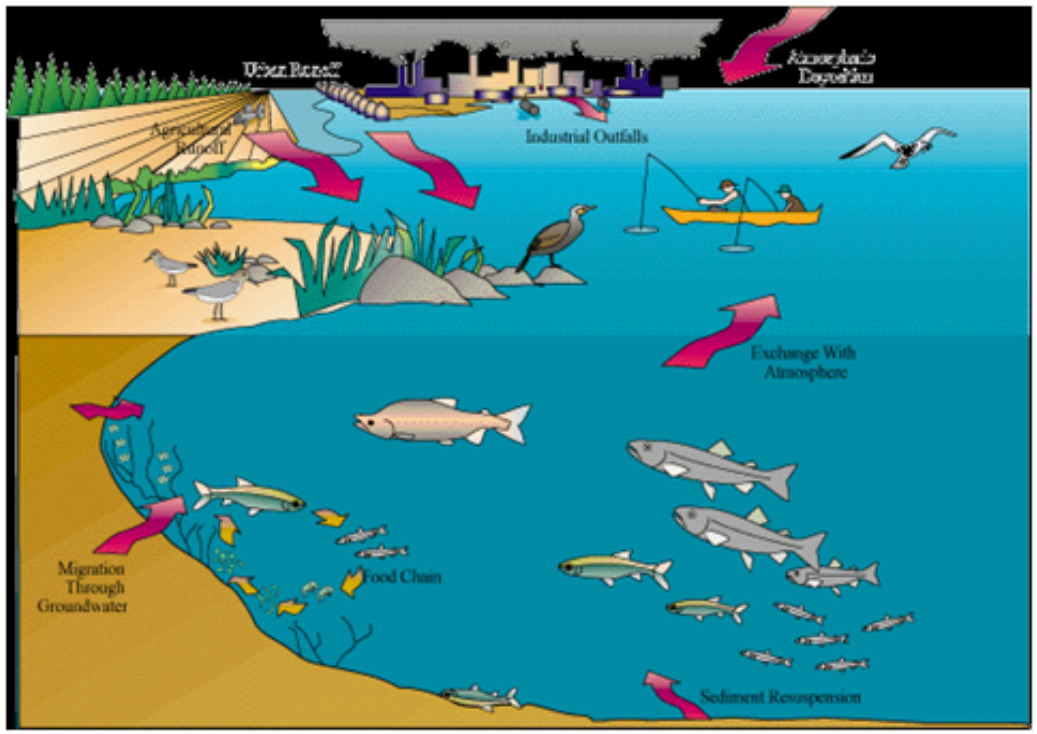
Uncertainty and Incentives for Nonpoint Pollution Control

