APPENDIX I – Detailed Simulation Results

From 2011 to 2100, the climate-sensitive experimental treatments had higher forest biomass (central, northeastern and western regions) and a more important shift from pure coniferous stands towards mixed stands dominated by conifer (black spruce) than our non-climate-sensitive treatments. The climate-sensitive treatments also had more wildfires, and larger total area burned and mean fire size (Figure 6). In comparison to non-climate-sensitive simulations, climate effects caused a net loss of presumed species presence area of approximately 1.5 million ha for the 64 landbird species modelled.

Tree species abundance and distribution

Our landscape simulations predicted tree biomass increase in both non-climate-sensitive and climate-sensitive scenarios, although it increased more in the climate-sensitive scenarios (Figure A4). Climate change affected forest growth both directly and indirectly via fire, with predicted increases in biomass growth through both mechanisms (Figure A4). Increased vegetation biomass was mostly predicted in the northern portion of the study area, especially in lowlands, while some localized decrease in biomass was predicted in the southwest, where the vegetation is currently composed of pure and mixed trembling aspen leading stands (Figure A5). Simulation results from both the full non-climate-sensitive and the climate-sensitive forest growth models showed changes in species composition on approximately 40% of the landscape (Figure A5). The full non-climate-sensitive model, however, presented most of the species' composition changes in the central and northwestern regions, while the full climate-sensitive scenario presented most of the changes in the southern region of the study area.

Our non-climate-sensitive models predicted conversion of approximately 3,000,000 ha of pure black spruce stands to mixed stands dominated by black spruce across the whole study area (Figure A5 and Table A1). Our climate-sensitive models predicted a more complex change in tree species dominance, with conversion of 300,000 ha of mixed trembling aspen dominated -- 181,00 of other stand types -- to 481,000 ha of mixed stands dominated by black spruce (37.4% increase in this stand type) in the western portion of the study area. It also forecasted the conversion from pure black spruce and mixed jack pine dominated stands in the northeastern (39.1% decrease), southern (29.5% decrease), and central (16.4% decrease) portions of the study area to mixed stands

dominated by black spruce (47% average increase) (Figure A3, Appendix I). In the central region of the study area, our climate-sensitive models also predicted increase of trembling aspen at lower altitudes, whereas in the southern and western regions we observed an increase in pure and mixed white spruce, and mixed black spruce dominated stands to the detriment of trembling aspen and jack pine (Figure A5).

Wildfire

Simulations of the non-climate-sensitive fire model predicted no changes in any of the three main fire parameters: mean and standard error of yearly burned area (294 ± 184 x 10^3 ha), number of fires per year (74 ± 9), fire size (8,060 ± 492 ha). Our simulations using a climate-sensitive version of the fire model, however, predicted an increase ($p < 0.01$) for all parameters from 2011 to 2100, across the study area. Across all replicates, the number of fires per year was projected to increase by 30% (259 ± 13 to 339 ± 17; mean ± SE), while total annual area burned and mean size of escaped fires were projected to increase by approximately 88% and 50% (from 502 ± 117 to 945 ± 313 x 10^3 ha, and 6,240 ± 177 to 9,440 ± 264 ha, respectively) (Figure 6).

