Some common funding considerations referred to as decision/funding criteria in this paper maybe incorporated within a spreadsheet environment. They include funding limits for subsets of particular features; requirement that dollar allocations to projects be within a given percent of requested amounts (the dollar amounts in the last row of Table 1 in the manuscript 1); ranked priorities and preferences in funding Category 2 features; and observance of complementary relationships among project features, i.e., funding all or none of certain combinations of features. For illustration purposes in this context, suppose the interest of the evaluator is the examination of funding only Category 2 features j=1-9 of Table 1 of the manuscript. Let the enumeration v=0,1,…,511 denote the funding scenarios. Further, let the following apply to the funding: 1) \$2M cap for Category 2 features; 2) features j=1,2 are funded jointly or neither is funded; 3) at least three features among j=1-9 must be funded in every scenario; 4) the percent of total funded dollars allocated to Category 2 features must be between 10% and 20%; and 5) the scenario score of the perceived value of funding features j=1-9 must be at least 15. Each Category 2 feature is assigned the score value of 1, 2, 3, 4, or 5 that reflects its reviewer-perceived outcome value where 1 denotes low outcome value and 5 indicates high outcome value. See Agol et al. (2014) for discussion of methods for evaluating the impact/outcome of conservation projects on the environment. In a formal framework the above considerations may be expressed as follows

Criterion 1: $0.280f_{2,1} + 0.352f_{2,2} + 0.375f_{2,3} + \ldots + 0.536f_{2,9} \leq 2$
Criterion 2: $f_{2,1} + f_{2,2} \neq 1$ (=0 or 2)
Criterion 3: $f_{2,1} + f_{2,2} + \ldots f_{2,9} \geq 3$
Criterion 4: $0.10 \leq (0.280f_{2,1} + 0.352f_{2,2} + 0.375f_{2,3} + \ldots + 0.536f_{2,9})/(11.069 + 0.280f_{2,1} + 0.352f_{2,2} + 0.375f_{2,3} + \ldots + 0.536f_{2,9}) \leq 0.20$
Criterion 5: $5f_{2,1} + 5f_{2,2} + 2f_{2,3} + 4f_{2,4} + 3f_{2,5} + 4f_{2,6} + 4f_{2,7} + 3f_{2,8} + 3f_{2,9} \geq 15.$

where $f_{2,1}, f_{2,2}, \ldots, f_{2,9}$ are indicator variables with values 0 or 1 indicating respectively exclusion or inclusion of Category 2 feature j (=1,2,…,9) in scenario v under examination. The 0/1 values of each scenario v are used to evaluate Criteria 1-5. This is conveniently done using the =sumproduct (•) function of Excel. This will be explained further in the narrative that follows.

The worksheet Illustration3.xlsx was developed for this situation by adapting the Evaluation sheet of Illustration1.xlsx in the following ways. First, six additional rows were inserted in the Evaluation sheet of Illustration1.xlsx after row 6. Row 11 of Illustration1.xlsx now appears as row 17. The purpose of doing so will be explained shortly. Thereafter, the Fill feature of Excel was used to enter respectively the values of v (=0,1,…,511) in cells F17, …, F528 of the emerging Evaluation sheet. Then the cell formulae of G48-AP48 were copied to cells G49-AP528. In doing so, the v in cells F17-F528 were converted to 0/1 form producing the 0/1 values of $f_{2,1},\ldots, f_{2,9}$ in cells K49-S528 of the Evaluation sheet of Illustration3.xlsx. A partial image of the Evaluation sheet of Illustration3.xlsx appears in Figure 3.1. It displays the results for the scenarios in which Category 2 features j=1-5 are introduced one-at-a-time with feature j=9.

Figure 3.1
Partial image of the evaluation sheet of illustration3.xlsx.

	F	I	J	K	L	M	N	O	P	Q	R	S	BY	BZ	CA	CB
15				Decatenated 0/1 characters of v and the 0/1 values of f2,j, j=1,…,9												
16	Scenario reference, v	Binary form of v		1	2	3	4	5	6	7	8	9	Funded Category 2 features, j	r	Funding cost[1]	Indicator of scenario v feasibility

