Nature Conservation: Information, Costs and Evaluation

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Conserv-Vision. The next 50 years
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Overview

Introduction
Public understanding of state of environment
Information sources and quality
Cost and expenditure information
Opportunity costs and financial costs
Total cost to recover a species
Evaluation of performance
An information-rich Conserv-Vision
Economics

With few exceptions ... its practitioners are little known to non-economists, and frequently mocked. Who can forget what Lyndon Johnson once said to John Kenneth Galbraith? "Did it ever occur to you, Ken, that making a speech on economics is a lot like pissin' down your leg. It seems hot to you, but it never does to anyone else."

Introduction

Conservation is challenging
Resources are limited

Factors for success
- Objectives defined and achievable
- Sufficient knowledge available
- Project costs estimated
- Sufficient resources available

Evaluations are needed
Public understanding of environment

Faulty understanding in New Zealand of current state of native species and ecosystems, and effectiveness of nature conservation.

Four NZ nationwide surveys, 2000 – 2006 on perceptions of environment, Hughey et al. 2000 adults asked about perceptions of environment, environment management, causes of damage.
New Zealand’s environment is ‘clean and green.’ (Hughey et al., 2006).
Public understanding of state of environment

2000 adults also asked to rate quality of 11 aspects of NZ environment (air, groundwater, soils...)

And …”how does NZ natural environment compare to other developed countries”

Respondents state:

- NZ species, bush and forest are in ‘good’ or ‘very good’ state
- NZ environment is in better condition than is environment in other countries.
Perceived state of New Zealand’s environment. (Hughey et al., 2006).
International comparison

2788 NZ taxa on threatened or endangered list.
416 increase over 2002 count.
IUCN lists 155 NZ species on Red List of Threatened Species (Critically Endangered, Endangered or Vulnerable)
NZ about 40\textsuperscript{TH} largest number of species

Ecuador 2183, USA 1178, Australia 639, Malaysia 917, PNG 301, New Caledonia 266
International rating of NZ biodiversity

Esty et al., 2005 provide a rating of 146 countries national environmental stewardship.

Biodiversity performance measured by:
- % of a country’s territory in threatened ecoregions
- threatened bird species as % of known breeding bird species
- threatened mammal species as % of known mammal species
- threatened amphibian species as % of known breeding amphibian species

A score between 0 and 1 for species abundance

NZ ranked 146th of 146 countries.

Biodiversity is easily NZ worst score.
Public understanding of conservation

Native bush and forest covers only 23% of NZ land area

175km$^2$ loss of indigenous habitat 1996-2002.

New Zealanders have overly sanguine view of native bush and forests, do not recognise how threatened are NZ species and habitat.
Information and conservation

‘..it is hard to imagine what a world of perfect information would be like.’


NZ public views on state of environment are well correlated with biophysical data, and understand causes of e.g. lower water quality.

Sharpest divergence is on state of native plant and animal species.

Why such a rosy view of biodiversity?

Hughey et al., 2006 sought answers.
Main sources of environmental information

- Newspapers: 80%
- Television: 60%
- Radio: 40%
- Magazines: 20%
- Internet: 10%
- Scientific journals: 5%
- Lectures and talks: 3%
- Other: 2%
Reliability of sources of environmental information

<table>
<thead>
<tr>
<th>Source</th>
<th>Very unreliable</th>
<th>Neither reliable nor unreliable</th>
<th>Reliable</th>
<th>Very reliable</th>
<th>Don't know</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scientists</td>
<td></td>
<td></td>
<td>12%</td>
<td></td>
<td></td>
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<tr>
<td>Regional Councils</td>
<td>11%</td>
<td></td>
<td>7%</td>
<td></td>
<td></td>
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<tr>
<td>Media</td>
<td>10%</td>
<td></td>
<td>8%</td>
<td></td>
<td></td>
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<tr>
<td>Lobby groups</td>
<td>21%</td>
<td></td>
<td>7%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inter-governmental organisations</td>
<td>8%</td>
<td></td>
<td>10%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Government departments</td>
<td>12%</td>
<td></td>
<td>8%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Businesses</td>
<td>19%</td>
<td></td>
<td>7%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Percentage of respondents
Information and conservation

Mass media unlikely to be real culprits. Does absence of information on overall state of NZ biodiversity and trends in its state, plus continual supply of feel good stories, delude the public?

*In the absence of data on ecosystem condition and trends, conservation objectives continue to be defined in terms of agency outputs rather than performance outcomes.*

Information and conservation

Publicly available information on NZ ecosystem conditions ands trends would be valuable to decision makers.

