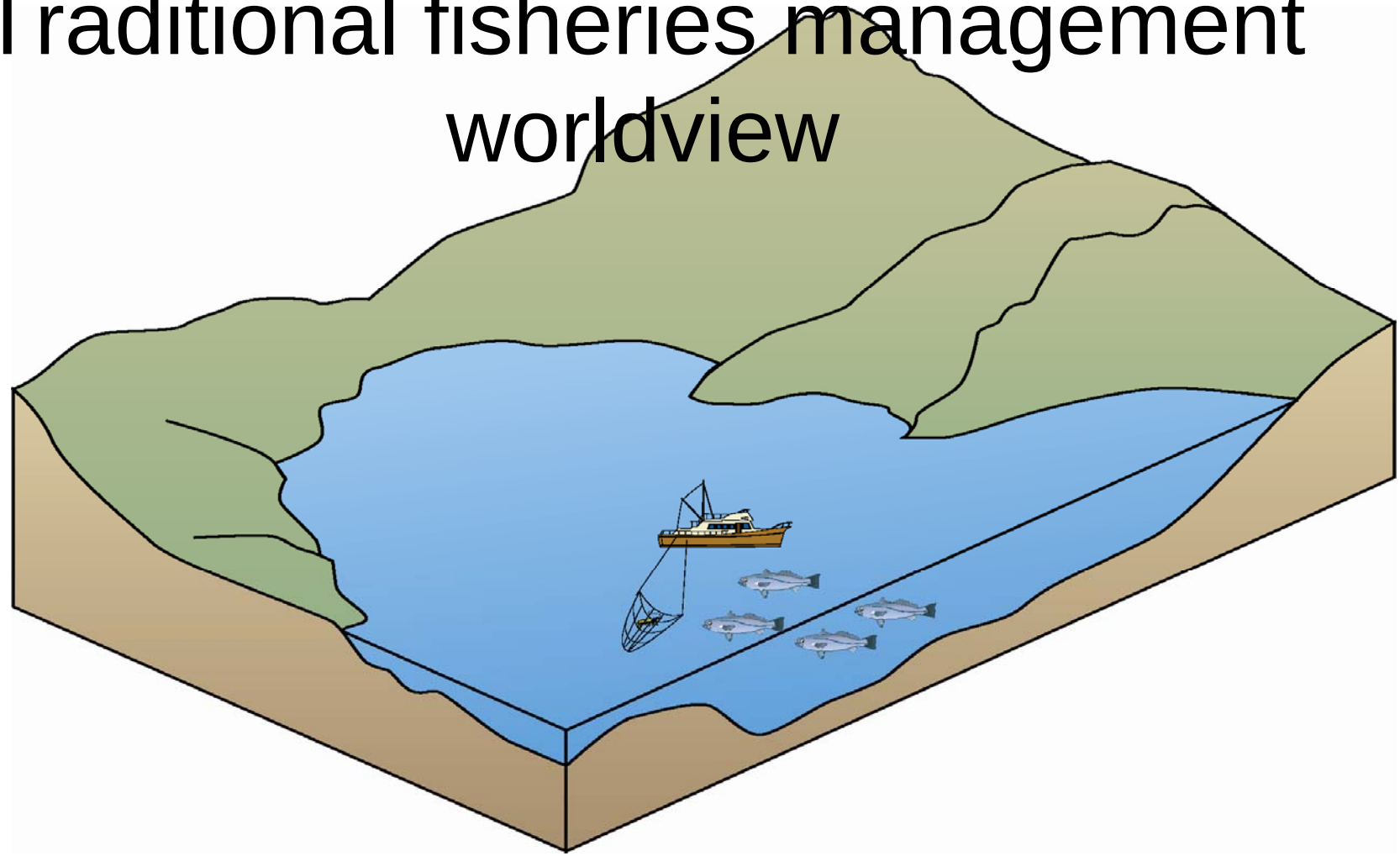
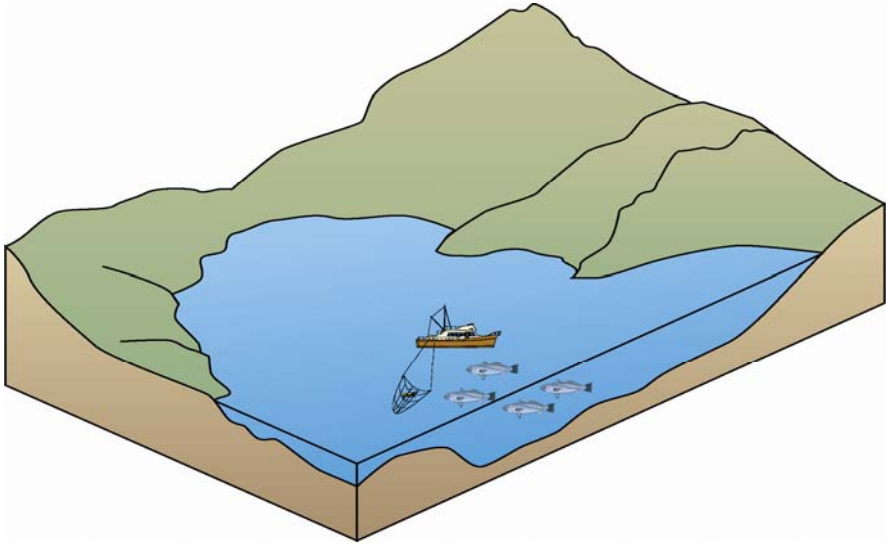
# Traditional fisheries management worldview



