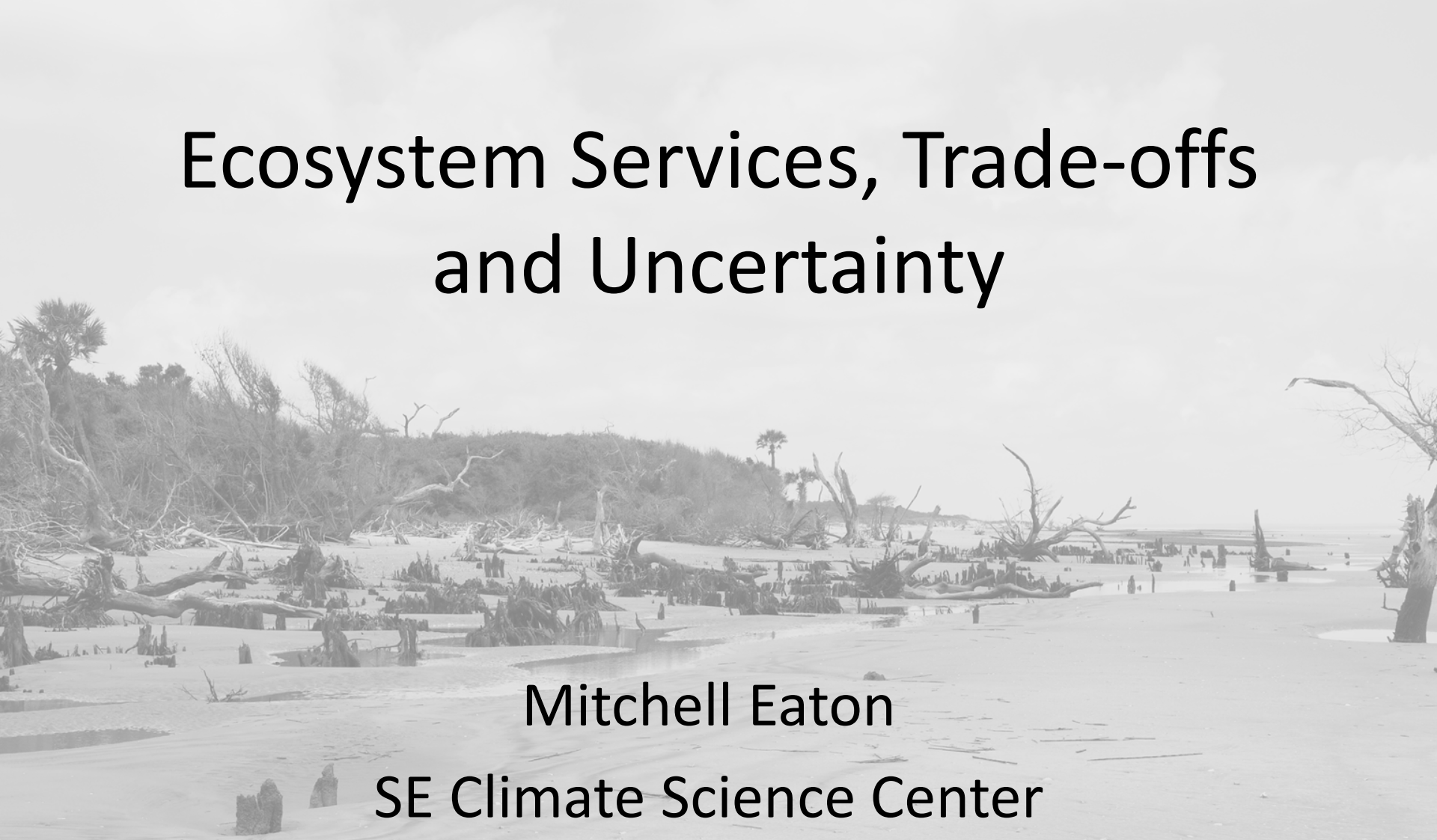
Ecosystem Services, Trade-offs and Uncertainty



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science for a changing world

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Failure in Conservation/NRM

- Scale mismatch
  - Scale of decision making vs. environmental process
  - More common when framed in terms of ES?
- Single sector, single objective framework
  - Common in many sectors (conservation, industry)
  - Risk of scale mismatch (governance)
  - Even with full accounting for ES & valuation, not final step in decision making
  - Trade-offs ignored; limited support for decision

