THE TAMAR SUSTAINABILITY INDEX (TSI)

Quantifying the benefits of environmental stewardship services supplied by farmers and graziers at the regional scale

A joint project by Tamar NRM and CSIRO funded by the Australian Government Department of Agriculture, Fisheries and Forestry National Landcare Program

CSIRO

Tamar Region Natural Resource Management Strategy

Australian Government
Department of Agriculture, Fisheries and Forestry
National Landcare Programme

What is the TSI?

The Tamar Sustainability Index (TSI) is a system for calculating the benefits of environmental stewardship services that farmers provide to the wider community.

The project is collaboration between CSIRO and Tamar NRM and is funded by the Department of Agricultural, Fisheries and Forestry under the National Landcare Programme.

The project commenced in March 2007 and is due to be completed by June 2008. A draft specification of the TSI has been produced. This involves on-ground field testing and the development of calculation procedures, computerised databases and decision support tools.

The TSI is being developed in the Tamar NRM region of Northern Tasmania with a view to national application given appropriate regional adjustments.

Stewardship Services

Many of Australia's farmers, graziers and land managers undertake activities that supply social benefits above and beyond food and fibre production. These activities are commonly referred to as stewardship services. A few examples include:

- Fencing-off creeks and natural habitat to protect biodiversity
- Removing harmful pest animals and weeds
- Maintaining long-term soil productivity (for future generations)
- Taking actions to improve catchment water quality
- Saving water to make more available for alternative uses (environmental, residential, industrial, agricultural)
- Sequestering greenhouse gases and reducing air pollution (*e.g.* caused by wind erosion)
- Preserving cultural heritage and the look and feel of rural landscapes

These types of activities may sometimes occur as part of a government or industry program, but they also occur on a voluntary and informal basis.

Why do we need an index?

The Tamar Sustainability Index (TSI) can be used to quantify the relative value of stewardship services occurring in different parts of the landscape. This is crucial for effective operation of a stewardship services program. The TSI can be used target scarce fiscal resources and guide payments to farmers and graziers.

Just as stock market indices can be used to help guide investor decisions on stock portfolios, the TSI will help guide investor decisions on stewardship services. Investors in stewardship services may be government agencies, private companies, non-government organisations, industry groups, community groups or individuals.

Without an index to guide payments we can never really make stewardship services programs work properly. We need an index to quantify the value of what we are buying.

How does the TSI work?

The TSI is comprised of 55 indicators (see Appendices A and B) under three broad groupings: site suitability; site management and contract security. These indicators account for a wide range of stewardship services on a given site. A site is a geographically defined area (usually within a single farm property) within which stewardship services are occurring – *e.g.* a revegetation site; weed removal site.

The indicators are combined to form an overall index using a technique called multiple criteria analysis. This involves placing a weight on each indicator (based on