$$B_{t+1} = G + R - F - M$$

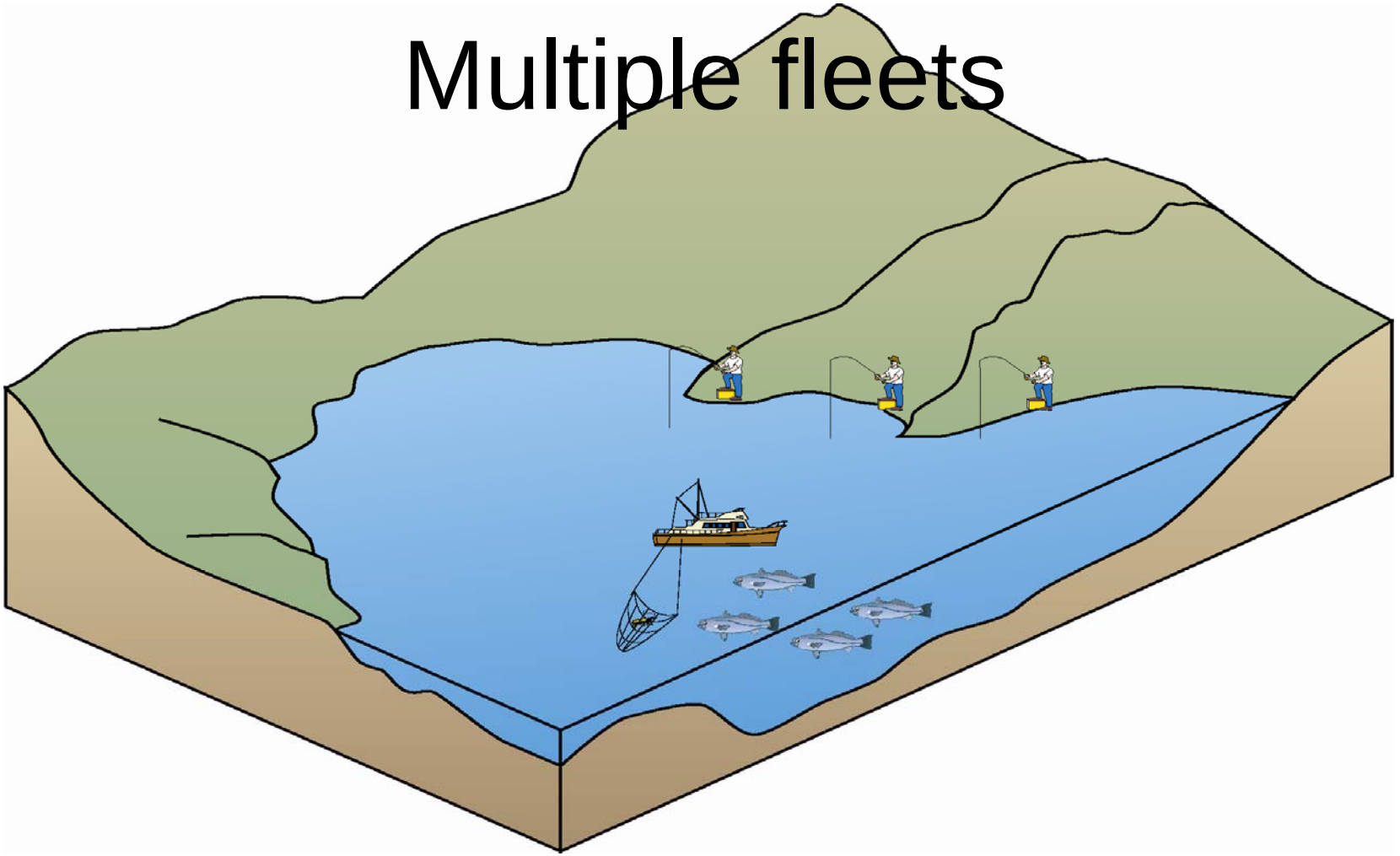
# Traditional approach to fisheries management



$$B_{t+1} = G + R - F - M$$

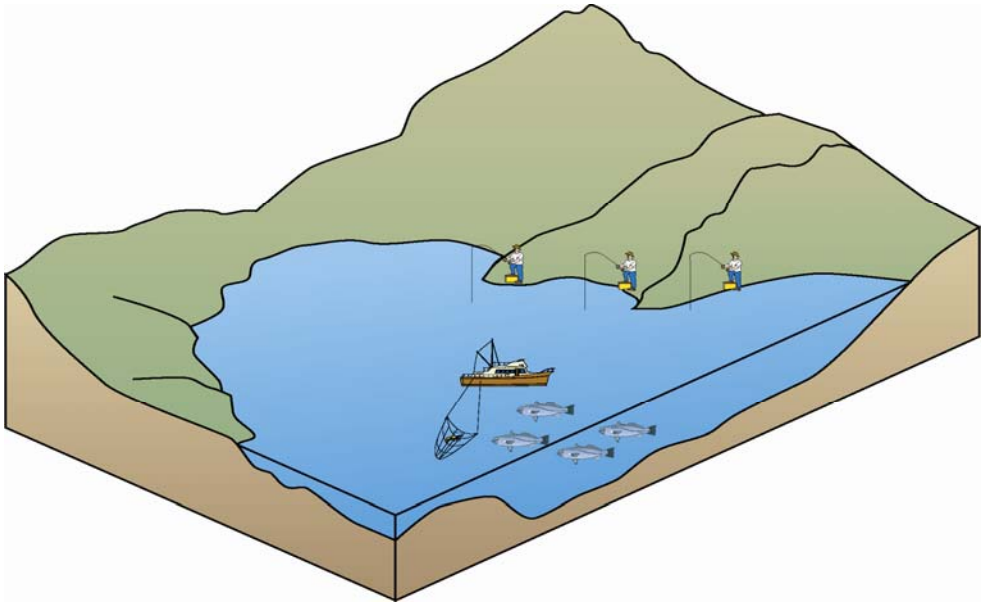
- Original US federal fisheries legislations focused purely on regulation of F to obtain optimum yield, under the assumption that all “surplus production” was really surplus
- Stakeholders limited to
  - Commercial fishery interests
  - Managers (protecting societal interest)