Would provide more rigorous basis for public to understand state and trends, scale of the conservation challenges, and assess progress towards conservation goals.
Cost and Expenditure Information

Why should we be concerned about conservation costs, surely we just get more money? Edinburgh University seminar attendee, 2000.

Conservation is costly, US$6 billion/year.

Only 2-3% of total land administered by DoC is in intensively managed areas.

Choice of conservation goals needs to consider projected costs of projects for informed decision making.

Cost or expenditure information needed to assess cost effectiveness, check on efficiency of resource use.
NZ does not require costs to be estimated for species recovery plans. Biodiversity Recovery Plan did not include projections of costs. Cost and expenditure data are elusive. Inconvenient and costly to produce. May raise expectations of funding. Its importance may not be recognized. Absence of cost data limits ability to make best use of conservation resources.
Costs, Funding and Expenditure

‘Cost - the amount of money required in order to accomplish a particular purpose
‘Funding’ - amount of money set aside for a particular purpose
‘Expenditure’ - $ actually used for that purpose.

Expenditures on one conservation project limit resources available for other conservation projects if they draw from the same fund.
Variation in Costs

The range in costs of conservation projects can be startling.

Balmford et al., 2003 studied variation in terrestrial conservation costs in 37 nations.

Costs range over 7 orders of magnitude

- $<US$0.1 \text{ km}^{-2}\text{y}^{-1}$ Russian Arctic
- $>$1m km$^{-2}$y$^{-1}$ W. European programmes with restoration.

Research may find large variation in NZ project costs
Costs of managing species

Emma Moran examined costs of managing NZ species
Obtained data from 11 species managers on cost and likely expenditures 2003-2012
Attempted to determine via case study what are main drivers of cost?
Asked why is a beetle cheaper than a bird?
Management Costs of species, 2003-2012

PV (6%) of total cost (NZ$ 2002)

Single species programs

Stephens Island ground beetle $11,802
Stephens Island frog $106,099
P. patulum $167,315
Campbell Island teal $385,480
flax snail $409,075
kakapo $3,330,223
mohua $5,311,145
South Island long-tailed bat $5,874,754
black stilt $7,146,709
North Island kokako $9,314,082

Stephens Island frog
climbing everlasting daisy
P. patulum
Campbell Island teal
flax snail
kakapo
mohua
South Island long-tailed bat
black stilt
North Island kokako

$0 $1,000,000 $2,000,000 $3,000,000 $4,000,000 $5,000,000 $6,000,000 $7,000,000 $8,000,000 $9,000,000 $10,000,000
Costs and expenditures 2003-2012

Single species programs

- PV of total annual cost 2003-2012
- PV of expected total annual expenditure 2003-2012
Opportunity Costs

Large range of costs, but <3 orders of magnitude.

Startling differences between species in their projected expenditure to cost ratio 2003-2012. Funds allocated to a high cost species may mean many species receive little or no funding. 92% of NZ acutely and chronically threatened species do not receive enough help and 77% have no programme specifically targeting their recovery.
Total recovery costs

Annual costs are part of the story, but recovery rate matters too. K selected species may take decades to recover, hence huge total recovery cost likely. < 4 orders of magnitude variation in total recovery costs.
Magnitude of total recovery costs.
Cost drivers

Drivers for costs might be discerned by case study.
Within an order, area of habitat seems to partly explain variation in management costs.
More data and more analysis needed to determine cost drivers.
Figure 2: PV of costs of objectives as a percentage of total cost 2003-2012

Single species programs

Stephens Island ground beetle
Stephens Island frog
climbing everlasting daisy
P. patulum
Campbell Island teal
flax snail
kakapo
mohua
South Island long-tailed bat
Black Stilt
North Island kokako

Advocacy and education
Survey and monitoring
Research
Captive breeding
Control of threats
Protection from threats
Breeding in wild
Translocation
Habitat restoration
Comments on Costs

Information on costs and expenditures is valuable.

Analysis of this information can help us understand opportunity costs of choices, determine how to achieve more with current resources, allocate resources to best effect.
Evaluation

When it comes to evaluating the success of its interventions, the field of ecosystem protection and biodiversity conservation lags behind most other policy fields. Ferraro and Pattanayak, 2006.

Lack of evaluation in nature conservation is disappointing.

Evaluation requires effort and expenditure. Is it worth it?

Ando et al., 1998 - consideration of both economic and ecologic factors meant could achieve habitat for 453 endangered species at one sixth of cost if solely ecologic factors considered.
Is Evaluation possible?

