

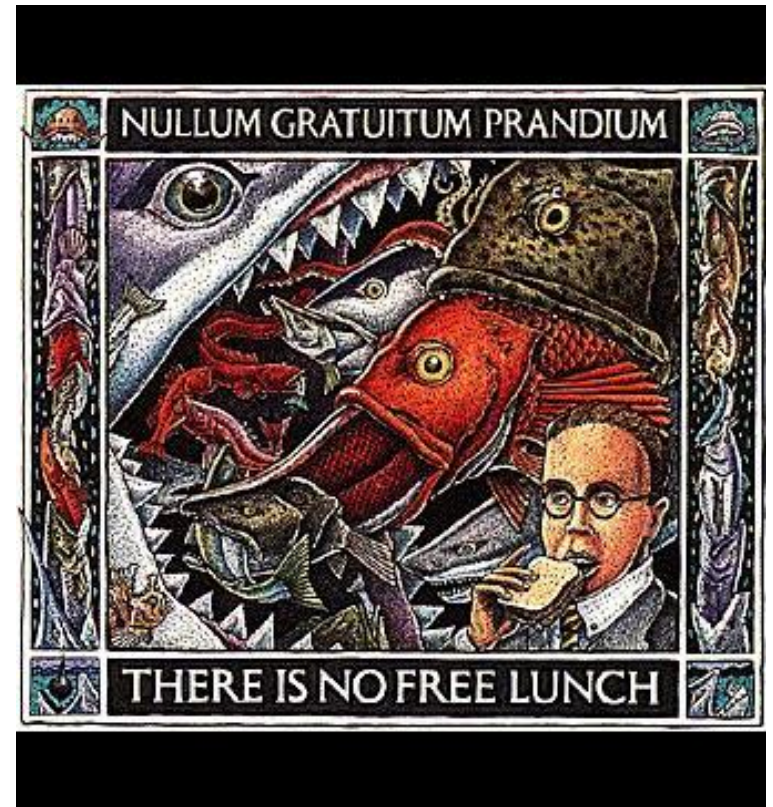
# Enabling comprehensive management: Ecosystem service trade-off analysis



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Crow White**

# Why Address Tradeoffs?

- Multiple Co-occurring Activities is the Norm
- They Interact to Affect Services
- Management Decisions that Ignore Interactions Create Unanticipated Consequences



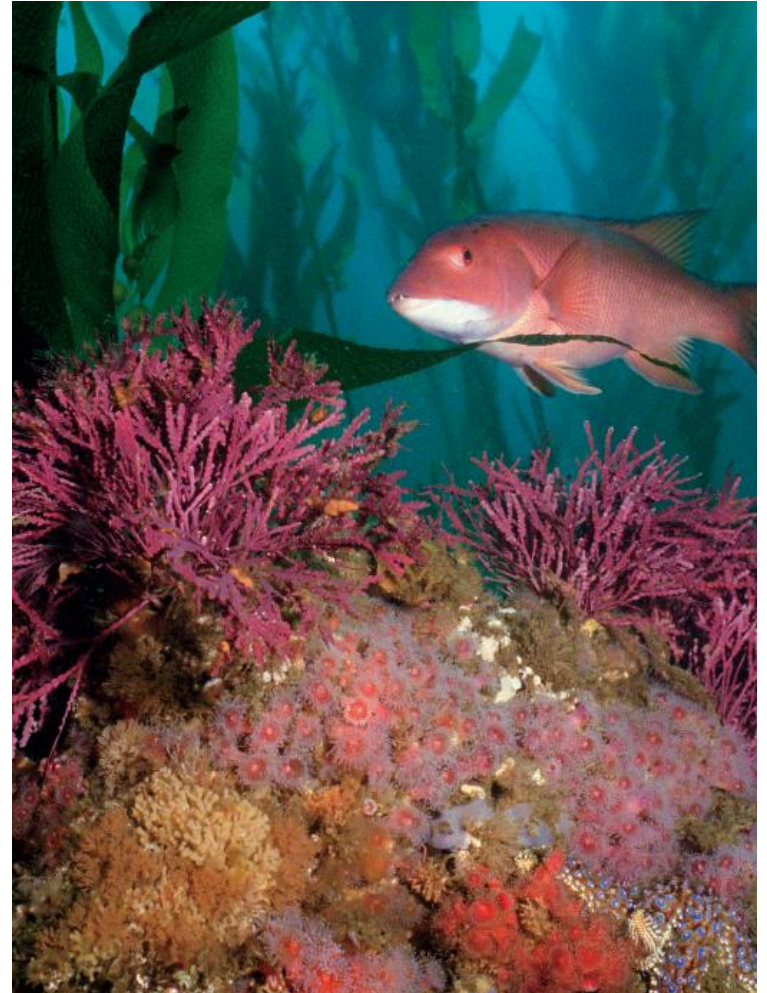
# Needs

- Methods that Focus on Delivery of Services
- Methods that Explicitly Explore Tradeoffs
- Methods that Inform Decision Making



# Ecosystem Services Trade-off Analysis

- Based on Simple Economic Decision Theory
- Bridges Artificial Separation of Ecological and Social Services
- Visualizes Relationship Between 2 or more Services