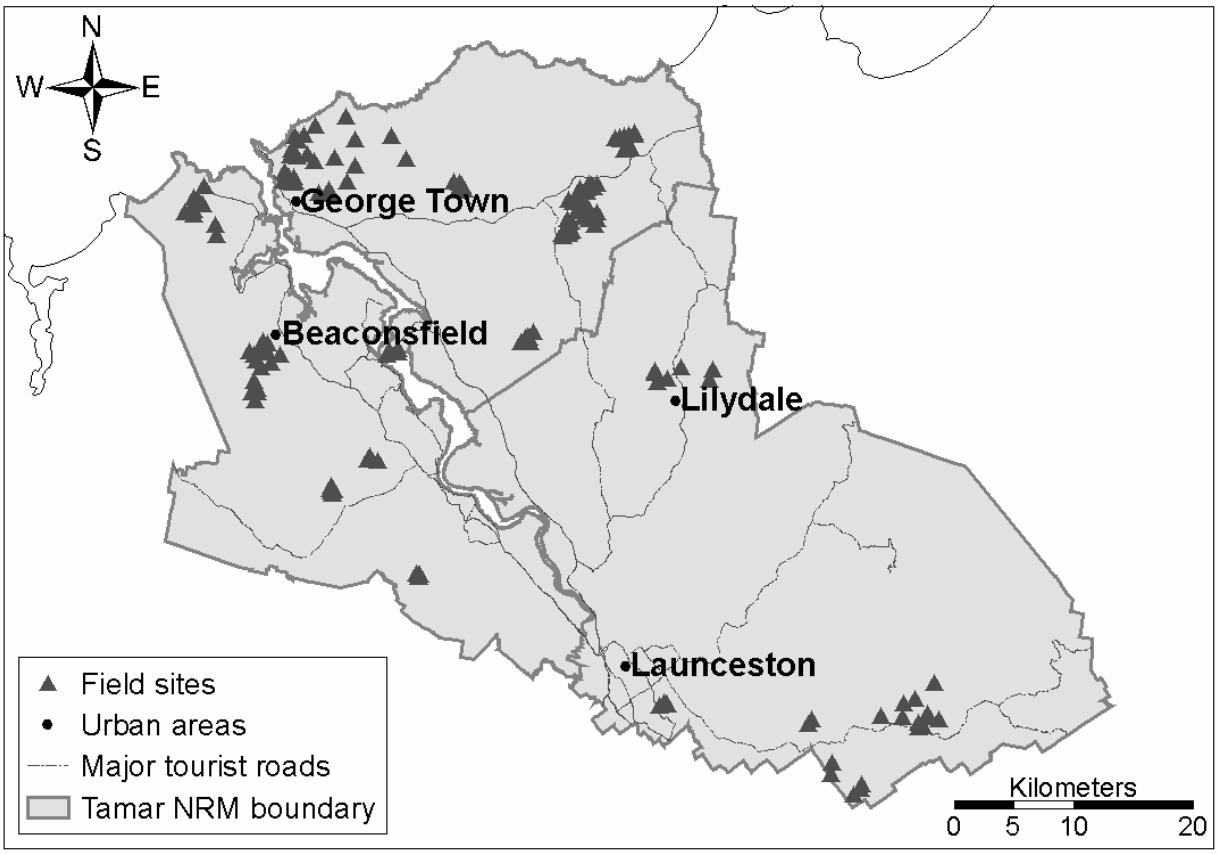
its relative importance). The result is an overall score between 0 (lowest benefit) and 100 (highest benefit).

The TSI indicators use information from the farmer, field assessments, natural resource condition maps and scientific models. As part of the TSI project a guidebook is being prepared on how to record the information required by each indicator.

The TSI data is stored in a customised MS Access database with a user-friendly interface. It can then be exported to a user-friendly multiple criteria analysis software tool. This is where decision makers can weight the criteria and compute an overall TSI score for each stewardship site. This also allows a cost (in dollars) to be entered for each site. The software can then determine the optimum portfolio of stewardship sites to fund under a constrained budget.

