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Supporting Information for

Selecting climate change scenarios using impact-relevant sensitivities

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Introduction

The supporting materials contain three figures, two tables, and one body of text.

Figure S1 is a map of the watersheds and ecoregions.

Figures S2 and S3 show further analysis from the vegetation modeling.

Tables S1, S2, S3, and S4 provide ΔT_{GCM}, ΔP_{GCM}, ΔI_q, and ΔI_c values for Figures 1 and 2.

Table S5 provides curve fitting equation coefficients (as seen in Figure 3).

The supplemental text and Table S6 provide information on our evaluation of the seasons of influence.

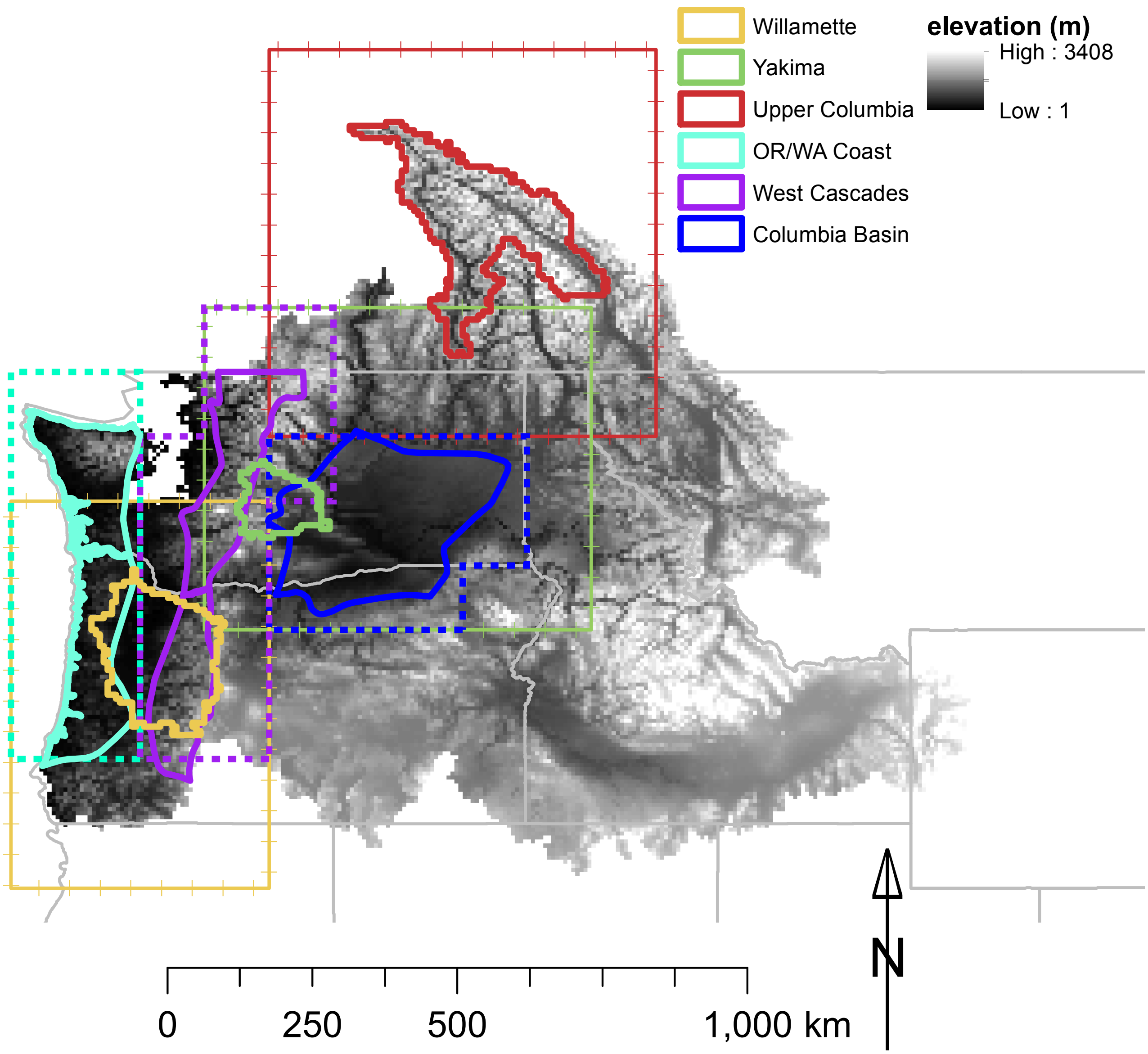

Figure S1. Pacific Northwest watersheds and ecoregions. Solid polygons identify the location of watersheds and ecoregions, boxes of the same color identify the domain of GCM output averaged for each polygon. Elevation data is displayed across the Columbia River basin and coastal drainages at 1/16th degree lat-lon resolution.

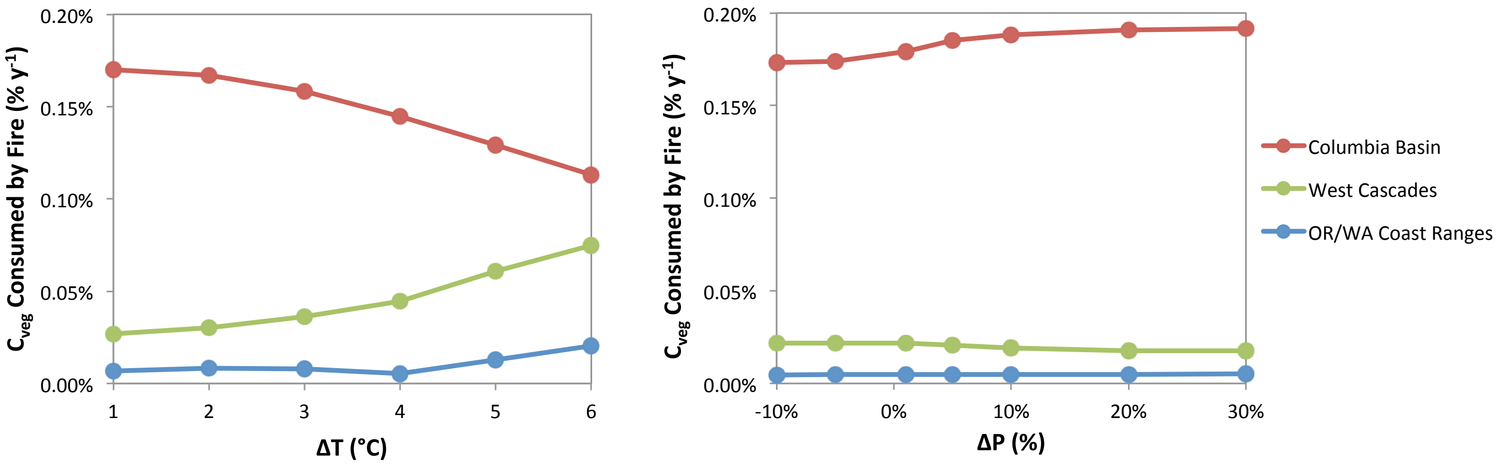

Figure S2. Simulated proportion of total live vegetation combusted by fire, 1970-1999, for ΔT (left panel) and ΔP (right panel) perturbation experiments in the three ecoregions.