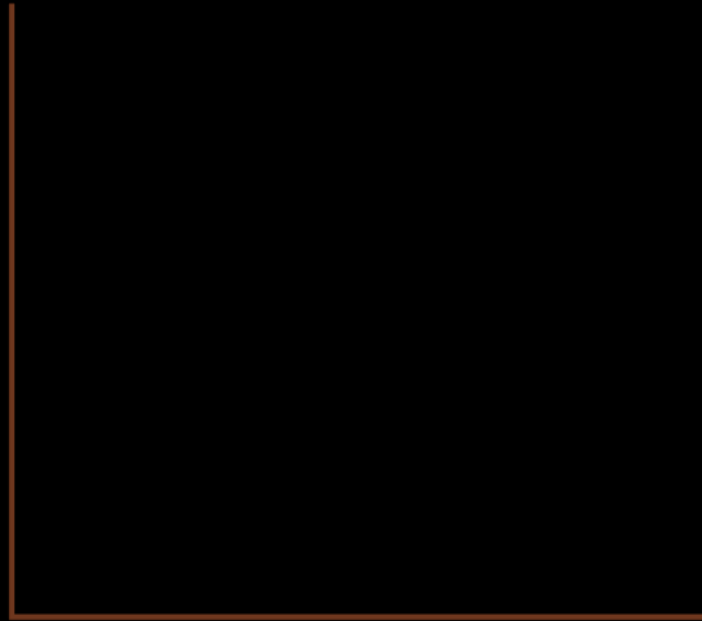


# Potentially interacting services



e.g., urchin yield, tourism profits,  
biodiversity, wave energy

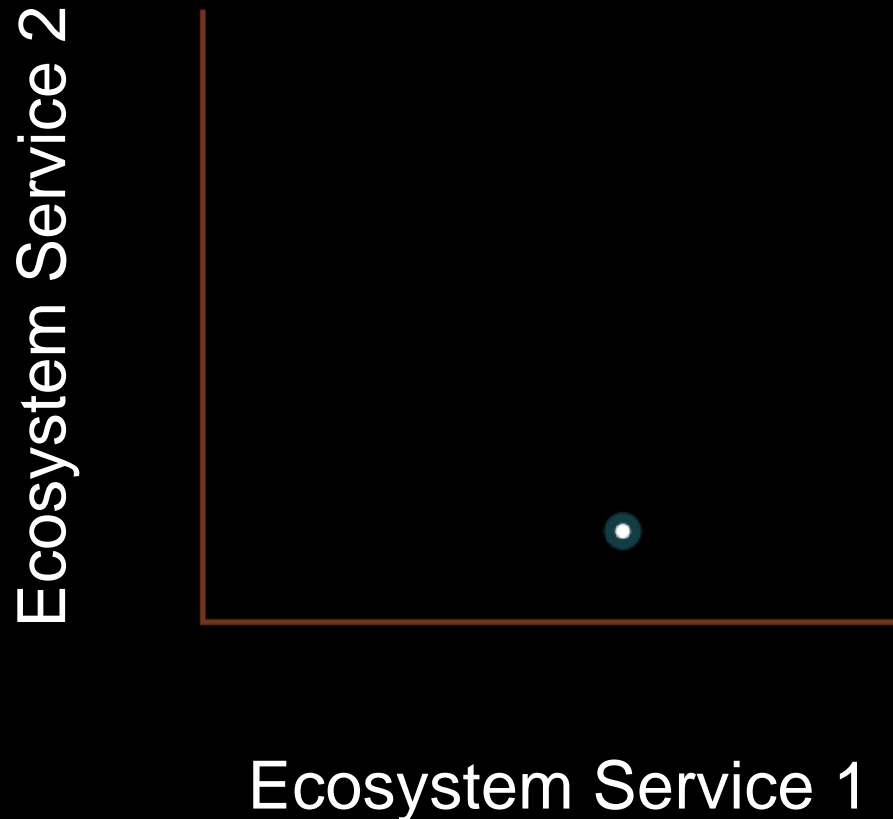
Ecosystem Service 2



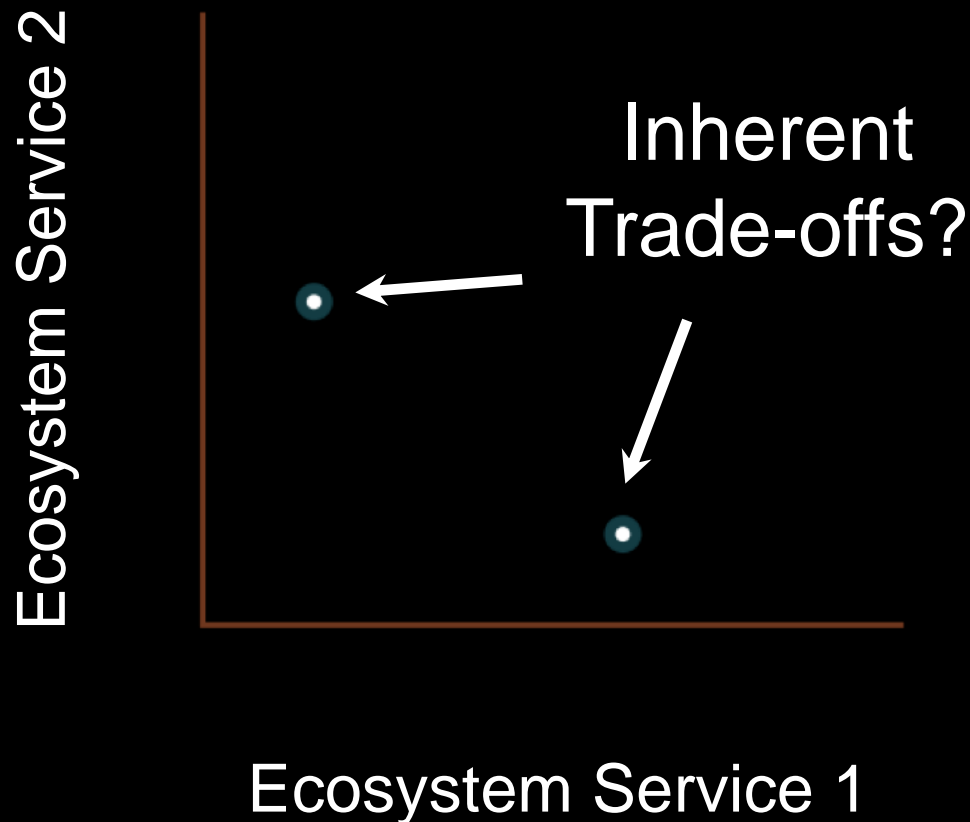
Ecosystem Service 1  
e.g., lingcod yield, shoreline protection,  
aesthetic value, aquaculture