# Multiple fleets



$$B_{t+1} = G + R - \left(F_1 + F_2\right) - M$$

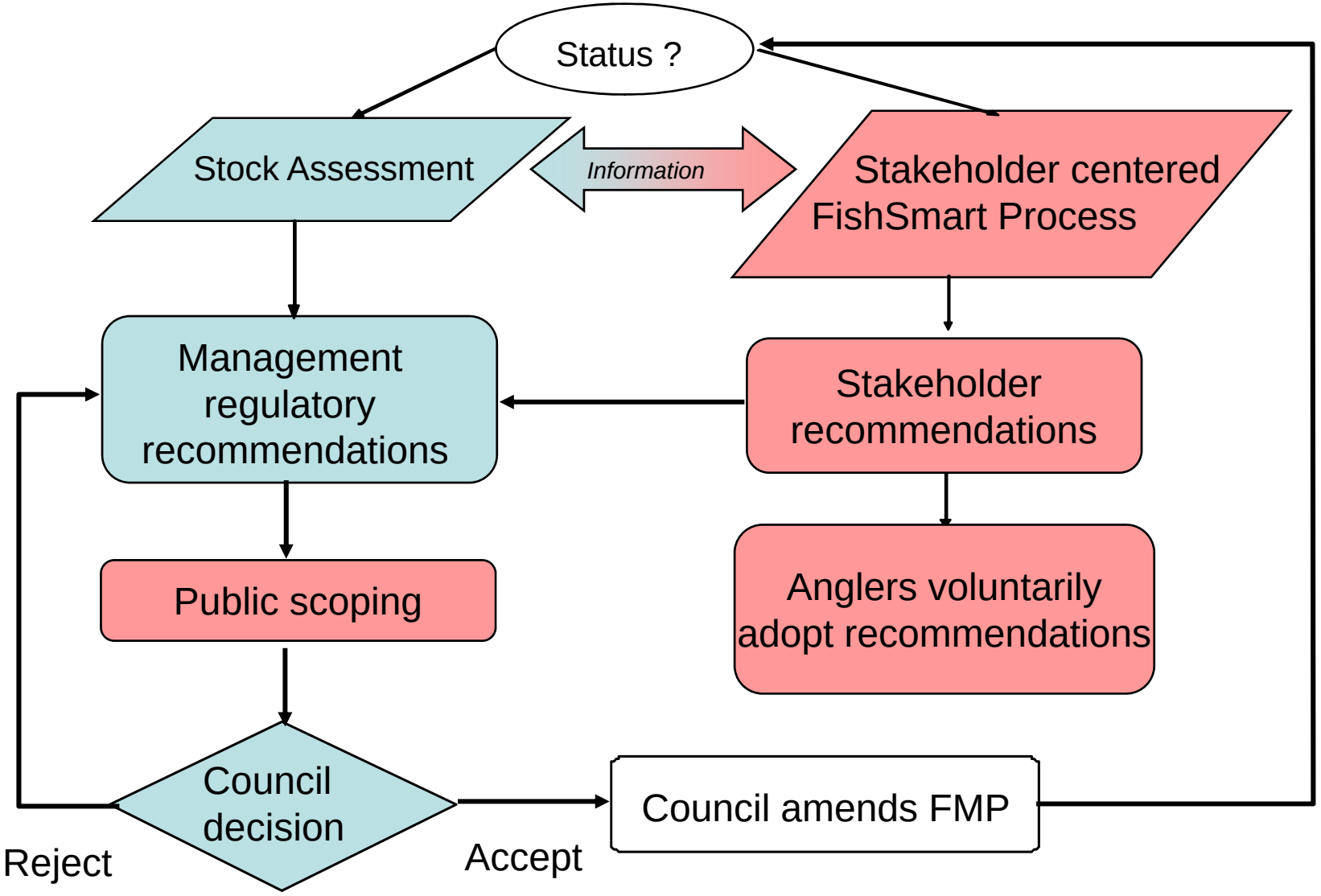
# Stakeholders with multiple fleets



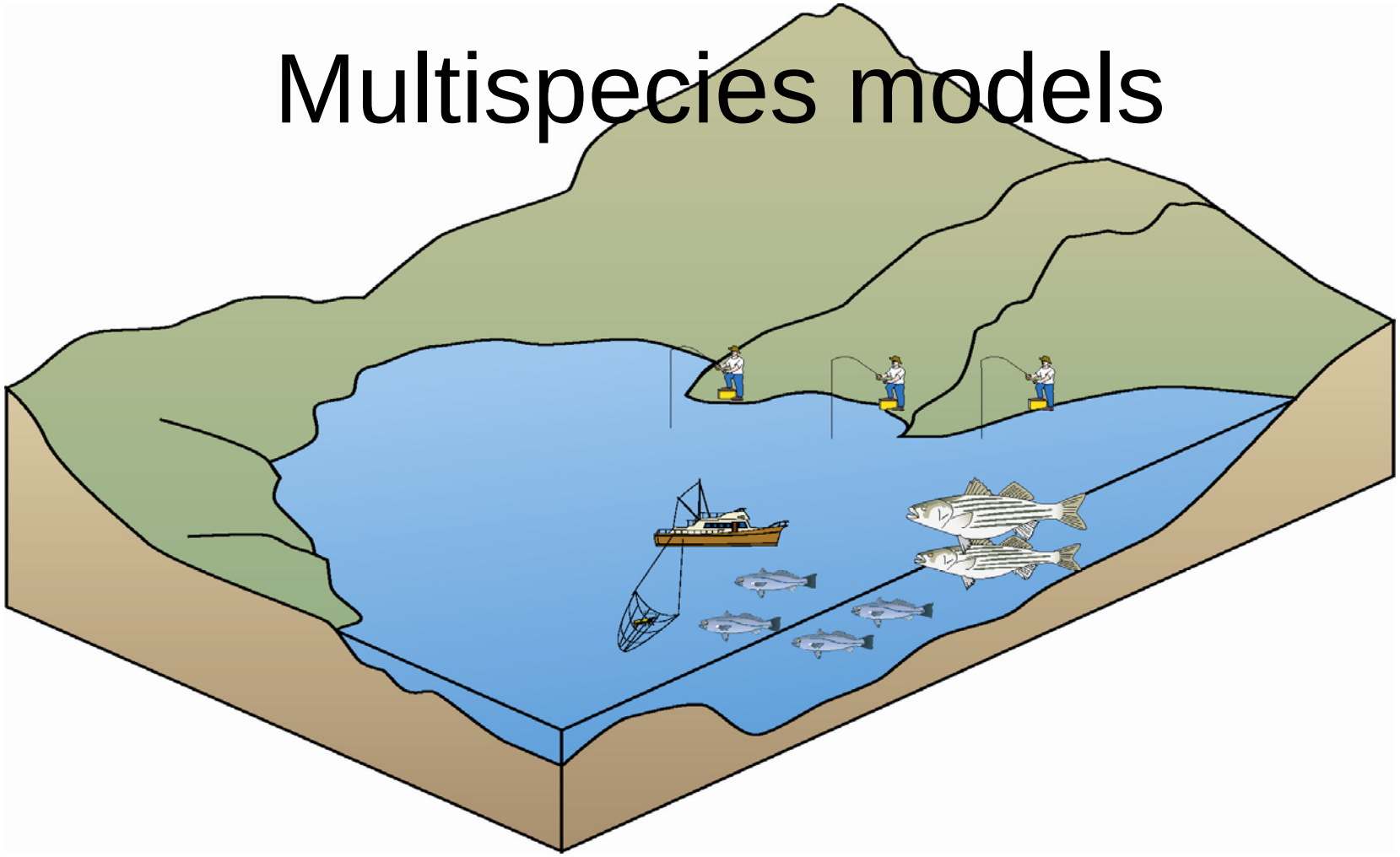
$$B_{t+1} = G + R - (F_1 + F_2) - M$$

- Management goals can become more complex – yield and allocation, but tools remain constant
- Stakeholders include
  - Commercial
  - Recreational
  - Managers (protecting societal interests)
  - Allied interests
    - Boat industry
    - Tackle industry