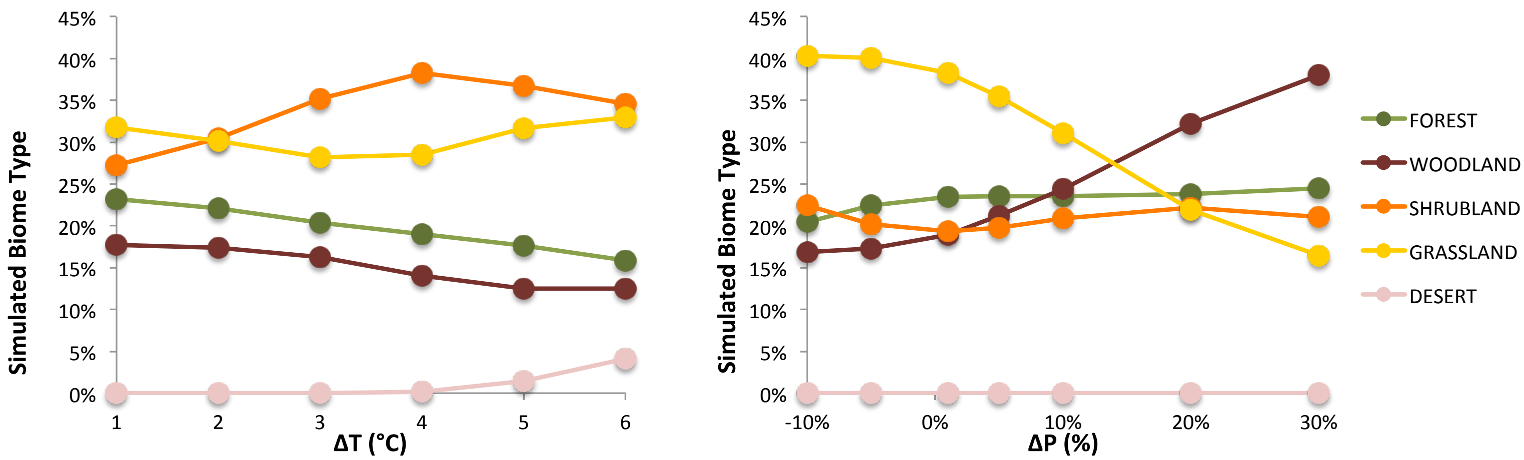

Figure S3. Composition of Columbia Basin ecoregion as percentages of MC2 simulated vegetation biome types, across ΔT (left panel) and ΔP (right panel) perturbation experiments. The composition of the OR/WA Coast and Western Cascade ecoregions remained 100% forest for all T and P perturbation experiments.

Table S1. Values for changes (plotted on Figure 1) from RCP 4.5 for three watersheds