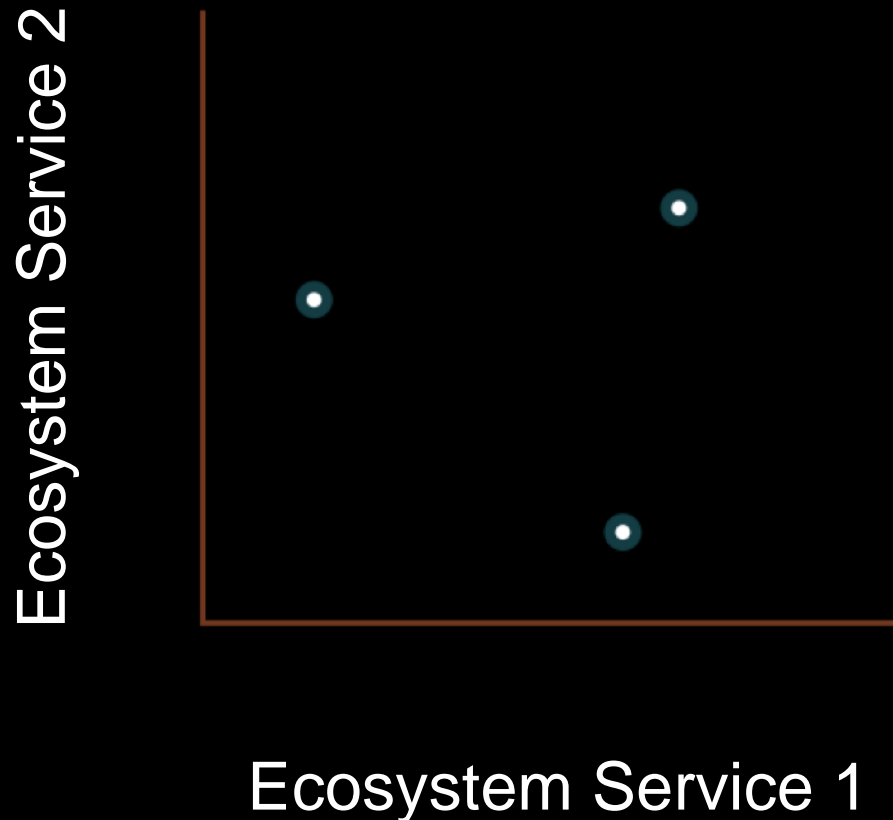
Any management action yields an ecosystem services outcome