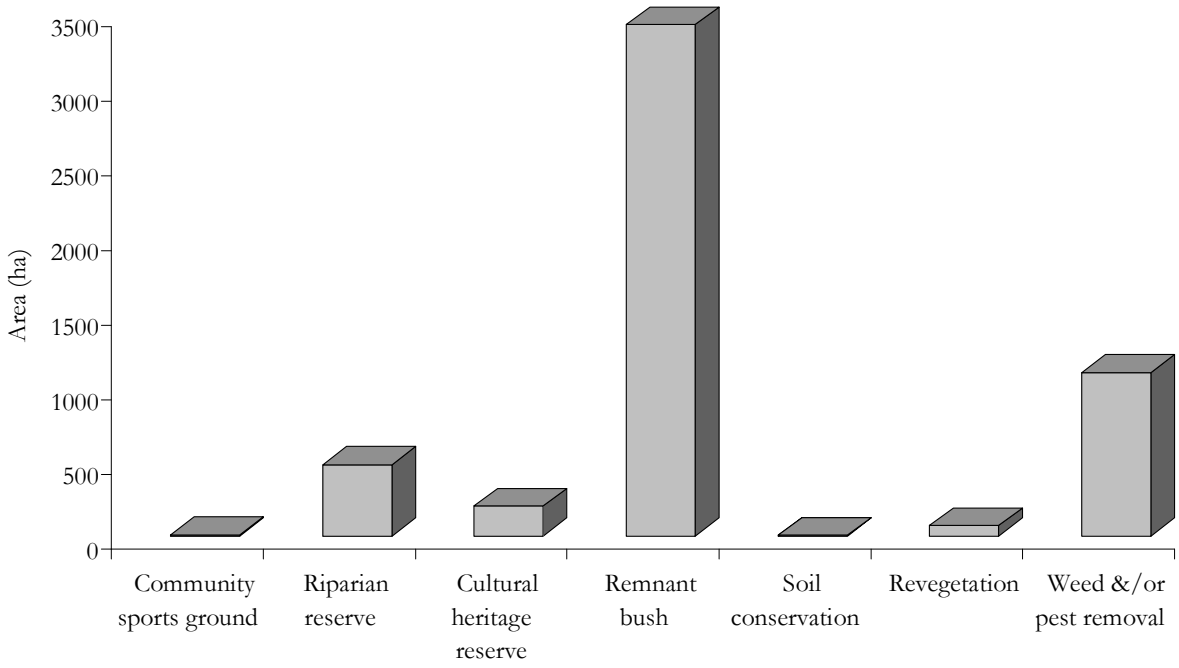
Field Testing

During November/December 2007 the CSIRO and Tamar NRM research team visited 21 farm properties with 154 environmental stewardship sites across the Tamar Region. A TSI score was computed for each site. An estimate was also made of the cost of supplying the services. The research team also sought input from a 32 person consultative group to select and weight indicators which comprise the TSI. The consultative group is made up of persons with knowledge/expertise of natural resource management issues within the region.

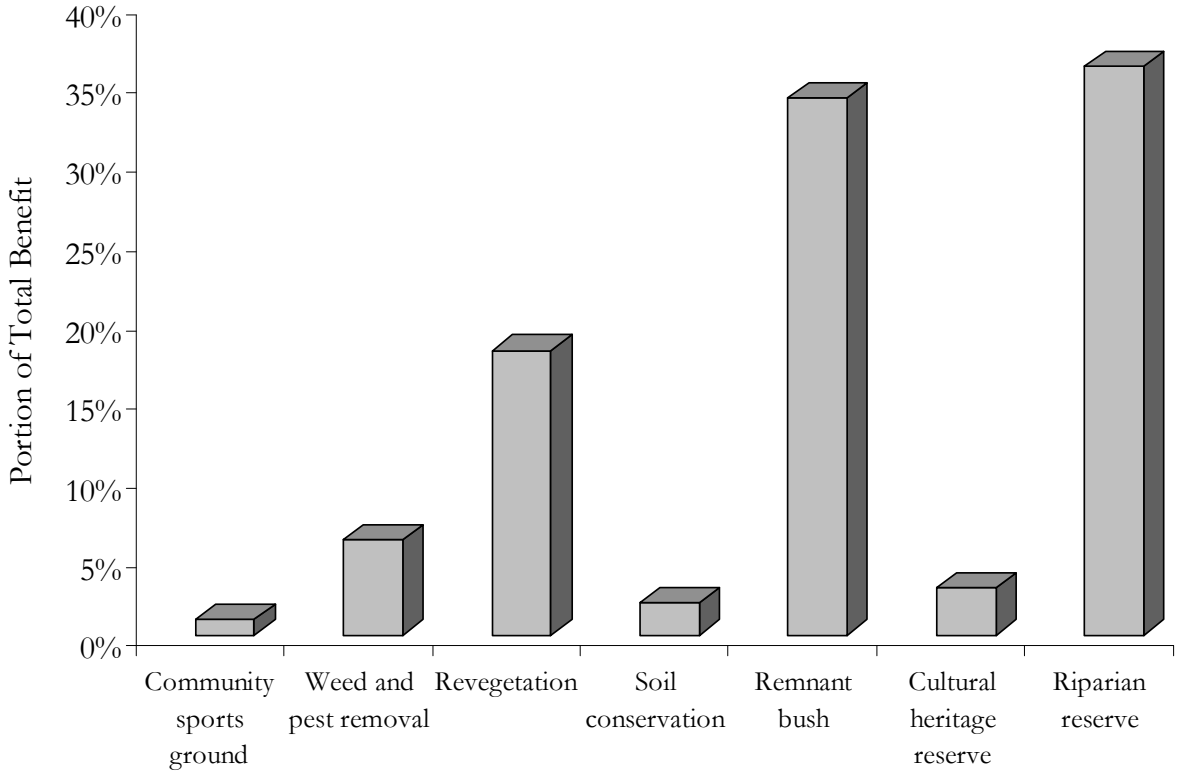


Results of Field Testing

By far the largest area of stewardship services was devoted to remnant bushland, followed by weed and pest removal. Farmers identified small areas of revegetation, soil conservation and community facilities.