Example: Cape Romain NWR, SC

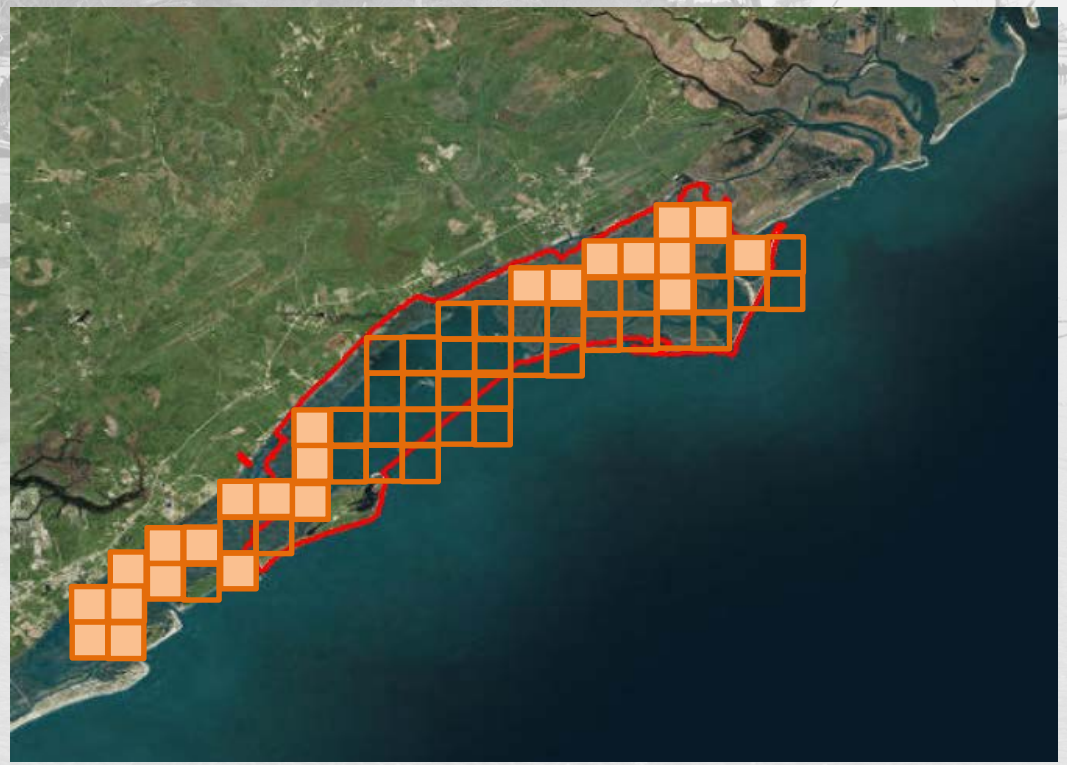
Cape Romain NWR: expanded decision context

Co-Production & Trade-Offs

- Co-production: research questions sourced from managers within the context of the particular decision
- Decisions involve:
  - predicting outcomes from alternative management choices (science),
  - valuing those outcomes (stakeholders)
- No single optimal decision; trade-offs and negotiation

Trade-offs

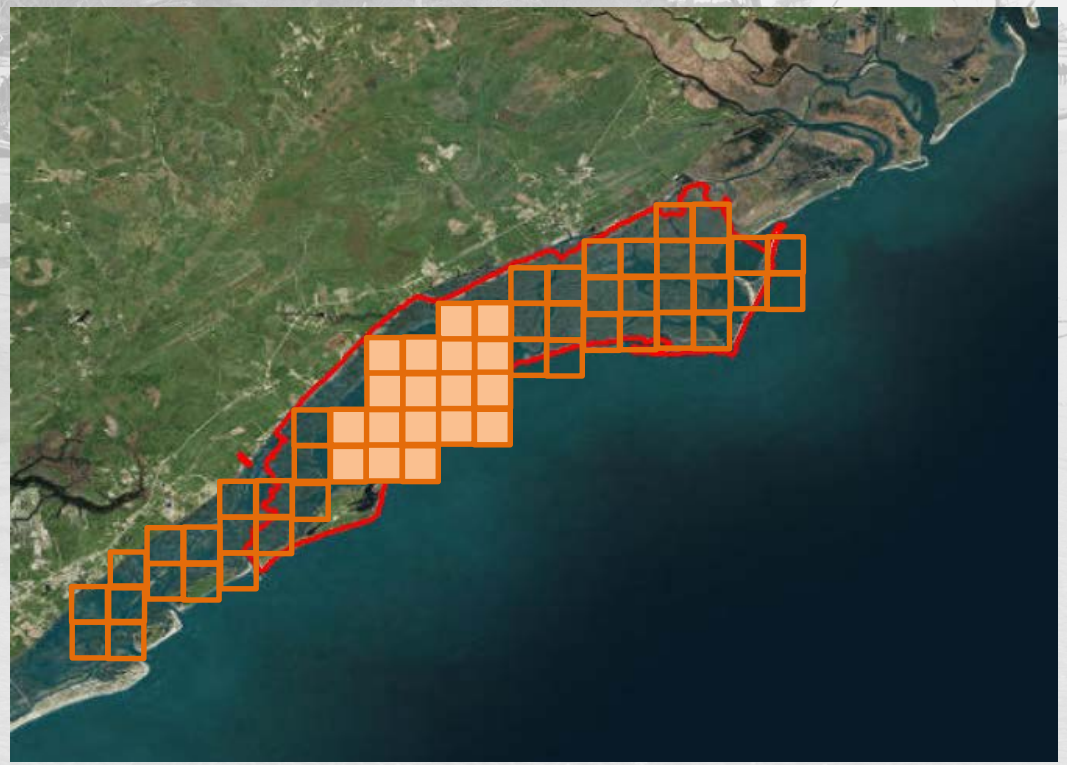
1. Biophysical constraints
   - Inherent limits to ecosystem services