# Different management actions yield different ecosystem service outcomes

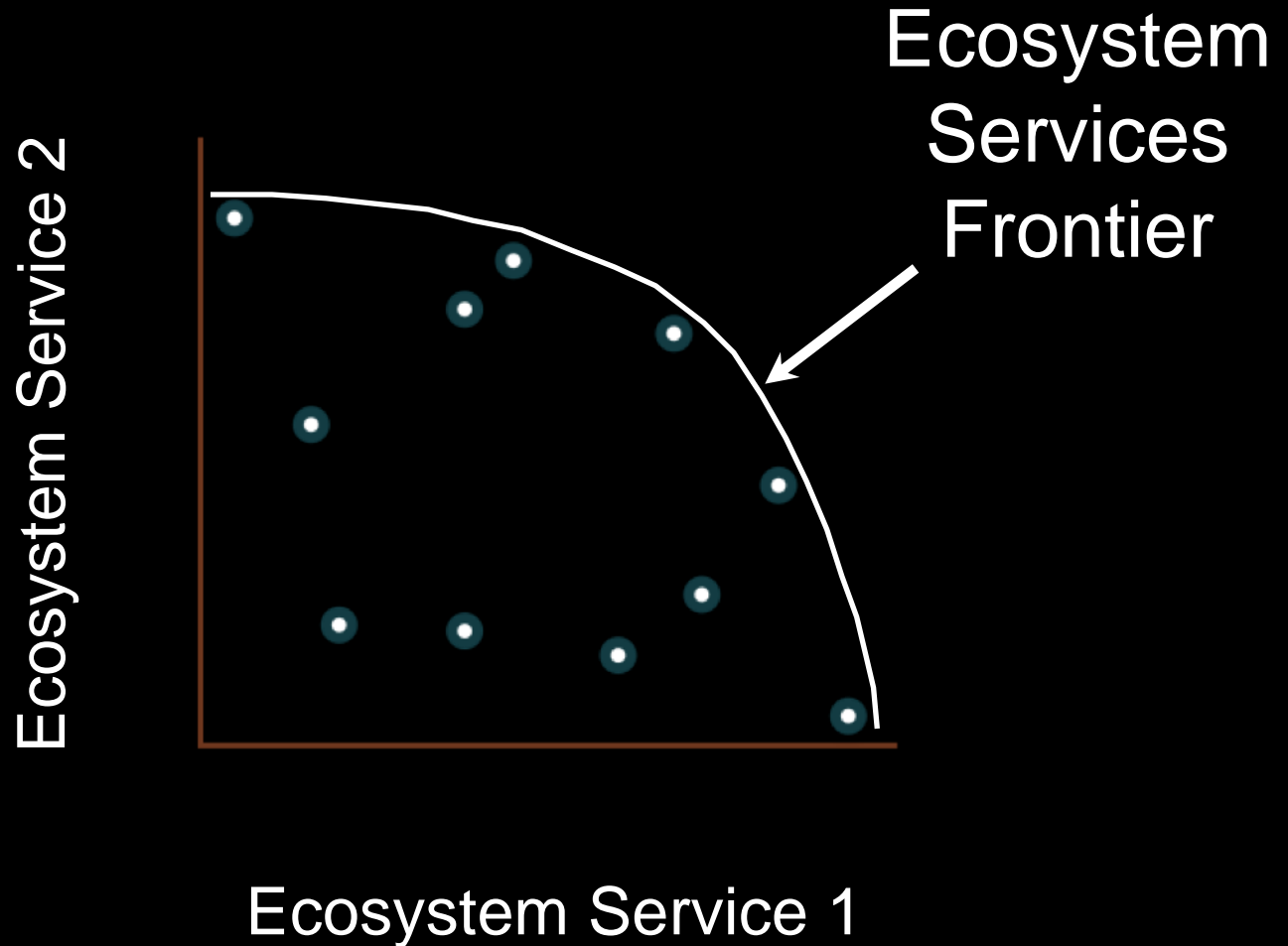


How can you distinguish between trade-offs and suboptimal management options?



