossil fuel

2. Diffuse sources, often from far inland, may dominate nutrient inputs into overenriched marine ecosystems.

3. Need to manage an entire drainage basin.

4. Effective ocean policy must extend well beyond the ocean and coastal zone to influence agricultural, energy, transportation, water resources, and land-uses.

5. Science must play a key role in advancing marine ecosystem management that is integrated, precautionary, and adaptive.

Source: Boesch *et al.* 2001

Contaminated Sediments

While some of the most toxic substances (e.g., DDT, PCBs, and lead additives in gasoline) have been banned for manufacture and use, material previously released may remain in the environment for decades to centuries.

Contaminated sediments require careful consideration when removed by dredging or managed in place.

Source: Boesch *et al.* 2001

Vessel Oil Spills

- Descriptive Statistics

Summary report: Vessel Oil Spills in US Waters: Descriptive Statistics

- Pollution Liability: Clean Environment vs. Energy Supply

Jin, D. and H.L. Kite-Powell, 1999. "On the Optimal Environmental Liability Limit for Marine Oil Transport." *Transportation Research Part E: Logistics and Transportation Review* 35(2):77-100.

- Determinants of Spill Size

Talley, W.K., D. Jin and H.L. Kite-Powell, 2001. "Vessel Accident Oil Spillage: Post US OPA-90." *Transportation Research Part D: Transport and Environment* 6(6):405-415.

- Cost-effective Spill Prevention

Kite-Powell, H.L., D. Jin and S. Farrow, 1997. "Expected Safety Benefits of Electronic Charts and Integrated Navigation Systems." *Journal of Transport Economics and Policy* 31(2):147-162.