# Developing consensus with multiple stakeholders

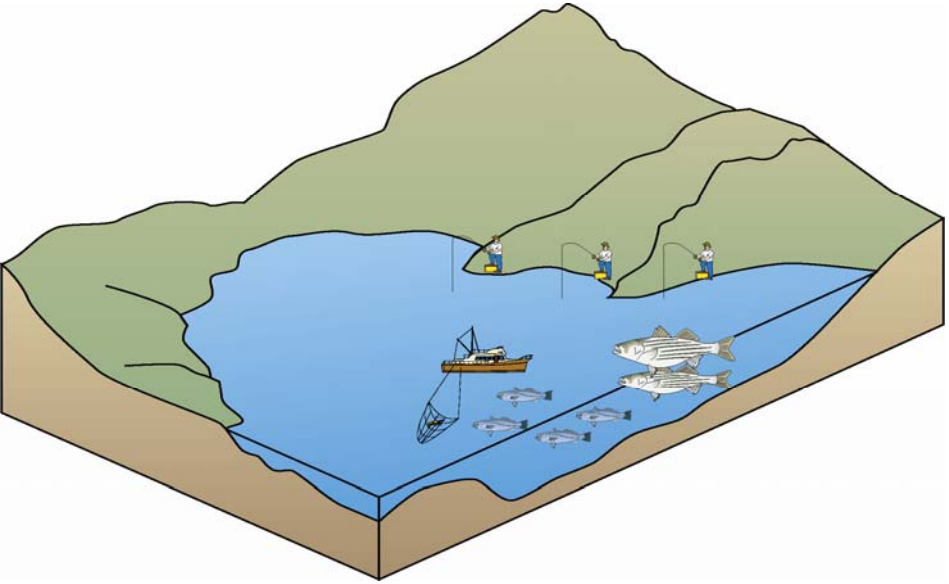


# Multispecies models



$$B_{t+1} = G + R - \left(F_1 + F_2\right) - \left(M + M_2\right)$$

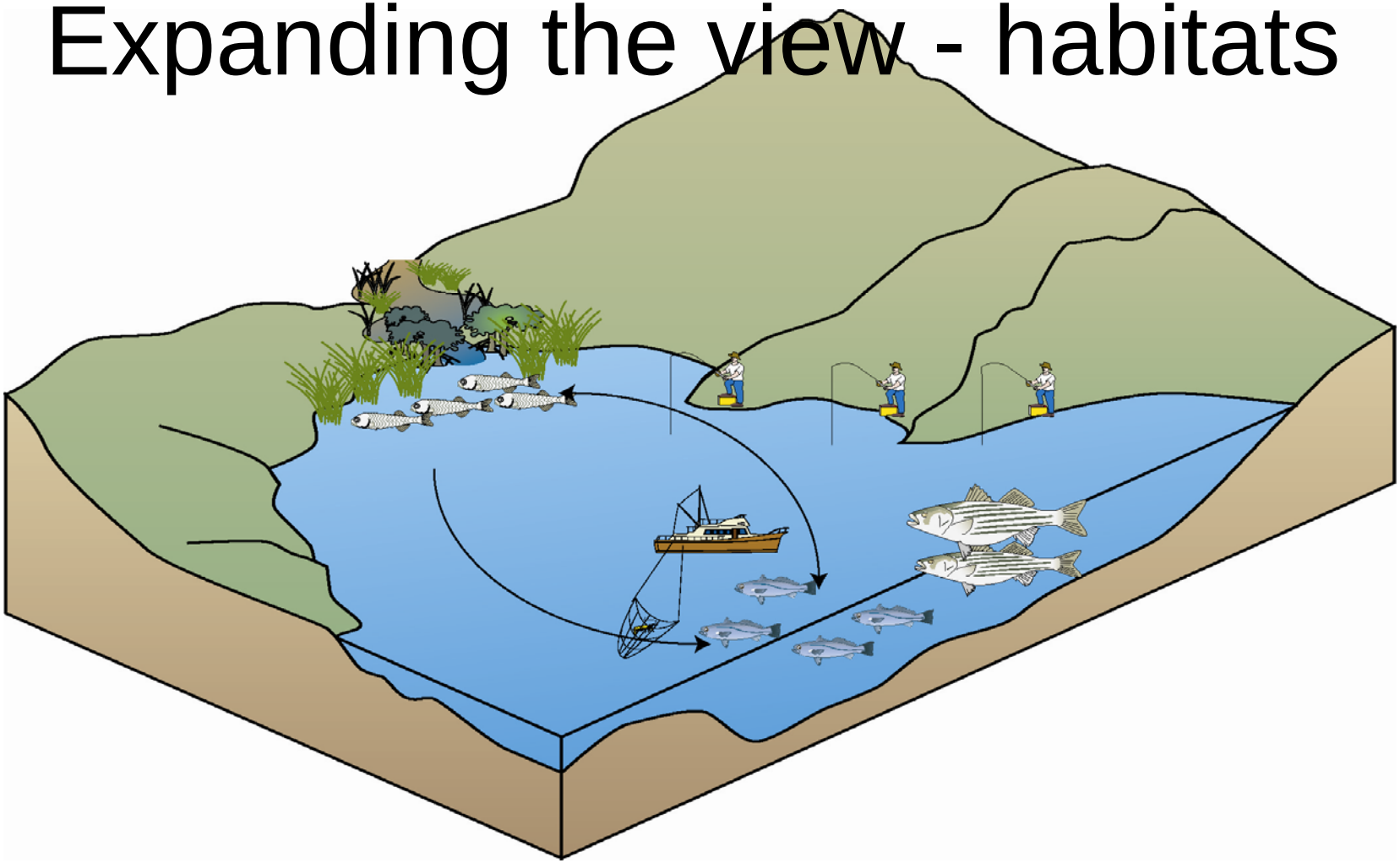
# Multispecies stakeholders



$$B_{t+1} = G + R - (F_1 + F_2) - (M + M_2)$$

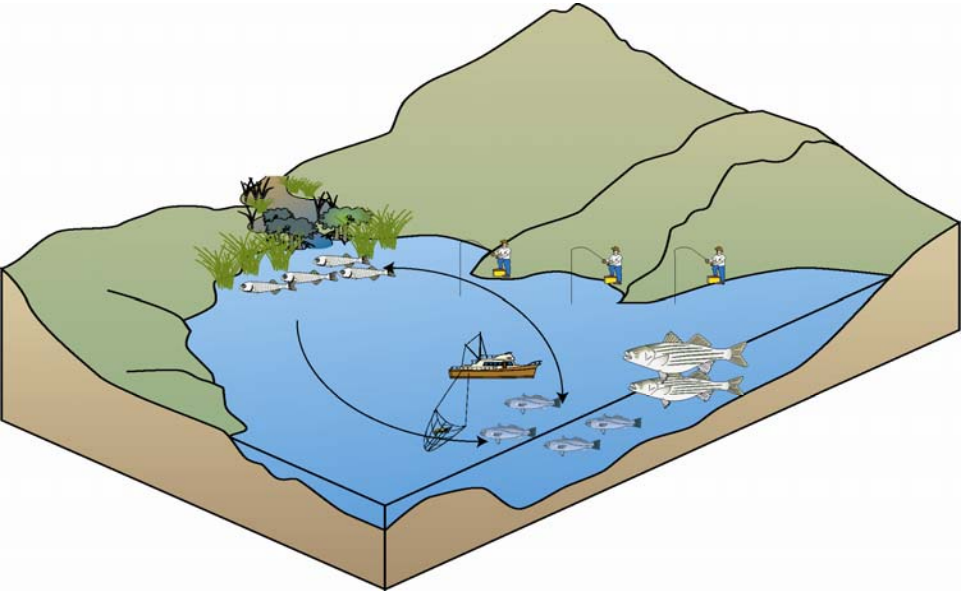
- Traditional approach still valid
- BUT, biomass reference points are adjusted upwards to allocate biomass to predators
- Stakeholders include
  - Commercial
  - Recreational
  - Managers (protecting societal interest)
  - Predator stakeholders