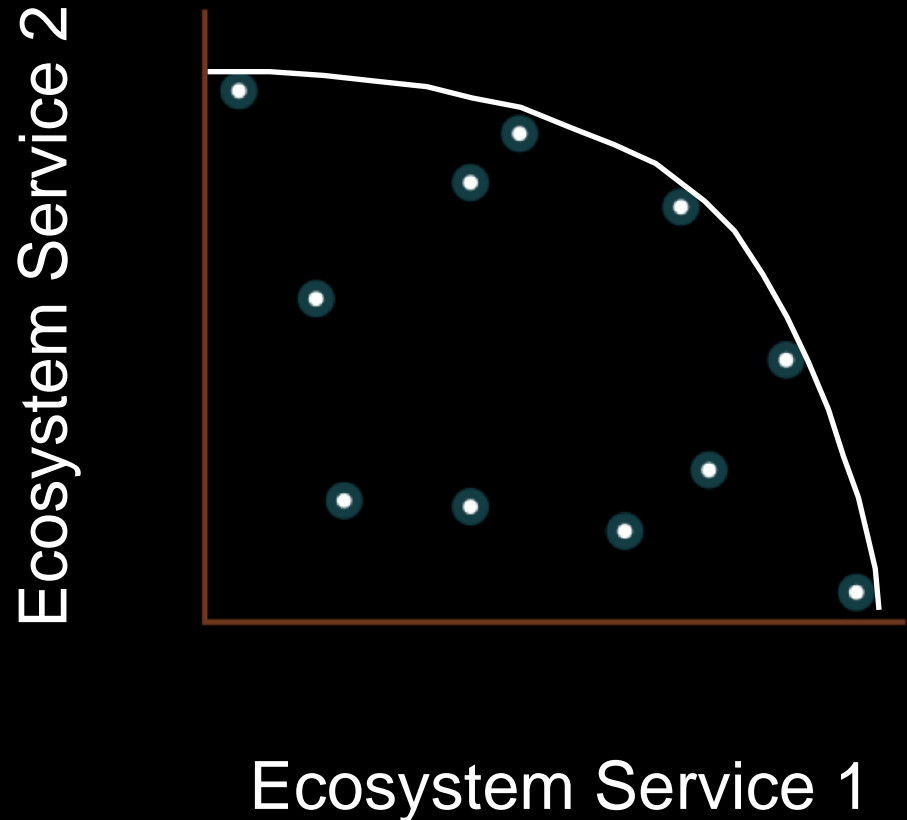
# Explore All Management Options

Management options that maximize both services lie on the frontier

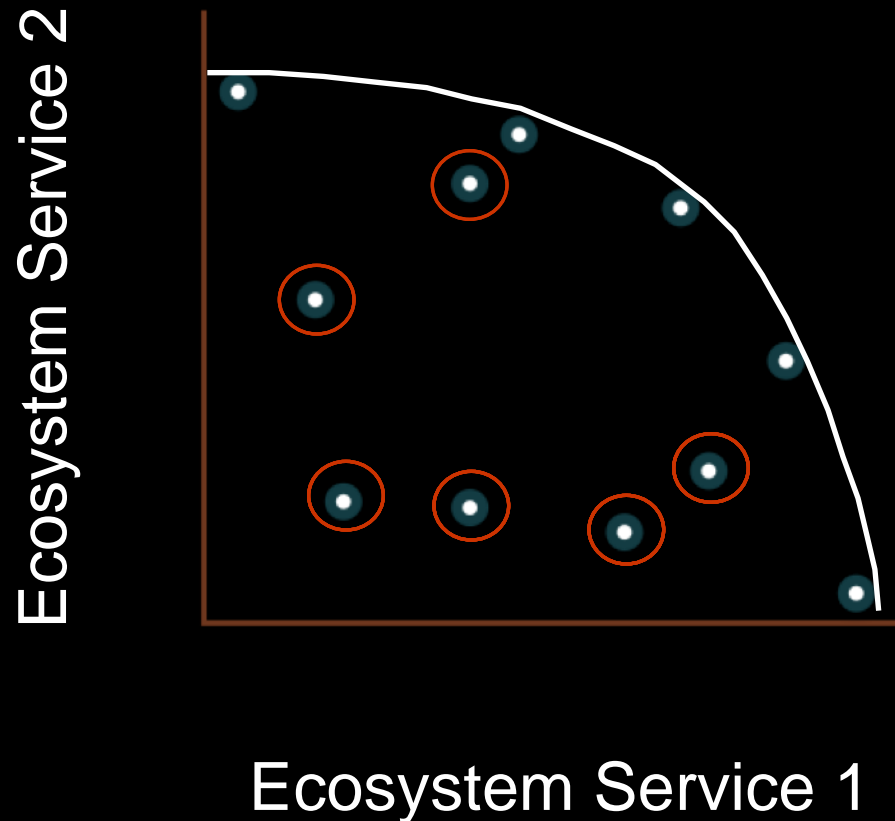


# How do we find the frontier?

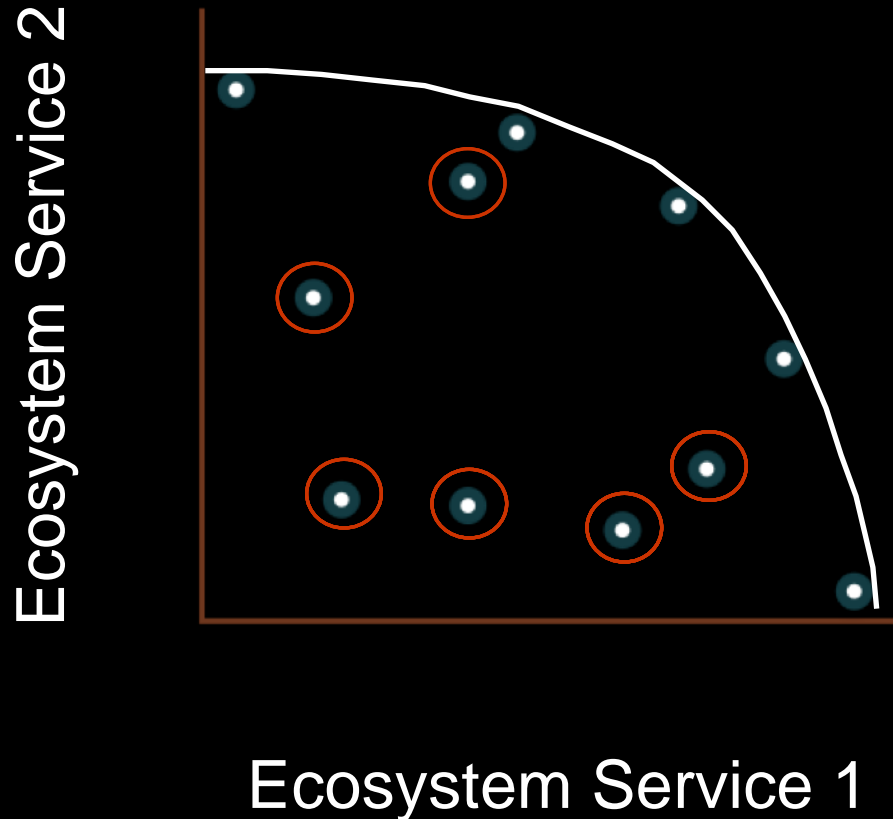
- Empirically
- Mathematical Models
- Logic Models



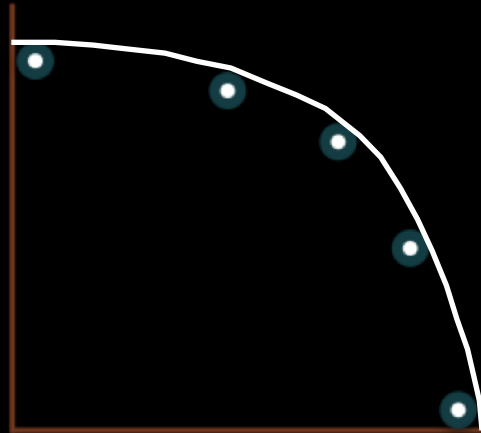
# Reveals sub-optimal management decisions



