

Success and cost effectiveness of multi-species projects

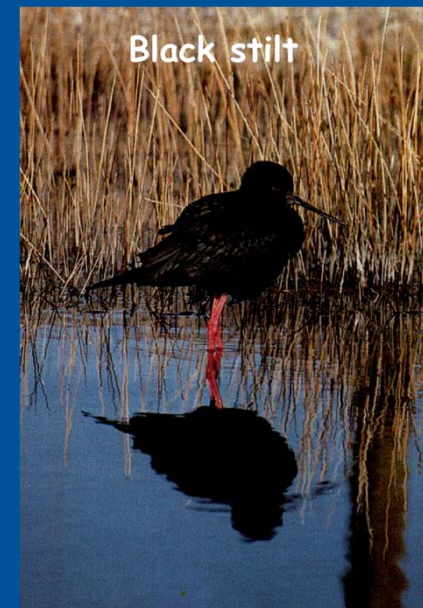
Ross Cullen , Ken Hughey,
Emma Moran

Lincoln University

<http://www.lincoln.ac.nz>

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Mitigating mammalian pests program.



OUTLINE

- Problem investigated
- Cost Utility Analysis and COPY
- Success
- Cost Effectiveness Analysis
- Problems and risks
- Policy implications
- Future directions

The Global Problem

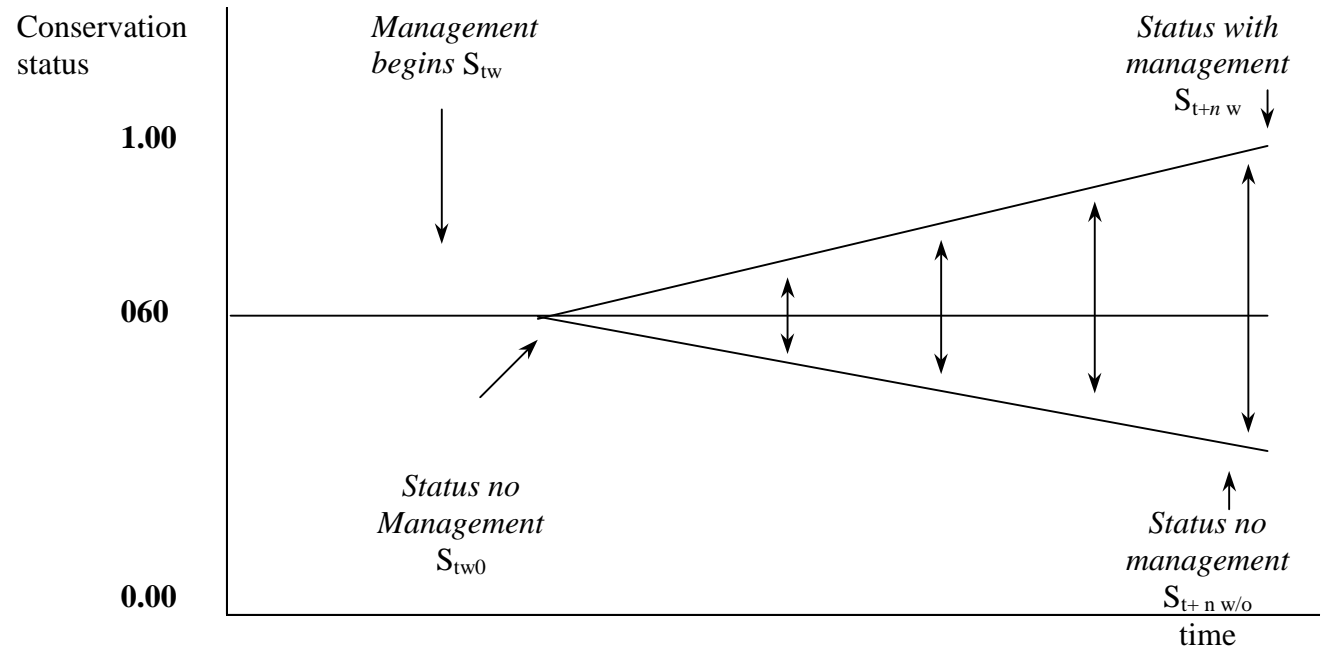
- Species loss is widely recognised as one of the most serious environmental problems nations face.
- There are 7- 20 million species on the planet.
- Expected loss of species in 25 years 140 000 – 5m.
- 2 - 25% of species are at risk. (UNEP; in World Bank, 2000).
- Expenditures on species protection projects are large, e.g., US\$280m/annum USA. Are increasing rapidly in NZ, NZ\$187 million over 5 years.
- Of 142 nations compared against a wide variety of indicators New Zealand is considered to be performing worst in terms of biodiversity (World Economic Forum 2002)