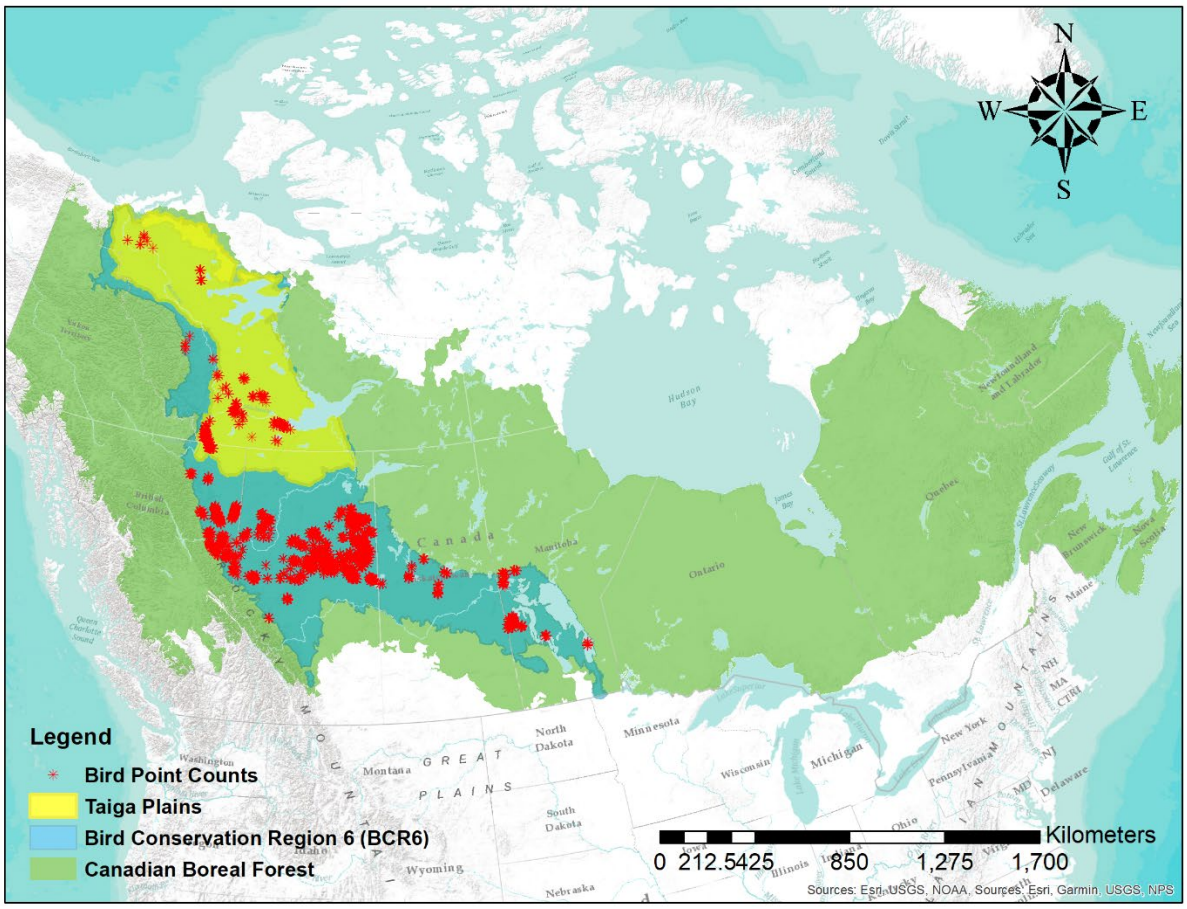

Figure A1. The map shows the Canadian boreal forest extent (green). Species abundance models for 64 landbird species were parameterized based on Bird Conservation Region 6 (blue), and forecasted for the Taiga plains ecozone (yellow within Canada's Northwest Territories).