Ex: Siting Oyster Reef Restoration

Trade-offs

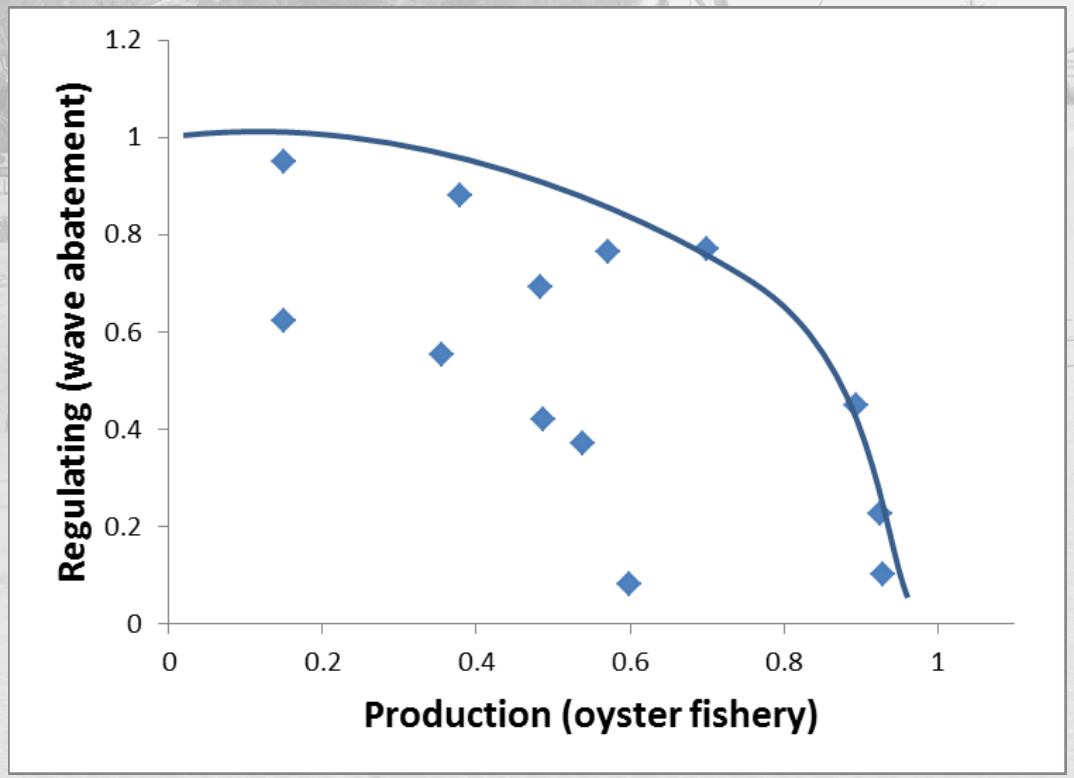
1. Biophysical constraints
   - Inherent limits to ecosystem services