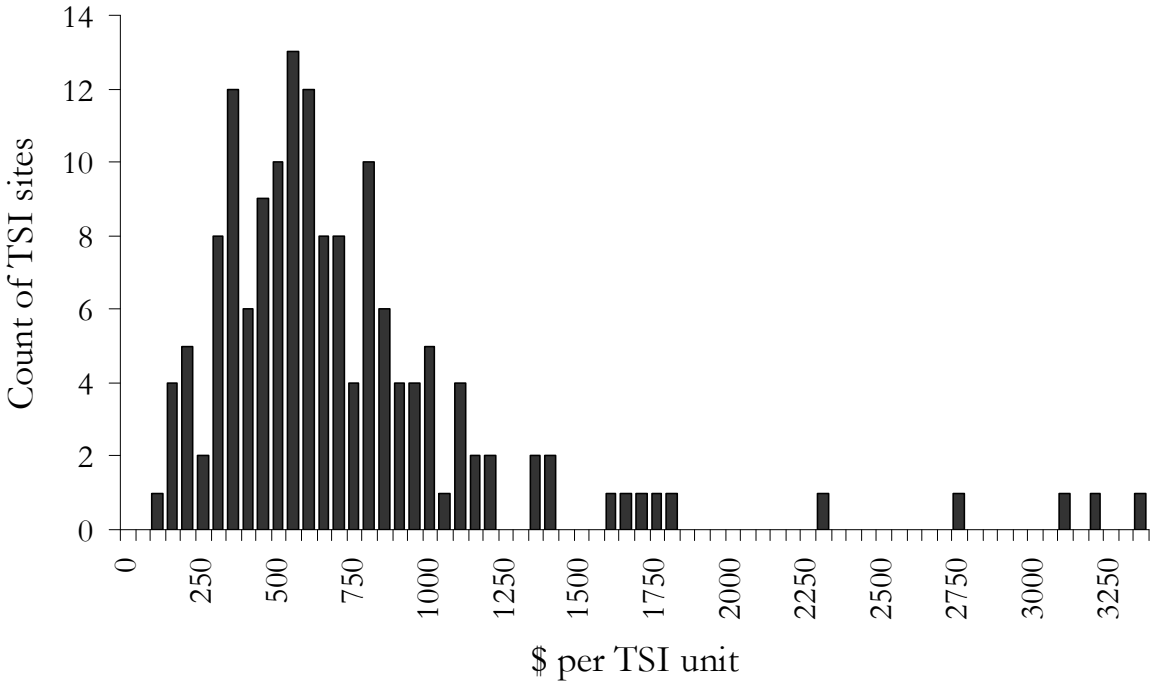
When viewed as the contribution to total benefit (as measured using the TSI) this picture changes. The largest benefit comes from riparian reserves – largely due to water quality benefits.



With information on costs and benefits it is possible to consider the optimal portfolio of stewardship sites to fund under a constrained budget. This is because we have data on the benefit cost ratios of each site. We also know the unit price of a TSI unit (i.e. $/TSI) and over time we can learn about the market and know what is "a good deal". The aggregate results for the Tamar Region are as follows.

	Area (ha)	Cost ($)	Cost / ha ($/ha)	TSI Score	B / C ratio
Total (sum)	5272	2,778,357	527	3735.8	0.3324
Maximum	875	131,335	600,844	43.6	0.0141
Minimum	0.02	1,358	55	12.3	0.0003
Average	34	18,041	11,325	24.3	0.0022
Standard Deviation	116	16,915	50,673	5.0	0.0017

There was much variation in the unit prices (cost : benefit ratios) of TSI units. As shown below it can be seen there is a cluster around $500/TSI unit then a long tail up to $3,250/TSI unit. This tells us that the costs of environmental stewardship services will play a major role in investment decisions.



Will the TSI have Australia-wide applicability?

Potentially, but it will need modifications to suit the specific social, economic and environmental conditions of Australia's diverse natural resource management regions. Our aim is to develop it in the Tamar NRM region with a view for potential State and National application.