		Willamette			Yakima			Upper Columbia		
GCM	ensemble member	annual ΔT (°C)	annual ΔP (%)	annual ΔI_c(%)	annual ΔT (°C)	annual ΔP (%)	annual ΔI_c(%)	annual ΔT (°C)	annual ΔP (%)	annual ΔI_c(%)
bcc-csm1-1	1	2.1	2.4	-18.6	2.6	4.9	-39.6	2.7	9.1	16.4
bcc-csm1-1-m	1	1.4	2.2	-14.3	1.8	5.0	-27.7	1.9	5.5	13.3
BNU-ESM	1	2.3	-0.4	-24.2	2.8	-1.9	-54.0	3.0	2.3	7.8
CanESM2	1	2.6	6.4	-14.2	3.3	4.7	-50.0	3.5	7.3	11.5
CanESM2	2	2.8	-2.6	-29.2	3.4	2.8	-54.3	3.5	7.9	11.8
CanESM2	3	2.5	-0.6	-25.4	3.1	-0.8	-56.9	3.2	4.6	9.8
CanESM2	4	2.6	13.8	-2.7	3.4	5.8	-49.0	3.4	2.7	6.8
CanESM2	5	2.8	6.5	-14.8	3.5	5.5	-51.1	3.6	6.7	10.3
CCSM4	1	1.6	1.6	-16.9	2.1	2.3	-37.2	2.2	0.7	7.9
CCSM4	2	1.8	-1.8	-23.5	2.2	-0.2	-42.6	2.5	-0.3	6.5
CCSM4	3	1.4	-4.4	-25.0	2.0	0.8	-36.9	2.2	0.1	7.3
CCSM4	4	1.6	-5.1	-27.5	2.1	-2.9	-44.4	2.3	-1.4	5.5
CCSM4	5	1.9	3.4	-16.1	2.5	3.4	-41.8	2.8	4.7	11.2
CCSM4	6	1.7	2.0	-17.2	2.1	5.3	-32.3	2.2	5.5	13.1
CESM1-CAM5	2	2.0	2.7	-17.8	2.6	5.9	-38.2	2.5	6.1	13.5
CESM1-CAM5	3	1.6	11.1	-1.8	2.0	9.4	-24.3	1.9	7.1	15.1
CMCC-CM	1	1.7	3.7	-13.9	2.0	6.9	-27.7	2.0	5.7	13.5
CNRM-CM5	1	1.8	3.9	-14.4	2.2	3.2	-36.7	2.1	1.6	9.0
CSIRO-Mk3-6-0	1	2.6	-1.6	-27.0	3.1	2.6	-50.3	2.9	3.5	9.7
CSIRO-Mk3-6-0	2	2.4	0.9	-22.4	2.8	5.2	-42.6	2.7	5.7	12.5
CSIRO-Mk3-6-0	3	2.3	-6.4	-33.6	2.7	-1.7	-52.4	2.7	1.7	8.2
CSIRO-Mk3-6-0	4	2.1	-0.9	-23.8	2.7	4.5	-42.0	2.6	5.9	12.9
CSIRO-Mk3-6-0	5	2.0	-2.6	-26.2	2.5	2.9	-42.1	2.5	2.6	9.6
CSIRO-Mk3-6-0	6	2.0	3.4	-16.5	2.5	7.9	-34.0	2.3	5.2	12.7
CSIRO-Mk3-6-0	7	1.9	-2.3	-24.8	2.3	-0.8	-45.0	2.3	1.1	8.2
CSIRO-Mk3-6-0	8	2.0	5.0	-13.8	2.5	1.3	-45.3	2.5	1.6	8.5
CSIRO-Mk3-6-0	9	1.8	-2.6	-25.0	2.3	1.6	-41.6	2.3	0.2	7.2
CSIRO-Mk3-6-0	10	2.1	2.4	-18.7	2.6	6.4	-38.4	2.6	1.6	8.3
EC-EARTH	2	1.6	-5.0	-27.1	2.0	1.9	-35.2	1.9	5.4	13.1