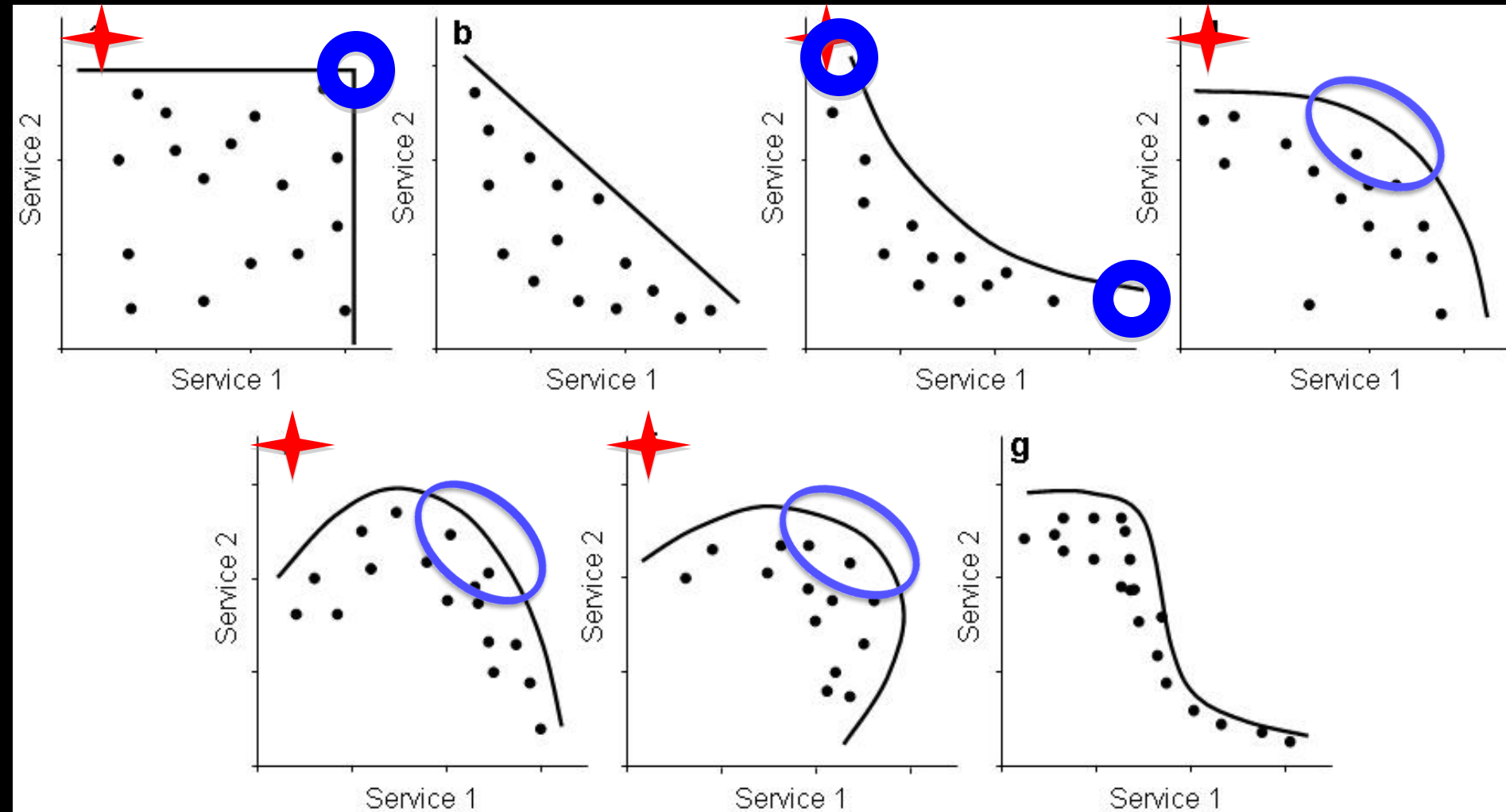
# How Do We Choose Among Optimal Solutions?