273	256	00000001	00000000	0	0	0	0	0	0	0	0	1	9	1	11.605	0
274	257	00000001	00000001	1	0	0	0	0	0	0	0	1	1 9	2	11.885	0
275	258	00000001	00000010	0	1	0	0	0	0	0	0	1	2 9	2	11.957	0
276	259	00000001	00000011	1	1	0	0	0	0	0	0	1	1 2 9	3	12.237	0
277	260	00000001	00000100	0	0	1	0	0	0	0	0	1	3 9	2	11.980	0
278	261	00000001	00000101	1	0	1	0	0	0	0	0	1	1 3 9	3	12.260	0
279	262	00000001	00000110	0	1	1	0	0	0	0	0	1	2 3 9	3	12.332	0
280	263	00000001	00000111	1	1	1	0	0	0	0	0	1	1 2 3 9	4	12.612	1
281	264	00000001	00001000	0	0	0	1	0	0	0	0	1	4 9	2	12.003	0
282	265	00000001	00001001	1	0	0	1	0	0	0	0	1	1 4 9	3	12.283	0
283	266	00000001	00001010	0	1	0	1	0	0	0	0	1	2 4 9	3	12.355	0
284	267	00000001	00001011	1	1	0	1	0	0	0	0	1	1 2 4 9	4	12.635	1
285	268	00000001	00001100	0	0	1	1	0	0	0	0	1	3 4 9	3	12.378	0
286	269	00000001	00001101	1	0	1	1	0	0	0	0	1	1 3 4 9	4	12.658	0
287	270	00000001	00001110	0	1	1	1	0	0	0	0	1	2 3 4 9	4	12.730	0
288	271	00000001	00001111	1	1	1	1	0	0	0	0	1	1 2 3 4 9	5	13.010	1
289	272	00000001	00010000	0	0	0	0	1	0	0	0	1	5 9	2	12.012	0
290	273	00000001	00010001	1	0	0	0	1	0	0	0	1	1 5 9	3	12.292	0
291	274	00000001	00010010	0	1	0	0	1	0	0	0	1	2 5 9	3	12.364	0
292	275	00000001	00010011	1	1	0	0	1	0	0	0	1	1 2 5 9	4	12.644	1
293	276	00000001	00010100	0	0	1	0	1	0	0	0	1	3 5 9	3	12.387	0
294	277	00000001	00010101	1	0	1	0	1	0	0	0	1	1 3 5 9	4	12.667	0
295	278	00000001	00010110	0	1	1	0	1	0	0	0	1	2 3 5 9	4	12.739	0
296	279	00000001	00010111	1	1	1	0	1	0	0	0	1	1 2 3 5 9	5	13.019	1
297	280	00000001	00011000	0	0	0	1	1	0	0	0	1	4 5 9	3	12.410	0
298	281	00000001	00011001	1	0	0	1	1	0	0	0	1	1 4 5 9	4	12.690	0
309	282	00000001	00011010	0	1	0	1	1	0	0	0	1	2 4 5 9	4	12.762	0
300	283	00000001	00011011	1	1	0	1	1	0	0	0	1	1 2 4 5 9	5	13.042	1
301	284	00000001	00011100	0	0	1	1	1	0	0	0	1	3 4 5 9	4	12.785	0
302	285	00000001	00011101	1	0	1	1	1	0	0	0	1	1 3 4 5 9	5	13.065	0
303	286	00000001	00011110	0	1	1	1	1	0	0	0	1	2 3 4 5 9	5	13.137	0
304	287	00000001	00011111	1	1	1	1	1	0	0	0	1	1 2 3 4 5 9	6	13.417	0

[1] $M.

The Excel© function sumproduct(•) was used to evaluate the left-hand side (LHS) of Criteria 1-5 for each funding scenario v. To facilitate the sum-product calculations, the coefficients of $f_{2,j}$ (j=1,…,9) in the above Criteria 1-5 were entered in cells K8-S13. A partial image from the Evaluation sheet of Illustration3.xlsx that includes these cells appears in Figure 3.2. The left hand side (LHS) of Criterion 1 for each scenario v is calculated using the sum-product (*) of the cell contents of K12-S12 one at a time with those in K17-S17, K18-S18, …, and K528-S528. The result is compared to the specified right hand side value (RHS) for Criterion 1 given in cell AR12 observing the operator in cell AQ12, see Figure 3.2. The outcomes are recorded in cells CC17-CC528 as 0 (Criterion 1 is not met) or 1 (Criterion 1 is met). The LHS valuation of Criterion 2 for each scenario v was obtained using the sum-product(*) of the cell contents of K11-S11 with those in K17-S17, K18-S18, …, and K528-S528. The LHS calculations were performed in cells CD17-CD528 and compared to the specified RHS for Criterion 2 appearing in cell AR13 and observing the operator between the two given in cell AQ11. The 0/1 outcomes are recorded in cells CD17-CD528. Similar evaluations were made for Criteria 3, 4 and 5 using K10-S10, K9-S9, K8-S8 and the same ranges of cells K17-S17, K18-S18, …, and K528-S528 with the 0/1 outcomes recorded in cells CE17-CE528, CF17-CF528 and CG17-CG528 respectively. The feasibilities of scenarios v=0,1,…,511 are respectively indicated by the products of the 0/1 cell contents of CC17-CG17, CC18-CG18, …, CC528-CG528 and appear in cells CB17-CB528. The cell contents of BX17-CB528 of the Evaluation sheet also appear in cells A17-E528 of the Results sheet. The latter were converted to values and sorted by r in ascending order, funding cost in ascending order. Thirty-nine of the 511 possible funding scenarios are feasible and displayed in Figure 3.3.

