Incorporating costs into conservation planning

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Outline

- Why should we care about costs in conservation planning
- Uses of cost data in conservation planning
- Different types of costs
- Obtaining data on costs
- Implications of using inappropriate cost data
Why are costs important?

- Limited funds to conserve biodiversity
  - Need to spend funds efficiently

- But:
  - Most conservation planning exercises don’t include economic data (both academic and real)
  - Assumes that costs are spatially homogenous
  - Places are identified as ‘important’ but without a clear objective
What are our objectives?

- Maximise biodiversity representation given a **fixed budget**
- Represent target amounts of biodiversity for **minimum cost**
Benefits of incorporating costs

1. Ensures cost-efficient plans
2. Helps identify preferences
3. Helps identify priority planning units or actions (cost-effectiveness analysis)
Types of costs

- Acquisition
- Management
- Transaction (e.g. for easements)
- Opportunity
- Stewardship
- Damage costs
Sources of cost data

- Direct data (dollars, forgone harvest)
- Indirect data (area, vulnerability, reserve size, habitat type)
Australian example (Carwardine et al)

1. Area
   - as baseline for comparison

2. Acquisition
   - cost of buying land

3. Stewardship
   - Compensation costs for loss of production
Area

- as a baseline for comparison

- used area of native vegetation

- assumed no actions for cleared land (e.g. restoration)
Acquisition cost

- Unimproved land value by Local Gov’t Area

- Land value in $/ha

- Multiplied by area of native veg in each planning unit

= cost of purchasing all areas of native vegetation in each planning unit
Stewardship cost

- Data on agricultural profitability over all agricultural commodities
- Profit in $/ha
- Multiplied by 50% of the area of native vegetation and calculated in perpetuity

= opportunity cost (compensation for loss of 50% production in each planning unit)
Sensitivity to cost data

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Similarity between irrepeaceability values</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Acquisition</td>
<td>0.35</td>
</tr>
<tr>
<td>3. Stewardship</td>
<td>0.32</td>
</tr>
<tr>
<td>1. Area</td>
<td>0.29</td>
</tr>
</tbody>
</table>
Efficiency of cost measures

- The scenario that minimised each cost was that which employed that particular cost measure.
- Ignoring cost (or using inappropriate costs) results in inefficiency!

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Cost measure used to calculate the cost of the best solution</th>
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<tbody>
<tr>
<td></td>
<td>Area</td>
</tr>
<tr>
<td>1. Area</td>
<td>Most cost efficient</td>
</tr>
<tr>
<td>2. Acquisition</td>
<td>4%</td>
</tr>
<tr>
<td>3. Stewardship</td>
<td>5%</td>
</tr>
</tbody>
</table>
Mediterranean example (Wilson et al)

- Obtained cost per unit area for a variety of conservation actions in 17 mediterranean ecoregions

- e.g. revegetation, invasive predator control, fire management, conservation easements
Mediterranean example

- Prioritised investment in each action using a dynamic conservation planning framework (based on Wilson et al, 2006 Nature).

- Using threat-specific actions (rather than just considering land acquisition to be a surrogate) enabled us to protect 78% more species over five years.
Rock Lobster Catch Estimates for South Australian waters
(Jasus edwardsii)

Mean Historical Catch Rate Estimates (kg per km2)
- 0 - 10
- 11 - 100
- 101 - 502

Adapted from McGarvey et al. 2003
Minimising costs in marine systems
(Stewart and Possingham, 2005)
Conclusions

- Conservation planning is sensitive to data on cost
- Need to incorporate costs for cost-efficient priorities!
- Need improved availability of cost data
- The appropriate cost measure depends on the planned conservation action
- Therefore objectives must be known