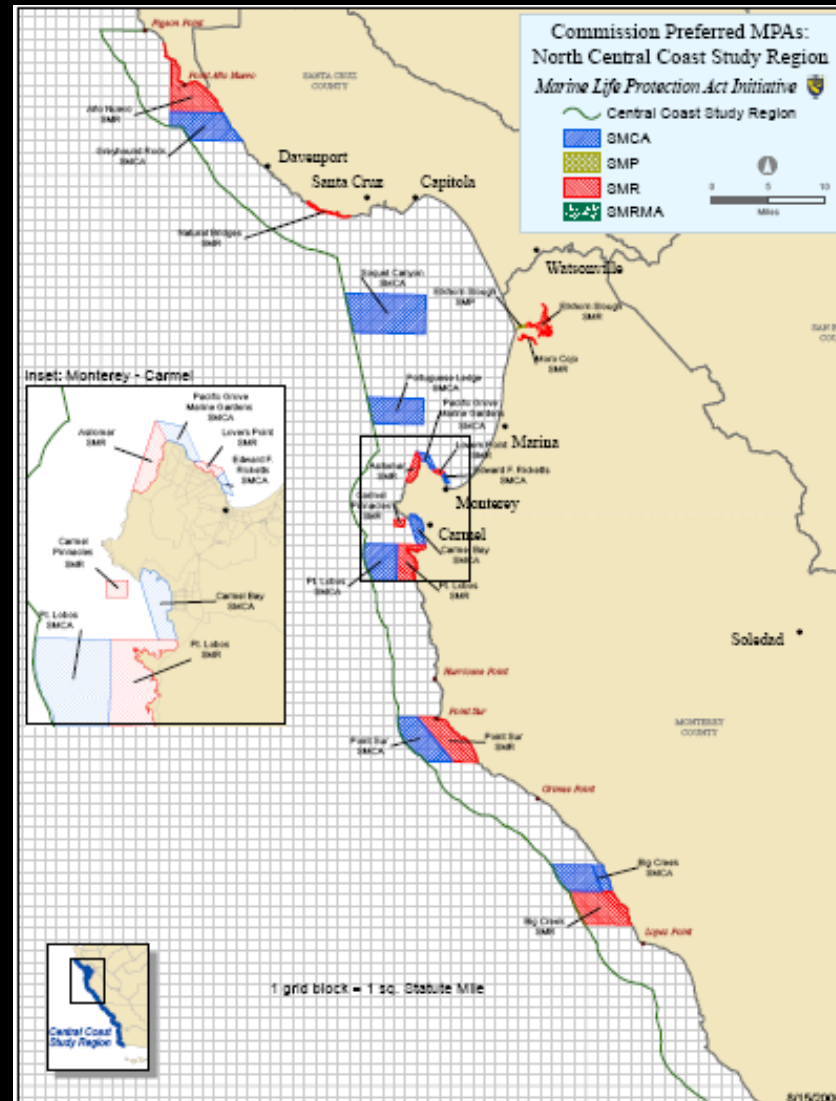
Does the frontier always have this shape?



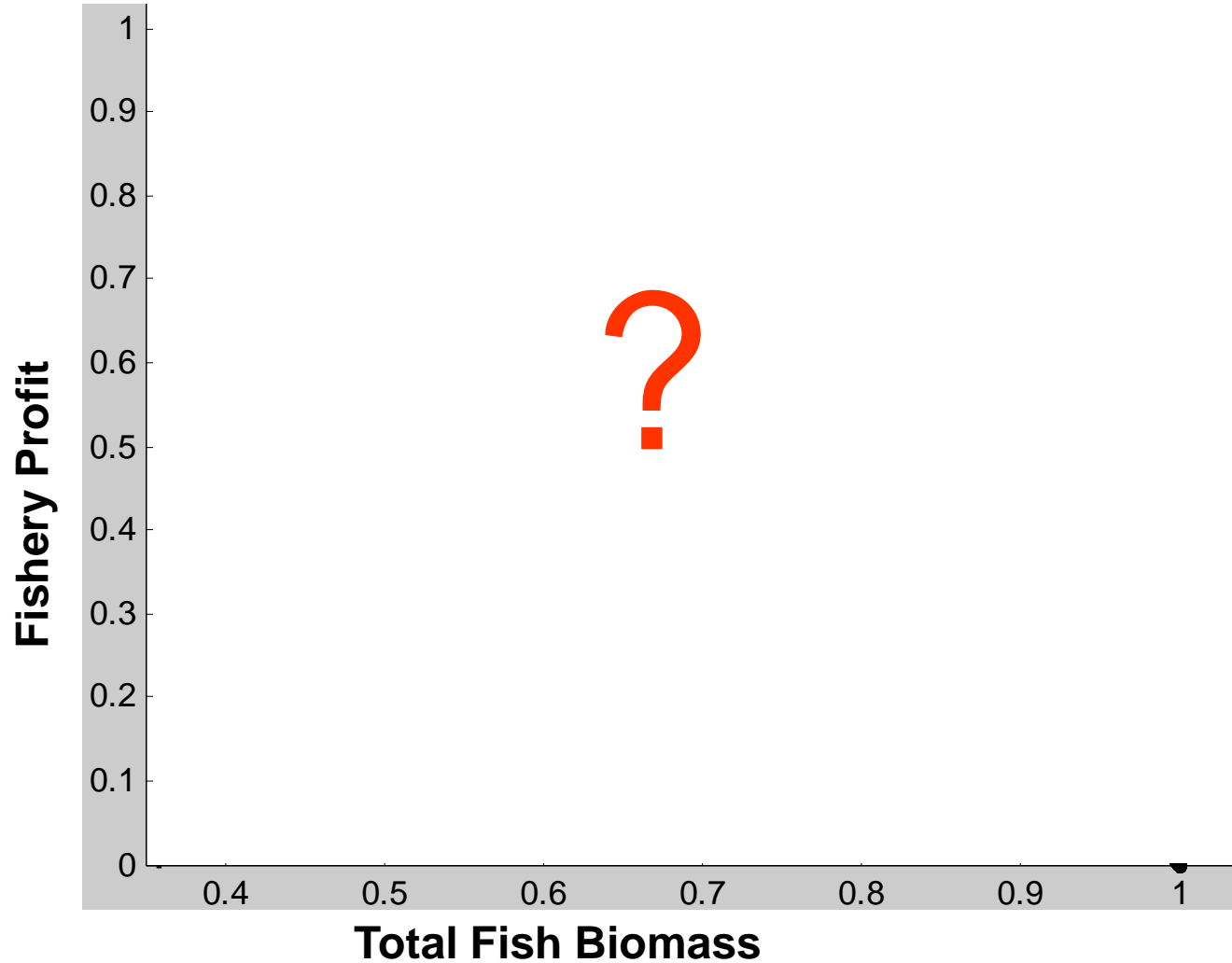
No – the shape matters and tells you important information