EC-EARTH	8	1.6	7.7	-7.4	1.8	10.9	-18.1	1.8	7.3	15.3
EC-EARTH	9	1.9	-3.4	-27.0	2.2	2.9	-37.3	2.3	7.4	15.2
FGOALS-g2	1	1.8	3.1	-15.7	2.2	7.6	-29.8	2.2	11.0	19.2
FGOALS-s2	1	1.9	0.0	-21.5	2.1	7.5	-27.8	2.1	11.3	19.6
FGOALS-s2	2	2.2	6.0	-13.1	2.4	11.5	-26.1	2.4	18.9	27.7
FGOALS-s2	3	1.9	8.9	-6.8	2.1	16.2	-14.1	2.1	17.3	26.2
GFDL-CM3	1	2.5	2.9	-19.5	2.9	10.0	-35.9	3.2	17.3	23.8
GFDL-ESM2G	1	2.0	0.8	-20.6	2.3	8.3	-30.1	2.2	7.9	15.9
GFDL-ESM2M	1	0.8	2.3	-8.4	1.0	5.0	-13.0	0.9	4.0	9.8
GISS-E2-R	1	1.1	4.6	-7.7	1.3	7.7	-13.7	1.5	10.5	18.4
GISS-E2-R	2	0.8	1.4	-10.2	0.9	5.0	-11.3	1.0	8.5	15.0
HadGEM2-AO	1	2.7	4.5	-17.6	3.7	5.6	-52.6	3.3	0.7	5.0
HadGEM2-CC	1	2.1	1.7	-19.8	2.8	2.0	-48.3	2.8	2.5	8.7
HadGEM2-ES	1	2.4	0.3	-23.5	3.0	6.8	-42.4	3.0	3.8	9.6
HadGEM2-ES	4	2.1	7.7	-10.0	2.7	6.8	-38.1	2.6	3.0	9.7
inmcm4	1	1.0	3.9	-8.2	1.1	0.5	-22.3	1.4	-0.1	6.6
IPSL-CM5A-LR	1	2.5	-4.6	-31.7	2.6	-5.1	-57.0	2.7	-3.5	2.5
IPSL-CM5A-LR	2	2.3	13.1	-2.5	2.4	10.5	-28.7	2.3	6.5	14.1
IPSL-CM5A-LR	3	2.7	2.2	-21.4	3.0	2.0	-50.5	3.1	0.5	5.7
IPSL-CM5A-LR	4	2.4	0.8	-22.5	2.6	2.0	-44.2	2.6	1.6	8.3
IPSL-CM5A-MR	1	2.4	-4.4	-30.9	2.7	-1.1	-51.0	2.7	-2.6	3.5
IPSL-CM5B-LR	1	1.7	3.3	-15.0	2.0	5.4	-29.9	2.2	4.0	11.5
MIROC-ESM	1	2.7	-6.0	-34.5	3.4	2.7	-53.7	3.9	10.8	13.3
MIROC-ESM-CHEM	1	2.7	-11.5	-43.3	3.3	-2.6	-61.3	3.7	5.8	8.8
MIROC5	1	1.8	3.9	-14.6	2.3	6.1	-34.3	2.6	8.1	15.3
MIROC5	2	1.5	6.0	-9.2	2.0	6.0	-28.8	2.2	7.2	15.0
MIROC5	3	1.6	-0.3	-20.1	2.3	3.9	-36.7	2.7	8.5	15.6
MPI-ESM-LR	1	1.8	-3.8	-26.7	1.9	1.3	-34.8	2.0	6.9	14.8
MPI-ESM-LR	2	2.0	-2.7	-26.3	2.3	1.2	-41.6	2.7	3.9	10.6
MPI-ESM-LR	3	1.8	-10.4	-37.5	1.9	-6.1	-47.0	2.1	-1.2	5.9
MRI-CGCM3	1	1.0	-2.4	-18.2	1.3	0.5	-25.5	1.4	2.2	9.0
NorESM1-M	1	1.8	1.7	-18.2	2.5	4.2	-40.6	2.8	7.4	14.2