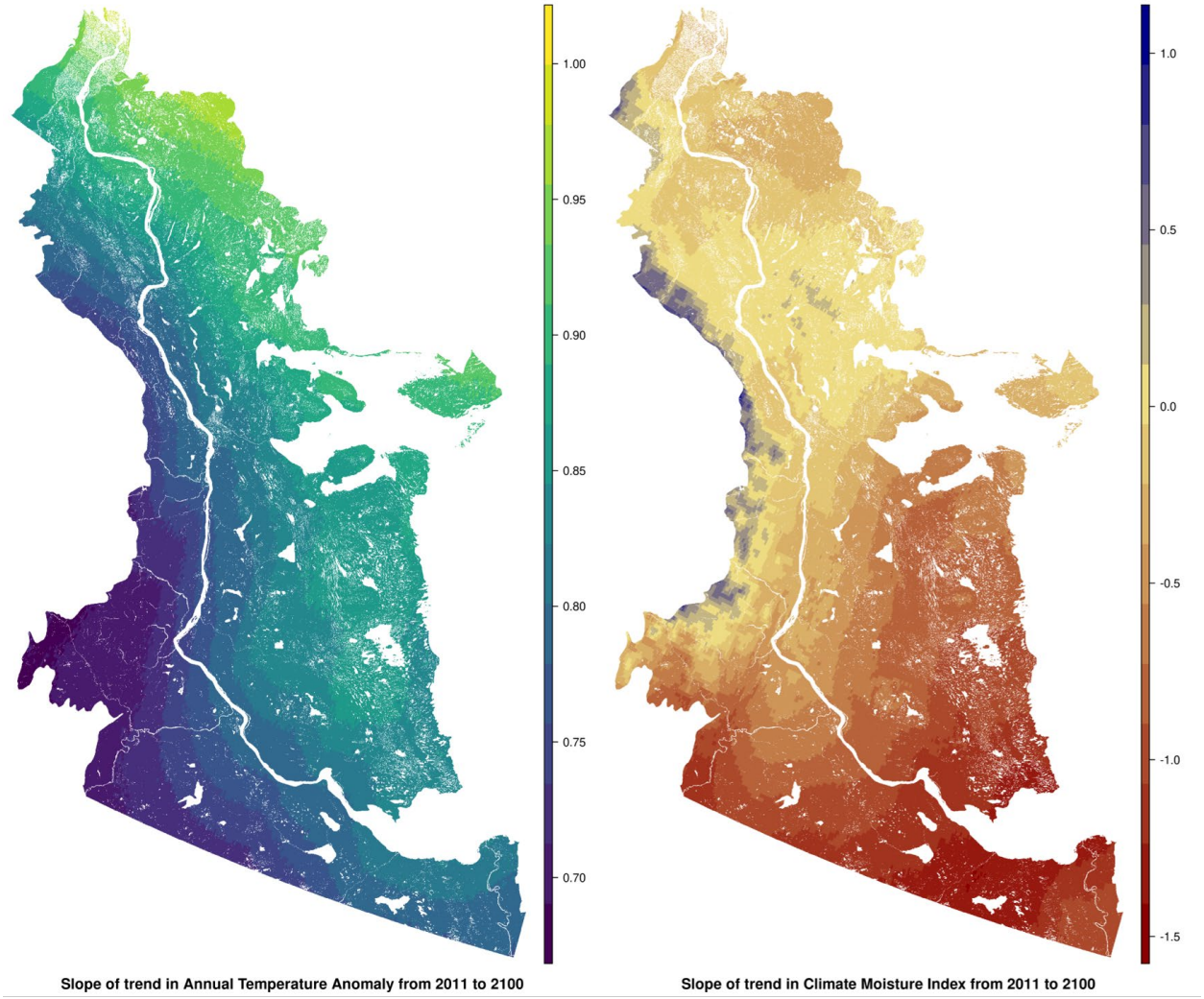

Figure A2. Slope of linear model of Annual Temperature Anomaly (ATA) and Climate Moisture Index from 2011 to 2100. These represent decadal changes in both indices.