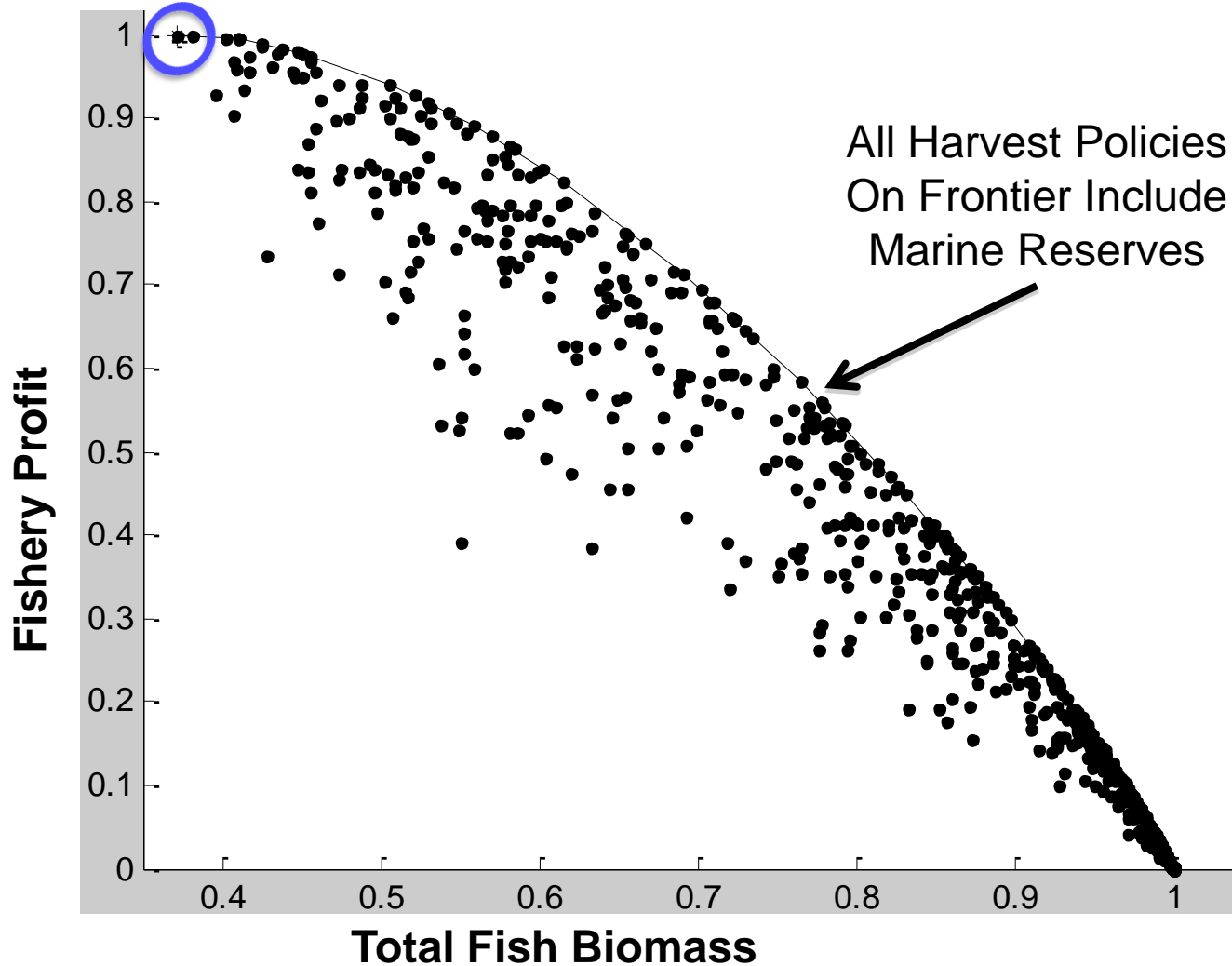
# Example: Reserves vs. Fisheries



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# Example: Reserves vs. Fisheries



# What trade-off analysis tells you:



- Is there a trade-off?
  - Some presumed trade-offs may not be trade-offs at all (fisheries example)
  - Demonstrates cost single-sector management when trade-offs exist
- Reveals inferior management options
- Identifies a SET of optimal management options
- We've done this for 3 services too

# Advantages of trade-off analysis:



- Can be N-dimensional
  - Hard to visualize, but mathematically straight-forward
  - Allow for comprehensive assessments
- Does not require services to be measured in dollars
- Makes decisions and their consequences explicit
- Can directly evaluate candidate spatial plans

# MA project: overview



# MA project: details

- Identify key tradeoffs and sites to analyze
- Gather data and develop production models for ecosystem services
- Develop valuation models for services
- Link models and quantitatively evaluate tradeoffs
- Map scenarios and different 'frontier' solutions
- Plug into MIDAS (MIMES team)