# Expanding the view - habitats



$$B_{t+1} = G + R' - (F_1 + F_2) - (M + M_2)$$

# Habitat issues



$$B_{t+1} = G + R' - \left(F_1 + F_2\right) - \left(M + M_2\right)$$

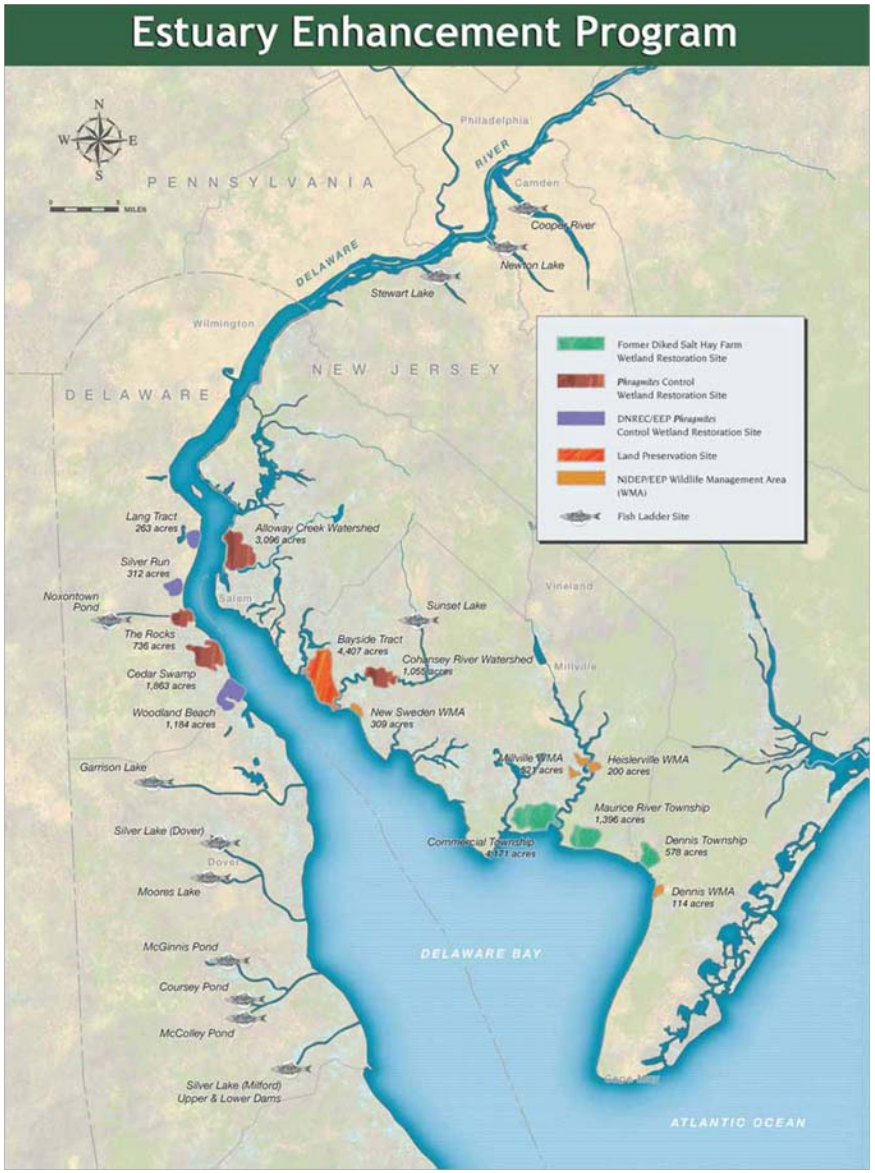
- FCMA include essential fish habitat, but provided no teeth to the concept
- ESA does have teeth, but because of that is rarely used in fisheries
- Traditional fisheries approaches would adjust reference points to account for R', but not change goals
- No new stakeholders

# Alternative approaches to habitat issues in fisheries

- Are there additional stakeholders?
  - Preventing loss / Restoring habitats
    - Land use planning, Other government agencies, NGOs, restoration organizations
- Case study: Power plant impingement
  - Cooling water intakes impinge substantial numbers of early life stages of fish
  - How has society asked power plant operators to respond
    - Avoidance technologies
    - Sponsor large scale research efforts – VEE, HRF
    - Stock enhancement efforts
    - Habitat restoration