Table S2. Values for changes (plotted on Figure 1) from RCP 8.5 for three watersheds

GCM	ensemble member	Willamette annual ΔT (°C)	Willamette annual ΔP (%)	Willamette annual ΔI_c(%)	Yakima annual ΔT (°C)	Yakima annual ΔP (%)	Yakima annual ΔI_c(%)	Upper Columbia annual ΔT (°C)	Upper Columbia annual ΔP (%)	Upper Columbia annual ΔI_c(%)
bcc-csm1-1	1	2.8	1.5	-22.9	3.5	5.6	-50.2	3.6	12.9	16.8
bcc-csm1-1-m	1	2.2	4.9	-15.2	2.7	5.3	-41.7	2.8	6.9	13.8
BNU-ESM	1	3.4	-1.8	-29.6	3.9	-6.8	-74.4	4.1	-3.2	-3.7
CanESM2	1	3.4	5.6	-17.9	4.2	6.0	-56.4	4.3	13.3	13.1
CanESM2	2	3.5	6.4	-16.7	4.2	9.9	-50.0	4.4	13.0	12.6
CanESM2	3	3.5	6.2	-17.0	4.2	8.5	-52.3	4.3	10.3	10.3
CanESM2	4	3.6	11.6	-8.7	4.5	7.1	-56.1	4.5	5.8	3.8
CanESM2	5	3.7	6.9	-16.2	4.5	6.4	-57.3	4.7	7.2	3.9
CCSM4	1	2.2	-2.3	-26.4	2.8	0.5	-50.6	3.0	2.4	7.9
CCSM4	2	2.2	-3.0	-28.0	2.7	0.7	-48.9	3.0	1.4	7.1
CCSM4	3	2.0	0.3	-21.6	2.7	6.5	-38.8	3.0	4.6	10.4
CCSM4	4	2.2	-3.3	-28.3	2.9	0.7	-50.9	3.1	2.7	8.1
CCSM4	5	2.4	1.3	-21.8	3.1	1.9	-52.1	3.4	0.9	4.7
CCSM4	6	2.3	2.9	-18.5	2.8	2.2	-46.9	2.9	2.2	8.0
CESM1-CAM5	2	2.6	7.3	-13.0	3.5	7.9	-47.0	3.4	5.6	10.2
CESM1-CAM5	3	2.7	8.9	-10.6	3.5	11.6	-40.6	3.4	9.3	14.1
CMCC-CM	1	2.1	8.0	-9.6	2.4	14.3	-22.1	2.3	11.5	19.6
CMCC-CMS	1	2.4	8.6	-10.1	2.8	13.2	-29.4	2.8	12.9	20.1
CNRM-CM5	1	2.2	10.6	-6.0	2.6	9.2	-33.6	2.5	6.0	13.3
CNRM-CM5	2	2.2	0.0	-22.8	2.5	1.8	-43.3	2.5	4.3	11.5
CNRM-CM5	4	2.0	6.8	-11.0	2.4	10.4	-29.0	2.4	10.5	18.5
CNRM-CM5	6	2.5	-2.2	-27.8	3.0	-0.8	-55.2	2.9	1.0	6.9
CNRM-CM5	10	2.4	4.2	-17.3	2.9	2.1	-48.5	2.7	4.0	10.5
CSIRO-Mk3-6-0	1	2.8	-3.5	-31.0	3.4	-2.1	-62.3	3.3	-2.6	1.6
CSIRO-Mk3-6-0	2	2.6	-3.4	-30.1	3.1	0.4	-54.9	3.1	3.0	8.4
CSIRO-Mk3-6-0	3	2.9	2.5	-21.4	3.4	6.7	-48.0	3.3	8.7	13.7
CSIRO-Mk3-6-0	4	2.6	-5.4	-33.1	3.1	2.1	-52.0	3.1	4.0	9.5
CSIRO-Mk3-6-0	5	2.4	-5.6	-33.0	3.1	-0.2	-55.3	3.1	1.3	6.5
CSIRO-Mk3-6-0	6	2.4	-4.3	-30.6	2.9	2.5	-48.4	2.9	1.1	6.9
CSIRO-Mk3-6-0	7	2.1	5.2	-14.3	2.7	4.8	-42.3	2.8	2.7	9.1
CSIRO-Mk3-6-0	8	2.5	-1.0	-25.9	3.1	-0.1	-54.7	3.1	2.5	7.8
CSIRO-Mk3-6-0	9	2.5	1.7	-21.3	3.1	2.7	-51.3	3.1	3.4	8.8