The Conservation Context in NZ

- New Zealand reported to have 1300 threatened and endangered species.
- About 34 species have 'recovery plans' some operating since at least 1987.
- Biodiversity strategy projects approx NZ \$1 billion additional expenditure on biodiversity programs over the next 20 years.
- Obvious challenges, develop methodologies to :
 - aid investment decision-making
 - evaluate the programs and projects.

COST UTILITY ANALYSIS

- Previous applications for single-species programmes.
- Definition and measurement of output needs refinement.
- Output measured by way of status of a species, c.f. a counterfactual (a 'with' versus 'without' approach).
- Conservation Output Protection Year - COPY is measure of output produced.
- COPY is a measure of time varying quality.
- i.e., the summed gain in conservation status 'With Management' compared to 'Without Management'.



Success, and Output from projects

- OUTPUT is the number of COPY gained from a multi species project.
- S_{tw} is conservation status in year t with management.
- S_{t-1w} is conservation status in year t-1 with management.
- $S_{tw/o}$ is conservation status in year t without management.
- $S_{t-1w/o}$ conservation status in year t -1 without management
- d is the discount rate.

Measurement of output from projects

- Measurement of output produced by projects is essential to determine if they are successful or not.
- Score assigned to each species depends on function chosen, e.g., linear, quadratic.
- Linear function assumes changes of equal importance e.g., Nationally Endangered to Extinct, same importance as Serious Decline to Nationally Endangered.
- Quadratic function reports greater value to changes at bottom of scale, e.g., a change from NE to E more value than SD to NE.
- Measurement of output produced using continuum from 0.00 to 1.00, and a quadratic function.

Study projects and approach

- We measure success, calculate output, and calculate cost effectiveness for six multi-species projects.
- Three Mainland Islands: Project River Recovery, Hurunui, Rotoiti.
- Three offshore islands: Maud, Tiritiri Matangi, Little Barrier.
- We recognise that projects have multiple goals.

Data collection

- Advised by DOC staff we obtained species status scores, and project cost data from the relevant project planners or managers.
- Some data also obtained from threatened species managers where necessary.
- Structured personal interviews, and a questionnaire used to collect data.
- Managers/planners provided each threatened species status 'With management', and 'Without management' using the conservation status continuum, and quadratic scale.

Results

- Zero COPY indicates there has been no divergence between a species status 'with management', and its 'without management' status.
- For each project we summed the COPY produced by each species, to obtain total project COPY, as our measure of output produced.
- 5 out of 6 multi-species projects have been successful, > 0.00 COPY.
- Little Barrier is the most successful project.
- Rotoiti MI has produced zero COPY.
- Offshore Is. mean COPY = 1.84, MI mean COPY = 0.57

Output from each project, numbers of COPY

Mainland Island	Offshore Island
<u>Project River Recovery</u>	<u>Maud Island</u>
Black Stilt 0.07	Maud Island Frog 1.215
Wrybill Plover 0.00	Stephens Island Gecko 0.87
Black Fronted tern 0.02	Giant Weta ?
Robust Grasshopper <u>0.07</u>	Kakapo 0.00
Total COPY 0.16	Wood pigeon <u>0.00</u>
	Total COPY 2.085?
<u>Hurunui</u>	<u>Little Barrier Island</u>
Yellowhead 0.14	North Island Saddleback 1.05
Great Spotted Kiwi 0.00	North Island kokako 0.55
Orange Fronted parakeet 1.04	North Island tuatara 0.00
Yellow Crown parakeet 0.10	Stitchbird <u>1.39</u>
South Island Kaka 0.00	Total COPY 2.99
Mistletoes <u>0.00</u>	
Total COPY 1.28	
<u>Rotoiti</u>	<u>Tiritiri Matangi</u>
South Island kaka 0.00	Takahe 0.09
South Island robin 0.00	Little Spotted Kiwi 0.00
Yellow Crown parakeet 0.00	Brown Teal 0.00
Mistletoes <u>0.00</u>	Stitchbird 0.06
Total COPY 0.00	North Island kokako <u>0.00</u>
	Total COPY 0.15