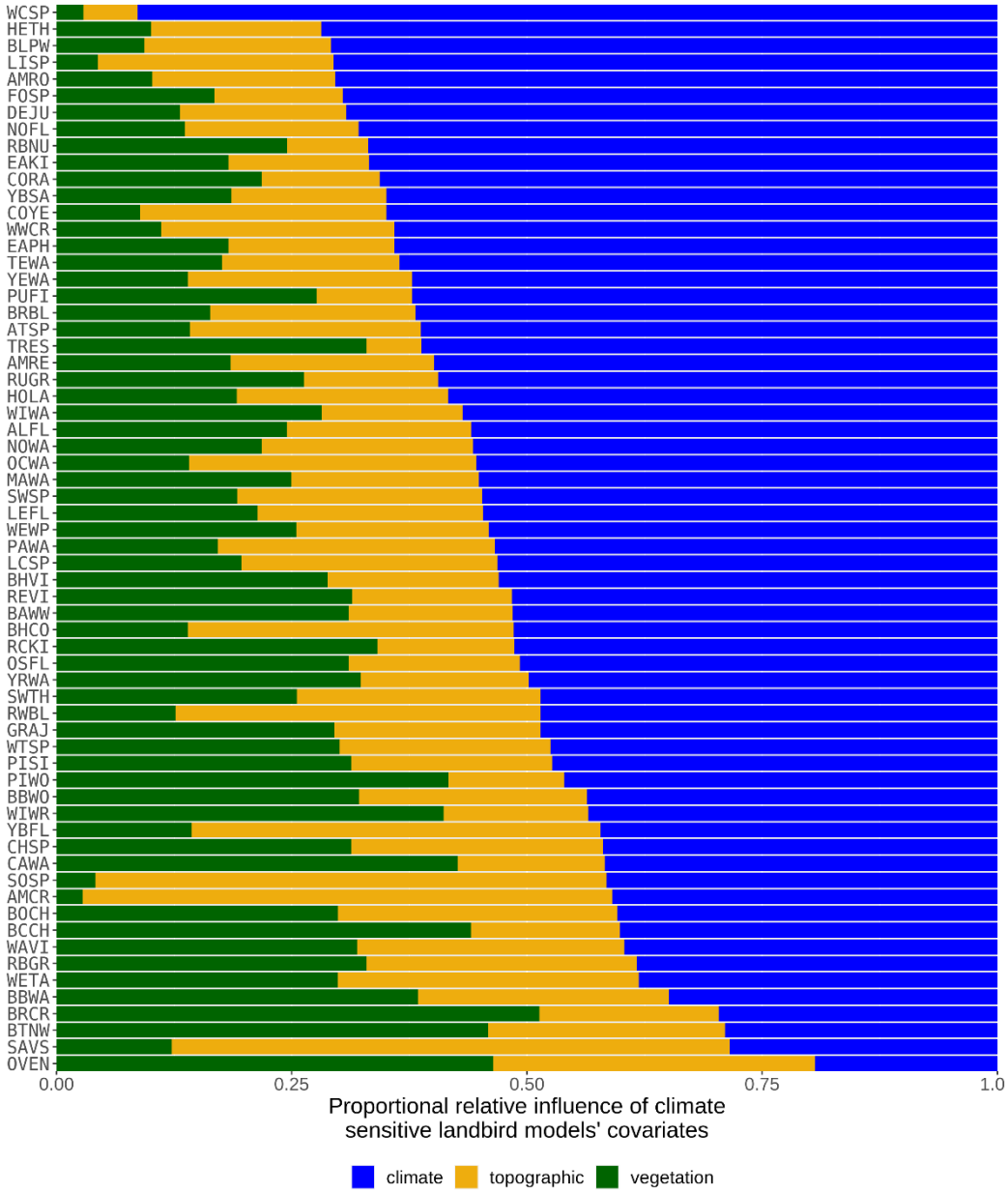

Figure A3. Proportional relative influence of covariates grouped by type on landbird climate-sensitive models (landbird boosted regression tree models [BRT's]; Birds.CS), ordered by sum of the relative importance of climate covariates. Please see Table A2 for bird statistical model's details (Appendix III).

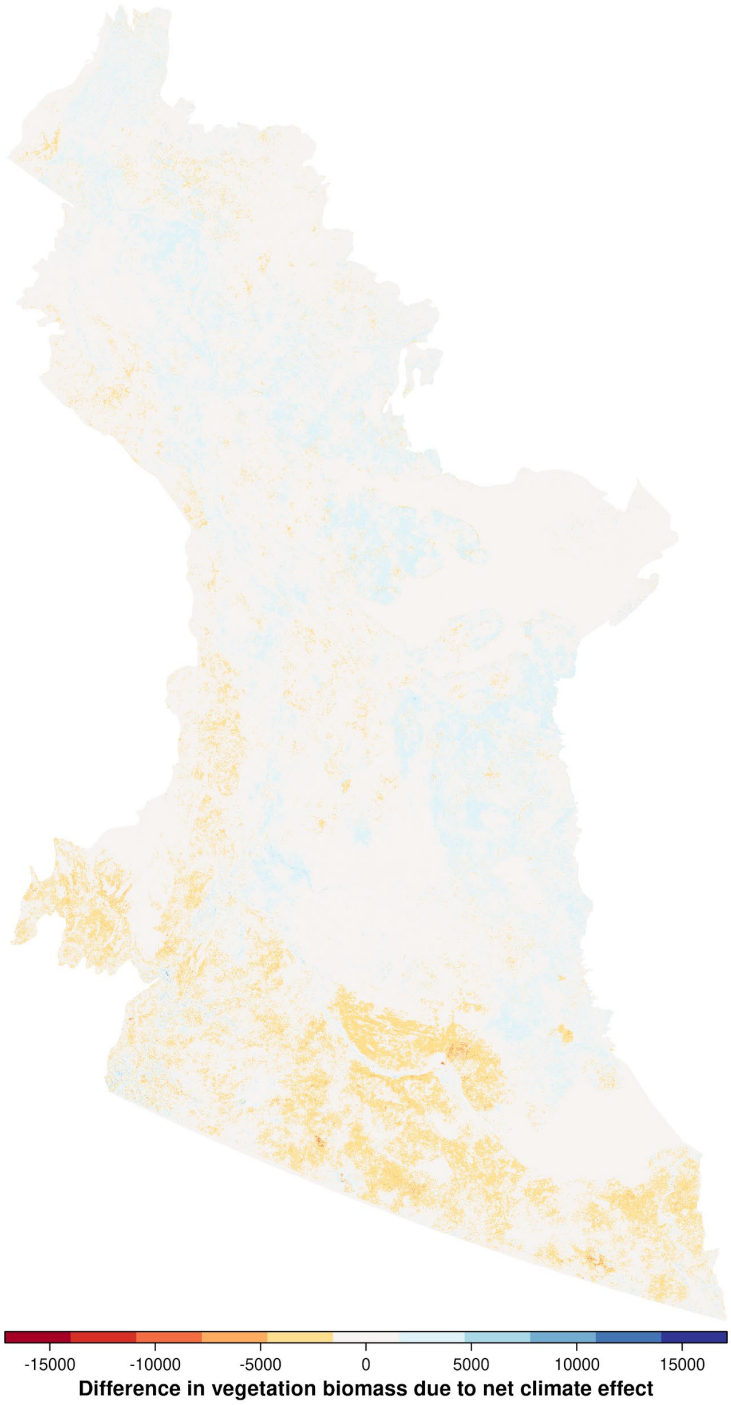

Figure A4. Mean (n = 10) difference in tree biomass (tons) between climate-sensitive (CS) and non-climate-sensitive models (non-CS) for the Bird Conservation Region 6 within the Northwest Territories.