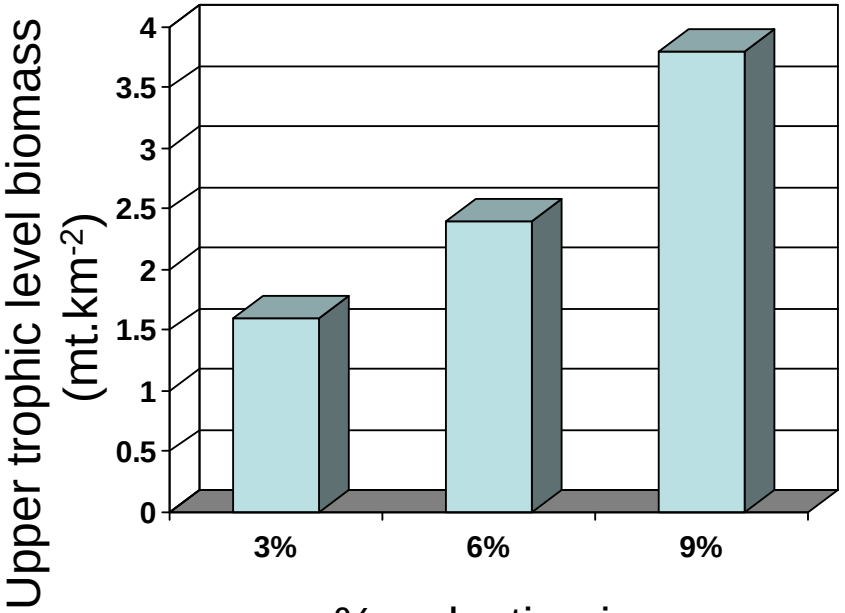
} Seek to offset production loss

# PSE&G Delaware Bay



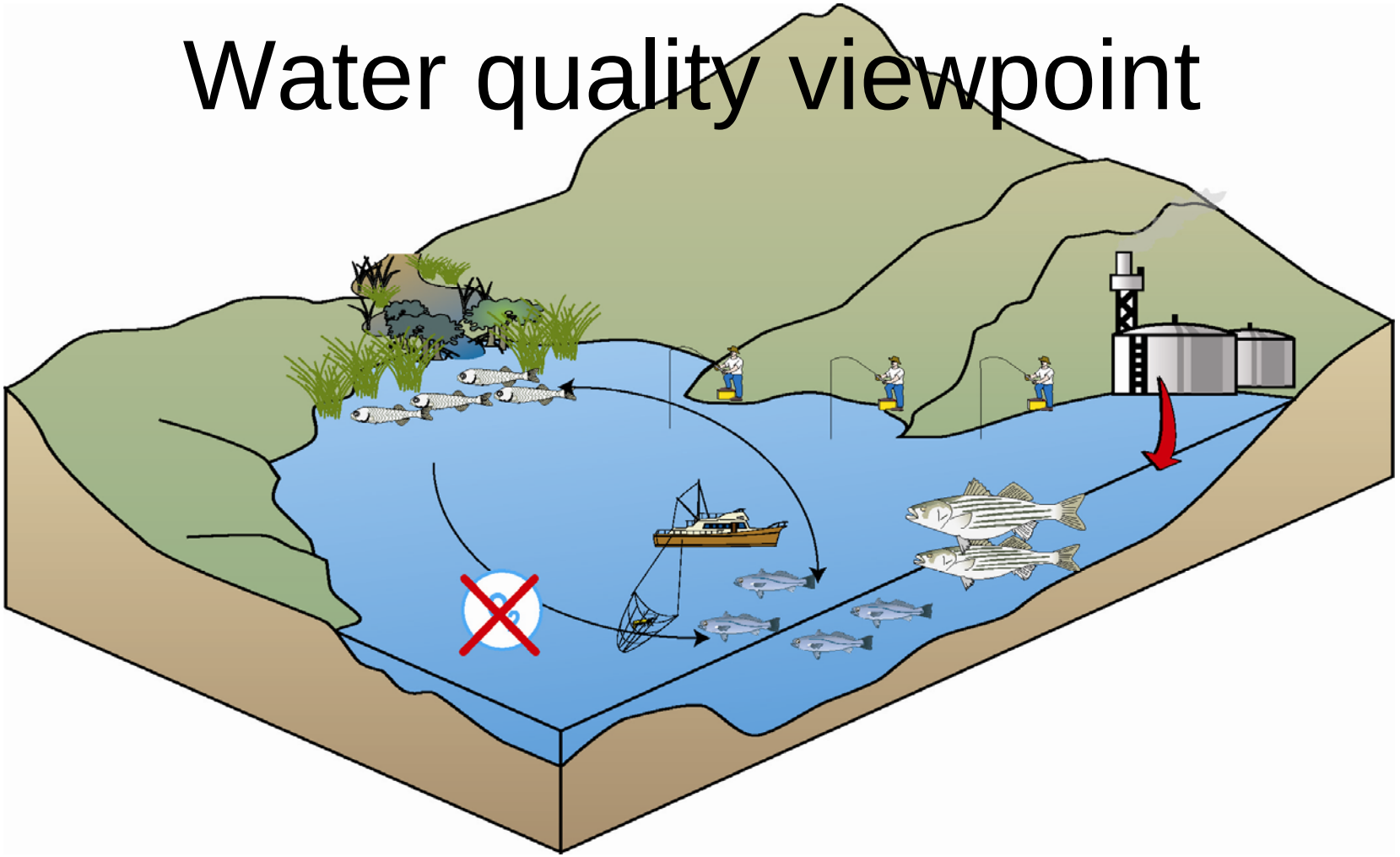

Delaware Ecosim Model

Biomass Lost if Restoration Not Conducted



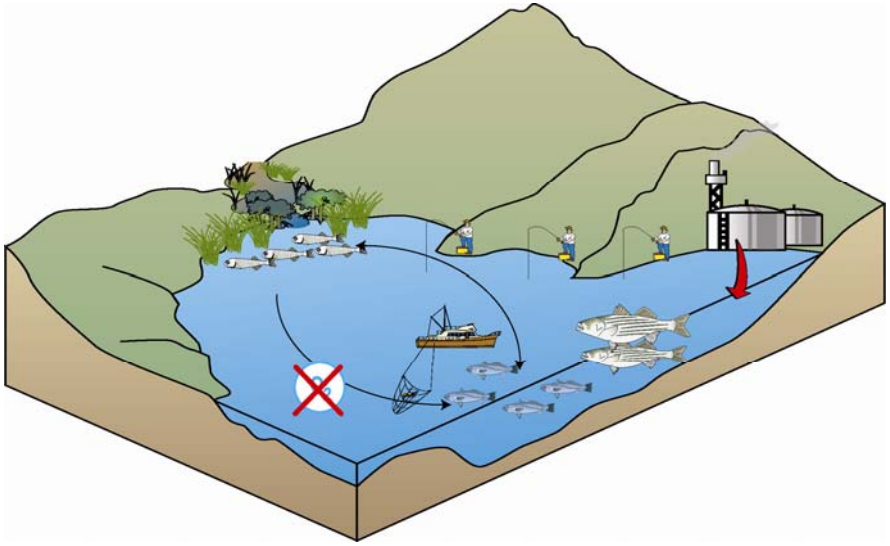

Frisk et al. (submitted). Ecol. Appl.