COSTS

Cost estimation tricky but achievable :

- Programs/project implemented together at a site
- Accounting system designed for record keeping not policy analysis
- \$ are available in different output classes

Same cost components collected for each program:

- Direct operational costs
- Organisation overhead component
- Staff salaries
- Capital charge

Costs, and cost effectiveness.

Discount rates
(%)

Project	0	3	6	10
River Recovery				
PV of Costs	\$5133758	\$4373811	\$3,772,120	\$3151261
Annualised cost			\$478,278	
Annualised cost/ha			\$43.48	
PV per COPY	\$32085988	\$27336320	\$23,575,751	\$19695382
Hurunui				
PV of Costs	\$104 6271	\$963947	\$892,760	\$811996
Annualized Cost			\$159,920	
Annualised cost/ha			\$13	
PV per COPY	\$817399	\$753084	\$697,469	\$634372
Rotoiti				
PV of Costs	\$1631540	\$1520236	\$1,422,720	\$1310512
Annualised costs			\$387,321	
Annualised cost/ha			\$469	
PV per COPY	undefined	undefined	undefined	undefined
Maud Island				
PV of Costs	\$3277849	\$2742837	\$2,342,837	\$1949018
Annualised Cost			\$241218	
Annualised cost/ha			\$754	
PV per COPY			\$1,123,662	
Little Barrier Island				
PV of Costs	\$1279103	\$1105252	\$972 ,803	\$840539
Annualised Costs			\$100,162	
Annualised cost /ha			\$36	
PV per COPY	\$427 794	\$369649	\$325,352	\$281116
Tiritiri Matangi Island				
PV of Costs	\$2347206	\$1949414	\$1,651,838	\$1361288
Annualised Cost			\$170078	
Annualised cost/ha			\$780	
PV per COPY	\$15 648 040	\$12996093	\$11,012,259	\$9075253

Results/implications

- Three projects with small area have annual costs/ha 20x the cost/ha of three large projects.
- Tiritiri Matangi costs 60x more/ha than does Hurunui.
- Annualised costs of projects range: \$81,000- \$509,000.
- 3 MI projects mean annualised cost 2x that of 3 OI projects, but only 30% of their mean COPY.
- Cost per COPY range: \$432, 000 to at least \$20million.
- Three projects cost per COPY < \$ 1.5m, manage large % of total population of one or more species.
- 6 multi-species c.f. 8 single species programmes (Cullen et al.; 200), shows MS projects have higher cost, less output, & worse cost effectiveness ratios.

Self critique

- We have focused on projects' success at managing threatened species, and recognise projects have multiple goals.
- We have only measured success and cost effectiveness at 3 MI and 3 OI.
- Focus on final rather than intermediate outputs
- Inadequate expenditure data still a big problem

Policy Implications

- Technique provides practical means to evaluate success, productivity, cost effectiveness of projects.
- Information requirements light, even for MS projects.
- Wide divergences in annual costs, output produced, cost/COPY.
- Successful projects manage big% of species, make significant progress cf 'no project'.
- Multi species projects are inferior to single species programmes
- MI projects inferior to OI projects.
- Results useful guide for project selection and resource allocation.

Future Directions

- Operationalise use of CUA.
- Ex ante rather than ex post analysis, via modelling of project success and COPY expected from projects
- Projection of expected costs of species recovery programmes.
- Modelling to determine likely outcomes if follow rules, e.g. most at risk first, K birds first, most unique species first, least cost species first, equal expenditure on all species, etc.