Figure A5. Proportional change in leading tree species from 2011 to 2100 for the Bird Conservation Region 6 within the Northwest Territories due to net effects of climate change, based on total biomass (i.e. all cohorts) from the averaged (n = 10) replications.

Table A1. Dominant tree species area in hectares in the landscape by year of simulation and factorial combination of climate-sensitive (LandR.CS for vegetation, and FireSense - fS - for wildfire) and non-climate-sensitive (LandR for vegetation and SCFM for wildfire) components.

Dominant Species	Year of Simulation	Scenario	Total Area (x10^3) ha
Betu_Pap	2011	LandR.CS_fS	100.83
Lari_Lar	2011	LandR.CS_fS	0.11
Pice_Gla	2011	LandR.CS_fS	396.28
Pice_Mar	2011	LandR.CS_fS	8,428.78
Pinu_Ban	2011	LandR.CS_fS	225.51
Popu_Tre	2011	LandR.CS_fS	846.19
Mixed_Betu_Pap	2011	LandR.CS_fS	149.28
Mixed_Lari_Lar	2011	LandR.CS_fS	27.28
Mixed_Pice_Gla	2011	LandR.CS_fS	2,497.81
Mixed_Pice_Mar	2011	LandR.CS_fS	7,088.03
Mixed_Pinu_Ban	2011	LandR.CS_fS	982.09
Mixed_Popu_Tre	2011	LandR.CS_fS	1,759.11
Betu_Pap	2011	LandR_SCFM	98.78
Lari_Lar	2011	LandR_SCFM	2.08
Pice_Gla	2011	LandR_SCFM	453.73
Pice_Mar	2011	LandR_SCFM	8,708.11
Pinu_Ban	2011	LandR_SCFM	180.61
Popu_Tre	2011	LandR_SCFM	754.92
Mixed_Betu_Pap	2011	LandR_SCFM	187.68
Mixed_Lari_Lar	2011	LandR_SCFM	41.74

Mixed_Pice_Gla	2011	LandR_SCFM	2,755.81
Mixed_Pice_Mar	2011	LandR_SCFM	6,787.21
Mixed_Pinu_Ban	2011	LandR_SCFM	768.55
Mixed_Popu_Tre	2011	LandR_SCFM	1,738.24
Betu_Pap	2100	LandR.CS_fS	9.14
Pice_Gla	2100	LandR.CS_fS	442.88
Pice_Mar	2100	LandR.CS_fS	6,327.40
Pinu_Ban	2100	LandR.CS_fS	3.77
Popu_Tre	2100	LandR.CS_fS	652.12
Mixed_Betu_Pap	2100	LandR.CS_fS	170.62
Mixed_Lari_Lar	2100	LandR.CS_fS	6.21
Mixed_Pice_Gla	2100	LandR.CS_fS	2,554.80
Mixed_Pice_Mar	2100	LandR.CS_fS	11,334.13
Mixed_Pinu_Ban	2100	LandR.CS_fS	163.33
Mixed_Popu_Tre	2100	LandR.CS_fS	790.57
Lari_Lar	2100	LandR.CS_fS	0.01
Betu_Pap	2100	LandR_SCFM	5.10
Pice_Gla	2100	LandR_SCFM	396.61
Pice_Mar	2100	LandR_SCFM	5,610.51
Pinu_Ban	2100	LandR_SCFM	4.89
Popu_Tre	2100	LandR_SCFM	659.28
Mixed_Betu_Pap	2100	LandR_SCFM	31.87
Mixed_Lari_Lar	2100	LandR_SCFM	1.80

Mixed_Pice_Gla	2100	LandR_SCFM	3767.66
Mixed_Pice_Mar	2100	LandR_SCFM	10,225.08
Mixed_Pinu_Ban	2100	LandR_SCFM	298.84
Mixed_Popu_Tre	2100	LandR_SCFM	1,471.17
Lari_Lar	2100	LandR_SCFM	0.01