Figure 3.2
Images of disjointed sections of evaluation sheet of illustration3.xlsx.

	I	J	K	L	M	N	O	P	Q	R	S
8	Criterion 5	Scoring value of the scenario	5	5	2	4	3	4	4	3	3
9	Criterion 4	% of $s to Category 2 features[1]	0.280	0.352	0.375	0.398	0.407	0.475	0.488	0.520	0.536
10	Criterion 3	No. of Category 2 features	1	1	1	1	1	1	1	1	1
11	Criterion 2	Features j=1,2 are complements	1	1	0	0	0	0	0	0	0
12	Criterion 1	Funding cap on Category 2 j=1-9	0.280	0.352	0.375	0.398	0.407	0.475	0.488	0.520	0.536

[1] Partial coefficient shown. Each coefficient is divided the scenario's total funding cost.

	I	AQ	AR	AS
7		Operator between LHS & RHS	RHS value	
9	Criterion 5	≥	15	
10	Criterion 4	[,]	0.10	0.20
11	Criterion 3	≥	3	
12	Criterion 2	≠	1	
13	Criterion 1	≤	2	

Analysis shows that the number of feasible scenarios for Criteria 1-5 is respectively 274, 256, 466, 386, and 324. When the most restrictive Criterion 2 is combined pairwise with the others, Criteria 1 and 2 account for the fewest (=142) feasible scenarios. The combination of Criteria 1, 2, and 5 is the triple with the smallest (=39) number of feasible scenarios. The $2M funding cap (Criterion 1) for Category 2 features, the complementarity (Criterion 2) of features j=1,2, and the threshold score value (Criterion 5) of 15 collectively eliminated many of the 511 ($=2^9$-1) possible funding scenarios for this situation. The consequences of less restrictive requirements for Criteria 1, 2, and/or 5 can be examined using the 'what if' feature of Excel.

A Calculator for this illustration is provided, see cells J1-K6 of the Evaluation sheet of Illustration3.xlsx.

See Figure 3.3 below.

Figure 3.3
The feasible scenarios of illustration 3.

v	Funded features, j	r	Scenario Cost ($M)
15	1 2 3 4	4	12.474
23	1 2 3 5	4	12.483
27	1 2 4 5	4	12.506
39	1 2 3 6	4	12.551
71	1 2 3 7	4	12.564
43	1 2 4 6	4	12.574
51	1 2 5 6	4	12.583
75	1 2 4 7	4	12.587
83	1 2 5 7	4	12.596
135	1 2 3 8	4	12.596
263	1 2 3 9	4	12.612
139	1 2 4 8	4	12.619
147	1 2 5 8	4	12.628
267	1 2 4 9	4	12.635
275	1 2 5 9	4	12.644

v	Funded features, j	r	Scenario Cost ($M)
31	1 2 3 4 5	5	12.881
47	1 2 3 4 6	5	12.949
55	1 2 3 5 6	5	12.958
79	1 2 3 4 7	5	12.962
87	1 2 3 5 7	5	12.971
59	1 2 4 5 6	5	12.981
91	1 2 4 5 7	5	12.994
143	1 2 3 4 8	5	12.994
151	1 2 3 5 8	5	13.003
271	1 2 3 4 9	5	13.010
279	1 2 3 5 9	5	13.019
155	1 2 4 5 8	5	13.026
103	1 2 3 6 7	5	13.039
283	1 2 4 5 9	5	13.042
107	1 2 4 6 7	5	13.062

99	1 2 6 7	4	12.664
163	1 2 6 8	4	12.696
195	1 2 7 8	4	12.709
291	1 2 6 9	4	12.712
323	1 2 7 9	4	12.725
387	1 2 8 9	4	12.757
120	4 5 6 7	4	12.837
232	4 6 7 8	4	12.950
360	4 6 7 9	4	12.966