CSIRO-Mk3-6-0	10	2.6	-2.6	-28.9	3.4	4.2	-51.3	3.4	1.5	5.6
FGOALS-g2	1	2.3	4.5	-16.4	2.8	10.6	-34.3	2.8	12.6	19.9
FGOALS-s2	1	3.0	3.5	-20.3	3.3	17.3	-29.9	3.4	21.6	27.4
FGOALS-s2	2	3.2	7.8	-13.8	3.4	13.7	-36.6	3.4	20.0	25.9
FGOALS-s2	3	2.9	0.1	-25.3	3.2	10.7	-39.3	3.2	17.9	24.3
FIO-ESM	1	1.6	7.5	-7.2	1.9	-0.3	-38.0	2.1	-0.7	6.4
FIO-ESM	2	1.5	6.2	-8.5	1.8	4.4	-27.7	1.9	4.4	12.0
FIO-ESM	3	1.5	7.5	-7.0	1.9	2.0	-33.3	2.0	1.5	8.9
GFDL-CM3	1	3.0	9.6	-10.4	3.4	13.6	-36.9	3.8	17.8	21.3
GFDL-ESM2G	1	2.2	1.6	-20.6	2.5	8.3	-33.9	2.4	8.4	16.1
GFDL-ESM2M	1	1.6	-1.1	-21.1	2.0	-0.3	-38.7	1.7	-0.5	6.6
GISS-E2-H	1	1.6	10.5	-2.7	1.9	6.3	-27.0	2.1	7.6	15.5
GISS-E2-H	2	2.3	4.1	-17.0	2.0	7.6	-27.3	2.5	1.9	8.8
GISS-E2-R	1	1.6	2.6	-15.4	1.8	5.0	-27.5	2.0	7.5	15.5
GISS-E2-R	2	1.3	2.3	-13.3	1.5	4.6	-22.2	1.5	6.7	14.3
HadGEM2-AO	1	3.5	3.4	-21.6	4.8	4.6	-61.3	4.6	1.2	-2.0
HadGEM2-CC	1	3.2	-0.7	-27.5	4.1	0.9	-63.5	4.1	0.5	0.4
HadGEM2-ES	1	3.3	-2.0	-29.6	4.0	6.0	-54.6	4.0	3.5	4.5
HadGEM2-ES	2	3.3	2.3	-22.8	4.1	6.1	-55.2	4.0	3.8	4.9
HadGEM2-ES	3	3.2	-4.8	-34.0	4.0	-1.7	-66.8	3.8	-2.9	-1.5
HadGEM2-ES	4	3.1	0.3	-25.6	4.0	5.3	-55.6	4.0	3.8	4.9
inmcm4	1	1.5	-3.1	-24.0	1.7	-3.0	-37.5	2.0	-0.1	7.1
IPSL-CM5A-LR	1	3.2	-4.0	-32.8	3.4	-0.7	-59.9	3.5	-0.5	2.8
IPSL-CM5A-LR	2	3.3	13.9	-4.3	3.6	14.3	-37.4	3.5	9.9	14.0
IPSL-CM5A-LR	3	3.4	11.9	-7.8	3.7	7.4	-49.9	3.8	5.3	7.9
IPSL-CM5A-LR	4	3.4	-1.2	-28.6	3.7	5.6	-52.4	3.8	4.3	6.7
IPSL-CM5A-MR	1	3.3	3.9	-20.3	3.7	7.8	-49.5	3.8	5.2	7.6
IPSL-CM5B-LR	1	2.5	4.9	-16.5	2.8	2.4	-47.6	3.2	3.8	8.9
MIROC-ESM	1	3.2	-5.0	-34.4	4.0	4.3	-57.8	4.6	14.1	12.2
MIROC-ESM-CHEM	1	3.5	-9.5	-42.1	4.2	0.8	-64.2	4.6	10.4	8.0
MIROC5	1	2.3	4.3	-16.7	2.9	10.5	-36.2	3.4	10.2	14.9
MIROC5	3	2.2	-2.2	-26.5	2.8	3.7	-44.7	3.2	8.2	13.6
MPI-ESM-LR	1	2.4	-7.0	-35.1	2.7	2.6	-45.9	3.0	7.5	13.7
MPI-ESM-LR	2	2.8	-7.9	-37.9	3.0	0.2	-52.8	3.2	4.2	9.5
MPI-ESM-LR	3	2.4	-10.7	-40.9	2.6	-2.0	-51.0	2.8	2.2	8.4
MRI-CGCM3	1	1.4	-0.3	-18.4	1.7	0.6	-32.7	1.8	2.1	9.5
NorESM1-M	1	2.1	1.5	-20.1	2.9	6.7	-41.2	3.0	8.7	14.8

