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Cumulative Effects of Environmental Change on Culturally Significant Ecosystems in the Inuvialuit Settlement Region

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APPENDIX 1

TABLE S1. Parameters for fire scenario generation with Geospatial Modeling Environment (GME) software (Beyer, 2014). Parameters were adjusted for fire simulation in each vegetation zone. Each simulation created a range of outputs based on the write frequency and the number of iterations. Outputs contained progressively more area disturbed by fire in later iterations and time steps. After simulations were run, three outputs were chosen for each vegetation zone to represent the scenarios of low, moderate, and high future fire occurrence shown in Table 2.

Vegetation Zone	Susceptibility	Spread	Event rate	Time steps	Iterations	Write frequency
Boreal Forest	0.2	0.25	0.3	50	5	25
Forest/Tundra Boundary	0.25	0.23	0.48	50	2	10
Tree Limit	0.26	0.23	0.49	50	10	10
Upper Tundra	0.25	0.23	0.48	50	2	10

TABLE S2. Parameters used in this Marxan analysis and their treatment across all simulations. For a full list of Marxan parameters, see Table S1.

Parameter treatment	Importance
Value of 1 added to each planning unit (PU)	Cost scores of 0 represent "free" land. In order to avoid Marxan over-selecting land, all PUs were adjusted to reflect a base cost of 1.
Boundary length modifier (BLM) set to 1	The BLM is Marxan's prioritization of contiguity. In order to ensure that simulations responded most directly to changes in disturbance levels, the BLM was set to a low value of 1.
Species penalty factor (SPF) set to 1	The SPF reflects Marxan's prioritization of meeting targets for each use value. A high SPF results in a greater penalty for not meeting the targeted percentage of protected area for a certain use value. In order to ensure that simulations responded most directly to changes in disturbance levels, the SPF was set to a low value of 1 for all 40 use values.
PU disturbance score > 80 "locked out"	In order to emphasize the impact of increasing disturbance, any PU with a disturbance score greater than 80 was locked out of simulations and not included in output. A disturbance score of 80 represents the equivalent of 50% of a PU disturbed by wildfire, based on our disturbance weighting system.
Target features set to 50, 75, and 90%	Three sets of simulations were run for all disturbance scenarios in order to explore the feasibility of conserving a range of use values.

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APPENDIX 2

Parameters imported from Marxan input file (input.dat):

VERSION 0.1

BLM 0.1
PROP 0.5
RANDSEED -1
BESTSCORE 10
NUMREPS 10

Annealing Parameters:

NUMITNS 10000000
STARTTEMP -1.00000000000000E+0000
COOLFAC 6.00000000000000E+0000
NUMTEMP 10000

Cost Threshold:

COSTTHRESH 0.00000000000000E+0000
THRESHPEN1 1.40000000000000E+0001
THRESHPEN2 1.00000000000000E+0000

Input Files:

INPUTDIR input
SPECNAME spec.dat
PUNAME pu.dat
PUVSPRNAME puvspr2.dat
BOUNDNAME bound.dat

Save Files:

SCENNAME output
SAVERUN 2
SAVEBEST 2
SAVESUMMARY 2
SAVESCEN 2
SAVETARGMET 2
SAVESUMSOLN 2
SAVELOG 2
OUTPUTDIR output

Program control:

RUNMODE 1
MISSLEVEL 1
ITIMPTYPE 0
HEURTYPE -1
CLUMPTYPE 0
VERBOSITY 3

APPENDIX 3

Wildlife harvesting areas included in Marxan analysis (imported from Marxan spec.dat file). These 40 areas were selected because they were included in community conservation plans for Inuvik, Aklavik, Paulatuk, and Tuktoyaktuk (Inuvialuit Joint Secretariat, 2008a–d). Use areas were included in this analysis if wildlife harvesting was occurring within the area. In many instances, this fact was noted in the label of the area (i.e., Tuktoyaktuk Fall Caribou Harvesting). In other instances, the metadata for a particular area noted its importance for wildlife harvesting (e.g., Husky Lakes was noted as an important harvesting area for multiple communities).

1 Tuktoyaktuk Fall Caribou Harvesting
2 Tuktoyaktuk Fall Fishing
3 Tuktoyaktuk Fall Goose Harvesting
4 Tuktoyaktuk Fall Seal Harvesting
5 Tuktoyaktuk Spring Caribou Harvesting
6 Tuktoyaktuk Spring Fishing
7 Tuktoyaktuk Spring Goose Harvesting
8 Tuktoyaktuk Spring Moose Harvesting
9 Tuktoyaktuk Summer Caribou Harvesting
10 Tuktoyaktuk Summer Fishing
11 Tuktoyaktuk Summer Goose Harvesting
12 Tuktoyaktuk Winter Caribou Harvesting
13 Tuktoyaktuk Winter Fishing
14 Tuktoyaktuk Winter Wolverine Harvesting
15 Bluenose Caribou Winter Range
16 Caribou Hills
17 Eastern North Slope
18 First Creek Watershed
19 Firth Creek and Babbage Watersheds
20 Fish Hole, Cache Creek, and Big Fish River
21 Fish Lakes and Rivers
22 Husky Lakes
23 Inner Mackenzie Delta
24 Kugaluk River Estuary
25 Kugmallit Bay
26 Mackenzie Bay and Shallow Bay
27 Mackenzie River Delta Key Migratory Bird Habitat
28 Paulatuk Spring Caribou Harvest
29 Paulatuk Spring Fishing
30 Paulatuk Spring Grizzly Bear Harvesting
31 Paulatuk Spring Muskox Harvesting
32 Paulatuk Spring Wolf Harvesting
33 Paulatuk Summer/Fall Caribou Harvesting
34 Paulatuk Summer/Fall Fishing
35 Paulatuk Summer/Fall Grizzly Bear Harvesting
36 Paulatuk Winter Caribou Harvesting
37 Paulatuk Winter Fishing
38 Paulatuk Winter Muskox Harvesting
39 Paulatuk Winter Wolf Harvesting
40 Paulatuk Winter Wolverine Harvesting