# Water quality viewpoint



$$B_{t+1} = G' + R' - \left(F_1 + F_2\right) - \left(M + M_2\right)$$

# Water quality viewpoint



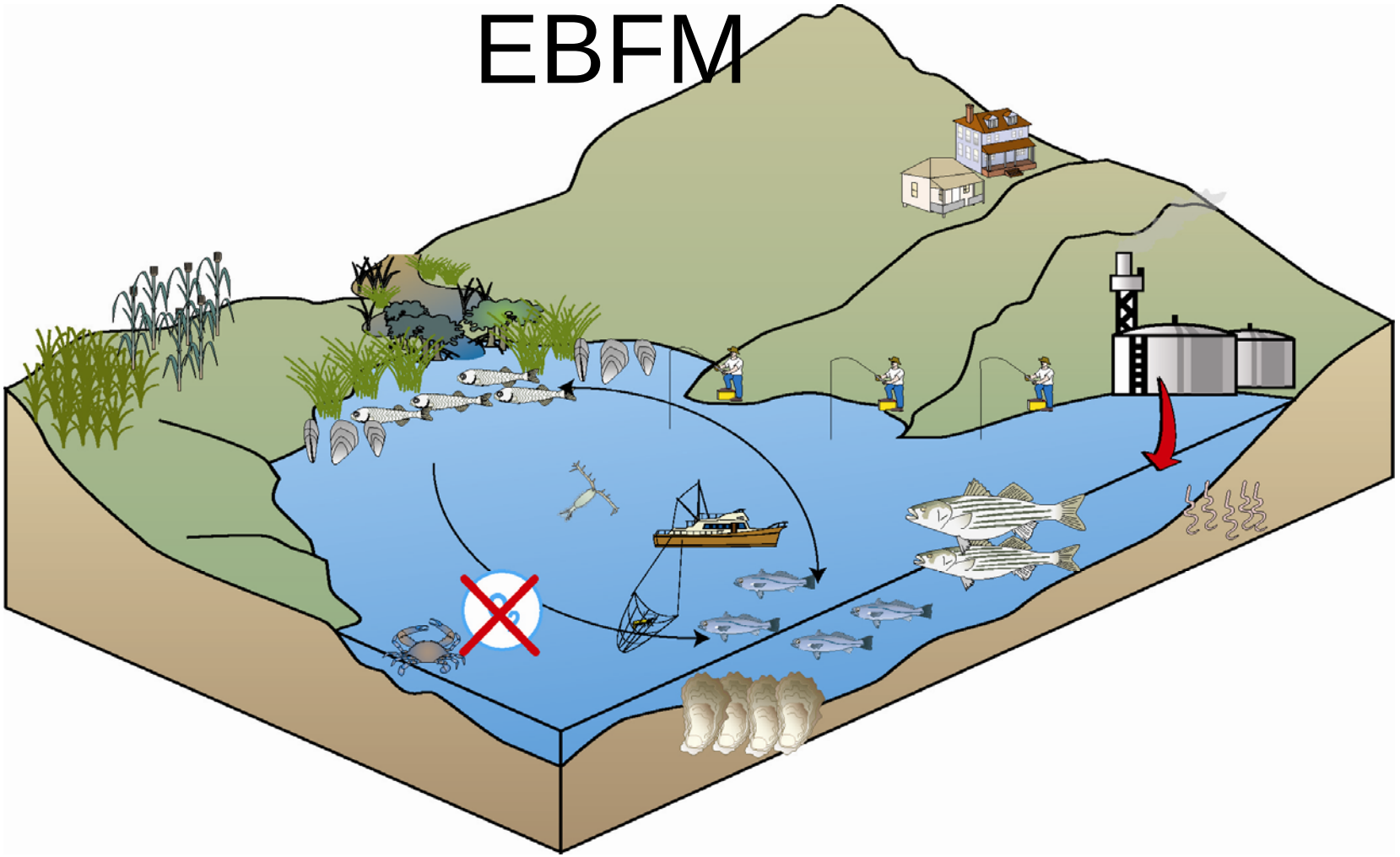
$$B_{t+1} = G' + R' - (F_1 + F_2) - (M + M_2)$$

- Traditional fisheries approaches would adjust reference points to account for G', but not change goals
- No new stakeholders

# Alternative water quality view

- Are there additional stakeholders?
  - Preventing / Restoring water quality changes
    - Land use planning, Other governmental agencies, Agricultural and industrial stakeholders, NGOs, ecological organizations
- Case study: CBP
  - Long term attempt to reverse decline in water quality in CB via comprehensive, watershed scale management.

# EBFM



$$B_{t+1} = G' + R' - (F_1 + F_2) - (M + M_2)$$

# Challenges to identifying stakeholders for EBFM

- What comes first – goal or stakeholders
  - The stakeholders you have in the room will affect the state goal or vision
- Given a goal, how is allocation determined
  - Allocation is often the most contentious issue in fisheries management because it is often not a scientific question
- Given an allocation, how is performance determined
  - What is monitored, and how is it related back to the goals