At this time, in fact, many recovery management actions cannot be determined to be successful or unsuccessful’ (Abbitt & Scott 2001: 1281).

Evaluation in nature conservation is feasible and essential to determine if progress is being made. There are many evaluation techniques available, both ecologic and economic, but a reluctance often to use them.

‘Few well-designed empirical analyses assess even the most common biodiversity conservation measures.’

Millennium Ecosystem Assessment, 2005
Is state of the art essential?

*If any progress is to be made in stemming the global decline of biodiversity, the field of conservation policy must adopt state-of-the-art program evaluation methods to determine what works and when.* Ferraro and Pattanayak, 2006: 482

Ferraro and Pattanayak may aim too high. Feasible low cost techniques may be more readily introduced and used.

Cost Effectiveness Analysis and Cost Utility Analysis are two such techniques.
Cost Utility Analysis

Can we compare what did happen to a species, to what would have happened if there was no species management?

Expert assessment required

Quantify the gain from management

\[ \text{COPY}_i = \sum_t (S_{tw} - S_{tw/o}) \]

- \( S_{tw} \) is species’ i conservation status in year t with management
- \( S_{tw/o} \) is species i conservation status in year t without management

Measure the cost of management

Calculate amount of conservation gain per $ cost
Evaluation of single species programmes

<table>
<thead>
<tr>
<th>Species recovery programme</th>
<th>Present Value of Total Expenditure</th>
<th>PV Expenditure per COPY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brothers Island tuatara <em>Sphenodon guntheri</em></td>
<td>13 694</td>
<td>40 780</td>
</tr>
<tr>
<td>Cook Strait tuatara <em>Sphenodon punctatus</em></td>
<td>13 694</td>
<td>76 457</td>
</tr>
<tr>
<td>Campbell Island teal <em>Anas anas nesietis</em></td>
<td>39 940</td>
<td>103 178</td>
</tr>
<tr>
<td>Short tailed bat <em>Mystacina tuberculata</em></td>
<td>318 938</td>
<td>184 570</td>
</tr>
<tr>
<td>Yellow-eyed penguin <em>Megadyptes anipodes</em></td>
<td>603 013</td>
<td>305 344</td>
</tr>
<tr>
<td>Hector's dolphin <em>Cephalorynchus hectori</em></td>
<td>773 844</td>
<td>1 048 245</td>
</tr>
<tr>
<td>Black stilt <em>Himantopus novaezelandiae</em></td>
<td>2 441822</td>
<td>1 077 724</td>
</tr>
<tr>
<td>Takahe <em>Porphyrio hochstetteri</em></td>
<td>3 278178</td>
<td>2 327 560</td>
</tr>
<tr>
<td>Project and location</td>
<td>Area (ha)</td>
<td>PV of costs $\text{r} = 6%$</td>
</tr>
<tr>
<td>--------------------------------------</td>
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<td>--------------------------------</td>
</tr>
<tr>
<td><strong>Offshore Islands</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Little Barrier Island</td>
<td>2,817</td>
<td>$770,345</td>
</tr>
<tr>
<td>Tiritiri Matangi</td>
<td>218</td>
<td>$1,547,381</td>
</tr>
<tr>
<td>Maud Island</td>
<td>320</td>
<td>$2,162,521</td>
</tr>
<tr>
<td>Mean Offshore Island</td>
<td>1118.3</td>
<td>$1,496,749</td>
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<tr>
<td><strong>Mainland Islands</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rotoiti</td>
<td>825</td>
<td>$1,408,457</td>
</tr>
<tr>
<td>Hurunui</td>
<td>12,000</td>
<td>$863,498</td>
</tr>
<tr>
<td>River Recovery</td>
<td>11,000</td>
<td>$3,966,070</td>
</tr>
<tr>
<td>Mean Mainland Island</td>
<td>7941.7</td>
<td>$2,079,342</td>
</tr>
</tbody>
</table>
Insights from evaluation

Evaluation can check whether some projects are much more cost effective than are other projects. Allow us to test assertions such as … “offshore islands have a significant advantage over mainland islands.”

Are there economies of scope - do multi species projects achieve more per $ than do single species projects?
A Conserv-Vision

By 2012 the following are widely adopted:

• Conservation programme outcomes and their counterfactuals are projected.
• Conservation programmes are costed before decisions are taken.
• Quantifiable, time-linked conservation goals are chosen.
• Timely monitoring and reporting of conservation programme outcomes and costs.
• Evaluation of conservation programmes including comparison to counterfactuals.