The methods and decision support systems we have developed in the Tamar NRM region are transferrable to other regions. The TSI could be used as a 'template' by other regions and help reduce the costs of starting from scratch. This approach will help improve the transparency, auditability and analytic rigour of investment decisions.

How can I get more information?

To find out more about this project please contact Kay Bailey from Tamar NRM:

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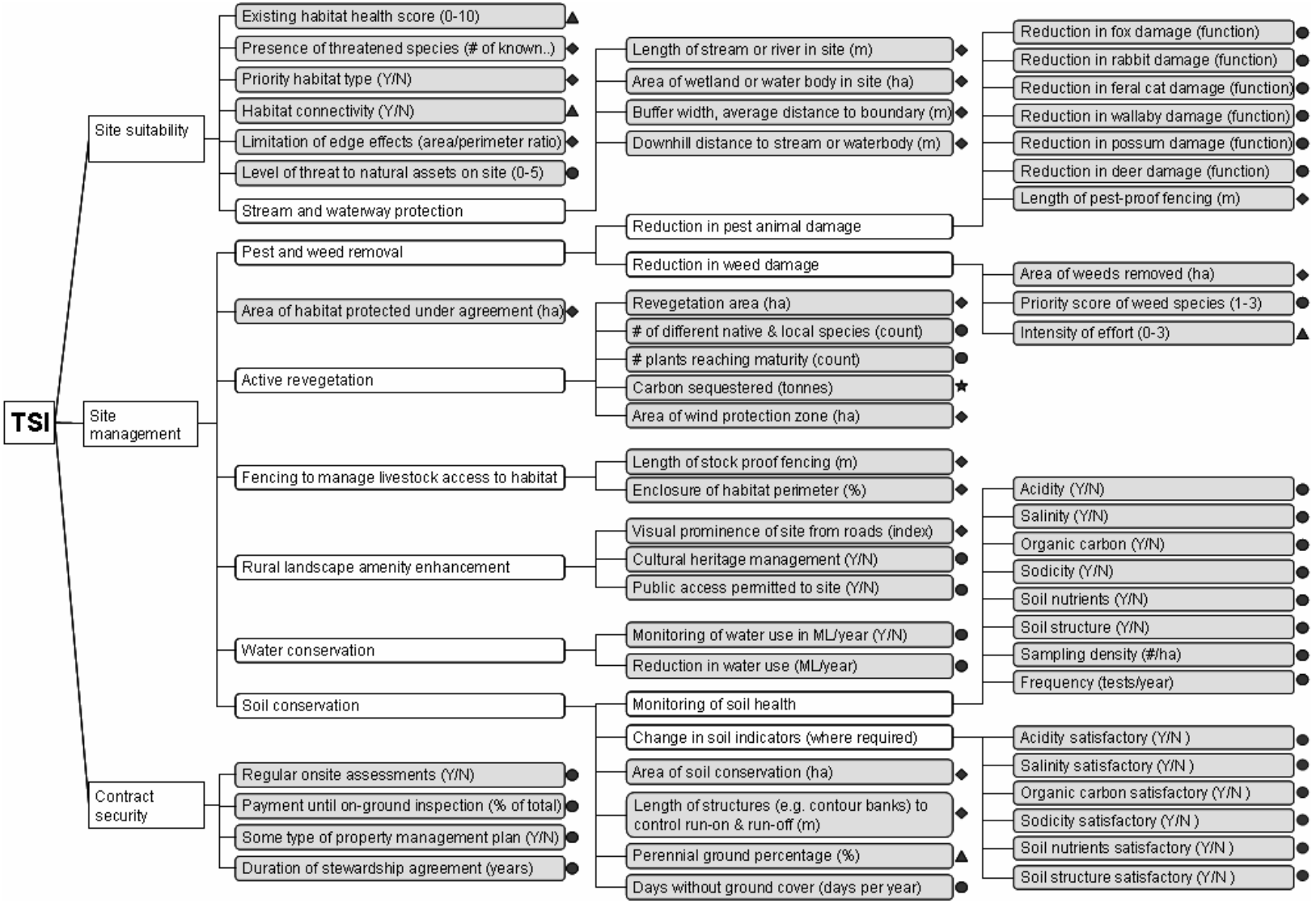
The research team includes Dr Stefan Hajkowicz and Kerry Collins of CSIRO Sustainable Ecosystems based in Brisbane.

