Experimental Mitigation and Risk Acceptance: A case study using seagrass ecosystems – can simple metrics work?

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Seagrasses

- Rival yield of subsidized crops on a Ha\(^{-1}\) basis
- Global Ecosystem Services: $1.9 T USD y\(^{-1}\)
  - Productivity, stability, nursery, forage, carbon ↓
- Globally threatened marine habitat
  - 29% lost since 1879
  - 7 % y\(^{-1}\) since 1990
- Not charismatic
## Seagrasses vs. Corals

### Seagrasses
- Non-charismatic
- Low diversity of simple foundation habitat
- Unappreciated services
  - Carbon sequestration
  - Acidification buffering
  - High associated biodiversity
- ~Linear scaling of restored habitat to services

### Corals
- Charismatic
- High diversity of complex foundation habitat
- Known services
  - Biodiversity
  - Nursery
  - Tourism
- Non-linear scaling of restored habitat to services
How important is quantifying associated biodiversity in seagrass restoration?
Net positive impact sequence

**Translation to U.S. approach regarding seagrasses**

**Step 1**
Prioritise and select biodiversity features to include
- e.g. species x, y and z; ecosystems A and B

**Step 2**
Select methods to collect data on amounts of each feature in the field
- e.g. canopy cover, species abundance

**Step 3**
Convert data into a currency
- e.g. Habitat Hectares

**Step 4**
Decide on adjustments needed for a fair exchange
- e.g. considering ratios, multipliers, time discounting, uncertainty, risk. This is known as an ‘exchange mechanism’

**If you build it, they will come..**

**Acreage and persistence**
* (acre-years of service; AYS)

**Habitat Equivalency Analysis**
guides ratio of **restored to lost** habitat to generate new **AYS_d** to offset lost **AYS_d**

**How is this applied?**
- “Reasonableness” standard
- $ compliance < non-compliance

Courtesy J. Ekstrom
As a result – simple surrogate metric of linear $AYS_d$ accepted in federal court

...at what risk?

Worldwide confirmation – numerous peer-reviewed studies:

- Faunal abundance and diversity scales linearly (and eventually asymptotically) with restoration acreage

- Restored seagrass beds rapidly take on services of natural beds
Risk issues

• Typical project-level risks (techniques, site, disturbances)
• Performance expectations = crops
• Risk of non-compliance – unreasonable requirements
• Risk of not prevailing in litigation

Challenges – Breaking Silos

• Over-the-horizon funding (defensible information)
• Scientists translating to economists, lawyers, regulators
• Building trust
Role of biodiversity in habitat management.

*Can simple habitat metrics be applied universally?*

- If services scale \(\sim\) linearly – *yes.. at project scale*
- If services scale non-linearly – *probably not*
Take – home point:
Simple metrics may represent biodiversity in structurally simple habitats with reasonable risk...

does this scale up to entire landscapes?

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