K. Sergerson (1988)



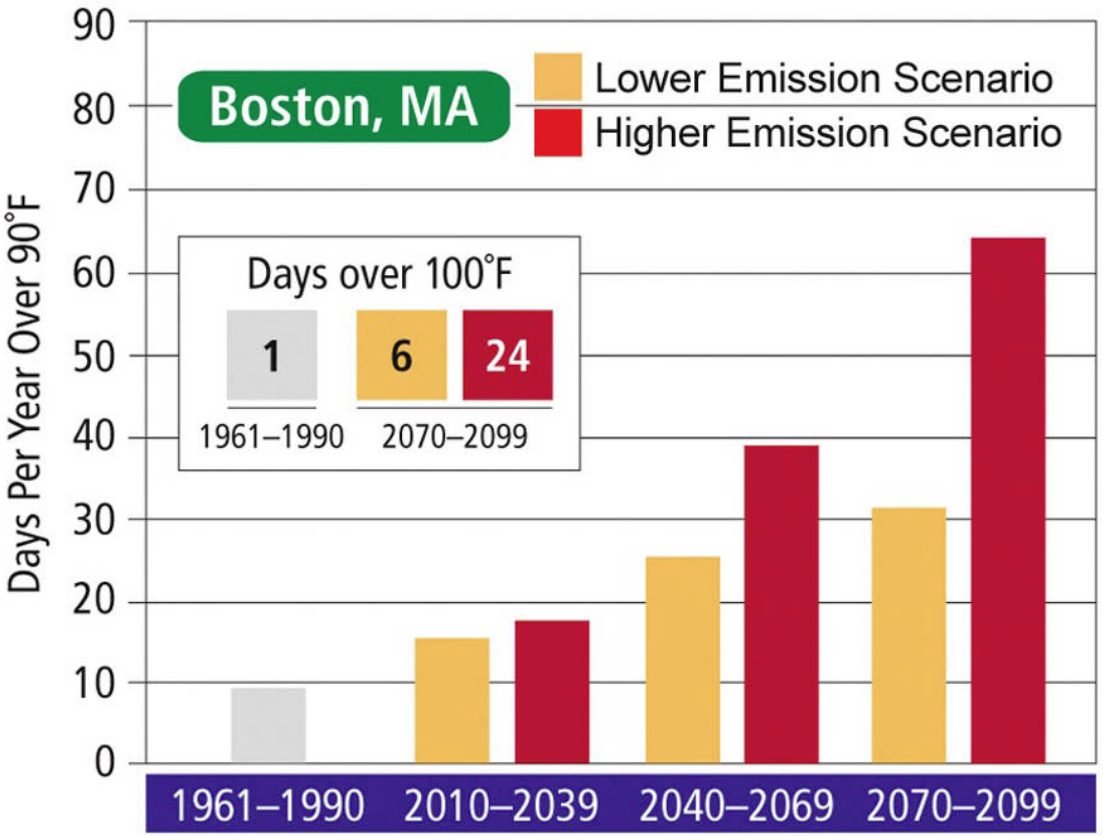
Main Points

Why the standard solutions in controlling point source problems are unworkable for Nonpoint Pollution?

1. *Stochastic Variables*
2. *Combine effects*
3. *Is Xapapadea's model considering NPP?*

Main Points

- Definition of Uncertainty....



Main Points

1. PDF: gives the probability that ambient pollutant levels of a given magnitude will occur at the specified time.
2. PDF depends on..
3. What is the objective of pollution control policies? "FOSD"

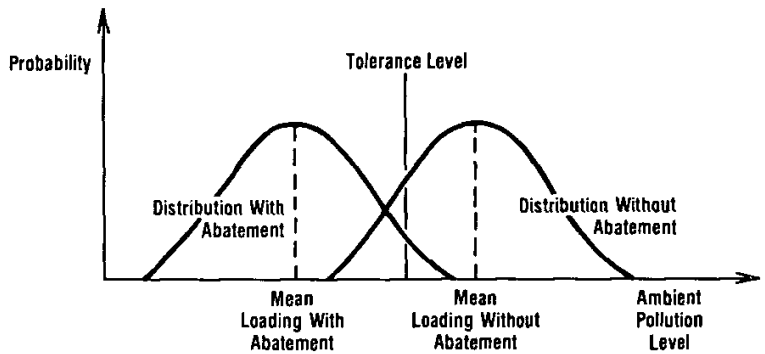


FIGURE 1

4. Stochastic relationship between discharge and ambient pollutant. Solution?

Single Polluter Problem

- x is the ambient level of a given pollutant
- $\bar{x}$ is the cutoff level
- x depends on abatement action and random variables
- $T(x)$ required payments
-

$$T(x) = \begin{cases} t(x - \bar{x}) + k & \text{if } x > \bar{x} \\ t(x - \bar{x}) & \text{if } x \leq \bar{x}. \end{cases}$$

- Liabilities of the polluter? Xapapadeas vs Segerson
  - influences outside his control

Single Polluter Problem

- How the polluter chooses his/her level of abatement
  - The polluter gambles on what his tax liability will be and weighs the additional abatement cost against the decrease in expected payments.
- Role of assimilative capacity
- ambient levels vs emissions (abatement)
  - Incentives for additional abatement since...

Single Polluter Problem - SHORT RUN

- a denotes the level of abatement
- $x(a, e)$ is the ambient pollution level, where e is a random variable, $\frac{\partial x}{\partial a} \leq 0$
- y output level, cost of producing y while abating to level a $C(y, a)$
- Social Planner (y^* and a^*):

$$py + E[B(x(0, e) - x(a, e))] - C(y, a),$$

- Firm ($\widehat{y}$ and $\hat{a}$):

$$py - C(y, a) - E(T(x(a, e))).$$

$$E[t(x(a, e))] = t \times E[x(a, e)] - t\overline{x} + k(1 - F(\overline{x}, a))$$

Single Polluter Problem - SHORT RUN

- (a) $k = 0$ and $t = E[B' \cdot x_a]/E[x_a]$,[11]
- (b) $t = 0$ and $k = -E[B' \cdot x_a]/F_a$,

or

- (c) t is arbitrary and $k = (-E[B' \cdot x_a] + tE[x_a])/F_a$,

Single Polluter Problem - LONG RUN

- N be the number of firms in the industry
- $p(Ny)$ inverse demand curve
- Long run efficiency conditions:

Single Polluter Problem - LONG RUN

- Long run equilibrium conditions of a competitive market:
- The infinite number of combinations of t, k and $\overline{x}$ that yield short run efficiency only one also yields long run efficiency.

Advantages and Disadvantages

- Minimum government interference
  - Free to choose the least cost pollution abatement techniques
- Flexibility
- Monitoring ambient pollutant levels
  - Monitoring of firm practices or metering of emissions.
  - Hot spots and crucial time periods
- Environmental quality (stochastic pollution)
  - Rather than emissions or erosion
- Disadvantages??