Ex: Siting Oyster Reef Restoration

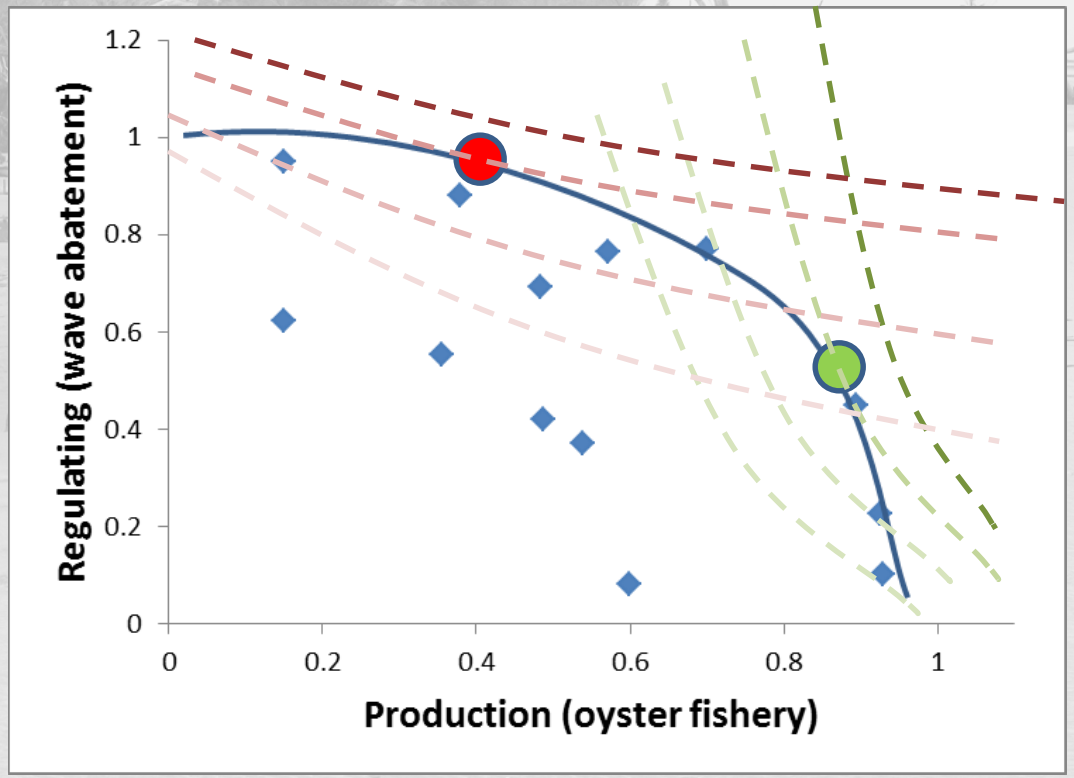
Trade-offs

1. Biophysical constraints
   - Inherent limits to ecosystem services
   - Efficiency frontier defines the region of constrained (optimal) trade-offs



Trade-offs

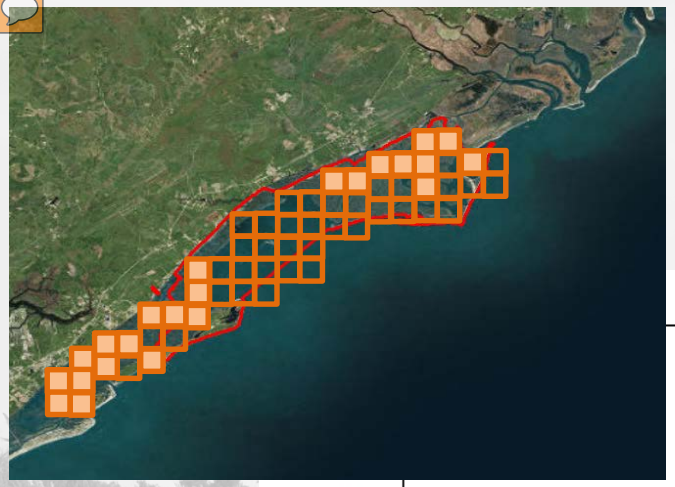
2. Value preferences
   - Benefits don't accrue to stakeholders equally
   - Frontier is 'optimal' but represents divergent values and 'efficient' trade-offs



King et al. 2015
Cavender-Bares et al. 2015

Climate Change & Uncertainty

- Another form of trade-off: risk vs. reward
- Portfolio theory
  - Risk measured by deviation from expected value
  - A portfolio of *uncorrelated* assets lowers risk
  - Climate change: market conditions
  - Evaluate expected returns and *variance* under different conditions
  - Trade-offs: maximize returns for a given level of risk, or minimize risk for a fixed return



Accounting for Uncertainty: Risk vs Reward