Appendix A. The TSI Structure. These indicators comprise the Tamar Sustainability Index (TSI). Grey boxes are the fingertip indicators of the TSI for which data is recorded. The symbols indicated the data source: ▲ field inspections, ♦ GIS, ● farmer/contract, ★ computer model.



Appendix B. Weights for indicators in the Tamar Sustainability Index

These weights were provided by the multi-stakeholder consultative group in the Tamar Region.

#	Indicator name	Units	Weight[c]	Cat-egory[d]
1	Existing habitat health score	Score (-44 to +44)	4.6%	A
2	Presence of threatened species[a]	Number	4.7%	A
3	Priority habitat type	Yes/No	4.8%	A
4	Habitat connectivity - marginal gain	Yes/No	4.0%	A
5	Limitation of edge effects (area/perimeter ratio)[a]	Ratio	3.2%	A
6	Level of threat to natural assets on site	Score (0 to 5)	4.0%	A
7	Length of stream or river in site	Meters	2.0%	A
8	Area of wetland or water body in site	Hectares	2.0%	A
9	Waterway buffer width, average distance to boundary[a]	Meters	1.9%	A
10	Downhill distance to stream or water body[a]	Meters	1.3%	A
11	Area of habitat protected under agreement	Hectares	7.8%	B
12	Reduction in fox damage	Function	0.3%	B
13	Reduction in rabbit damage	Function	0.4%	B
14	Reduction in deer damage	Function	0.3%	B
15	Reduction in wallaby damage	Function	0.5%	B
16	Reduction in possum damage	Function	0.4%	B
17	Reduction in feral cat damage	Function	0.4%	B
18	Length of pest-proof fencing	Meters	1.0%	B
19	Area of weeds removed	Hectares	1.5%	B
20	Priority score of weed species removed	Score (0 to 3)	1.5%	B
21	Intensity of effort	Score (0 to 3)	0.9%	B
22	Revegetation area	Hectares	1.7%	B
23	Number of different native and local species used	Number	1.2%	B
24	Number of plants reaching maturity	Number	1.2%	B
25	Carbon sequestered	Tonnes	1.1%	B
26	Area of wind protection zone	Hectares	0.8%	B
27	Length of stock proof fencing	Meters	3.8%	B
28	Enclosure of habitat perimeter[b]	Percentage	3.8%	B
29	Visual prominence of site from roads	Number	1.1%	B
30	Cultural heritage management	Yes/No	0.8%	B
31	Public access permitted to site	Yes/No	0.7%	B

32	Monitoring of water use in ML/year	Yes/No	3.6%	B
33	Reduction in water use	ML/Year	3.7%	B
34	Area of soil conservation	Hectares	1.4%	B
35	Length of structures used to control run-off and run-on	Meters	0.6%	B
36	Perennial ground cover percentage	Percentage	1.2%	B
37	Days without ground cover	Number	0.8%	B
38	Acidity monitoring	Yes/No	0.2%	B
39	Salinity monitoring	Yes/No	0.2%	B
40	Organic carbon monitoring	Yes/No	0.3%	B
41	Sodicity monitoring	Yes/No	0.2%	B
42	Soil nutrients monitoring	Yes/No	0.2%	B
43	Soil structure monitoring	Yes/No	0.3%	B
44	Analysis frequency	Number / Year	0.2%	B
45	Sampling density	Number / Hectare	0.2%	B
46	Acidity satisfactory	Yes/No	0.2%	B
47	Salinity satisfactory	Yes/No	0.2%	B
48	Organic carbon satisfactory	Yes/No	0.2%	B
49	Sodicity satisfactory	Yes/No	0.2%	B
50	Soil nutrients satisfactory	Yes/No	0.2%	B
51	Soil structure satisfactory	Yes/No	0.3%	B
52	Regular onsite assessments	Yes/No	4.9%	C
53	Payment until on-ground inspection	Percentage of total	3.8%	C
54	Current property management plan (or something similar)	Yes/No	6.8%	C
55	Duration of stewardship agreement	Years	5.9%	C

a. Concave transformation function (Equation 3)
b. Convex transformation function (Equation 4)
c. This is the average weight for the consultative group members.
d. Categories: A=Site Suitability; B=Site Management; C=Contract security.
e. Data source: ▲ field inspections, ♦ GIS, ● farmer/contract, ★ computer model.