Table S3. Values for changes (plotted on Figure 2) from RCP 4.5 for three ecoregions.

GCM	ensemble member	OR/WA Coast Ranges annual ΔT (°C)	OR/WA Coast Ranges annual ΔP (%)	OR/WA Coast Ranges annual ΔI_c(%)	Western Cascades annual ΔT (°C)	Western Cascades annual ΔP (%)	Western Cascades annual ΔI_c(%)	Columbia Basin annual ΔT (°C)	Columbia Basin annual ΔP (%)	Columbia Basin annual ΔI_c(%)
bcc-csm1-1	1	2.1	6.1	-7.1	2.3	4.8	-16.7	2.5	3.7	-3.1
bcc-csm1-1-m	1	1.3	2.0	-4.0	1.6	3.3	-14.0	1.7	5.1	2.3
BNU-ESM	1	2.4	1.2	-8.8	2.6	-1.6	-17.9	2.7	-2.8	-11.5
CanESM2	1	2.4	6.3	-8.5	2.9	4.7	-18.2	3.2	4.8	-5.7
CanESM2	2	2.6	0.1	-9.4	3.0	0.8	-18.8	3.3	2.4	-9.1
CanESM2	3	2.3	-0.4	-8.2	2.8	-0.7	-18.3	3.1	-0.9	-11.5
CanESM2	4	2.4	10.0	-8.7	2.9	9.0	-18.1	3.3	8.0	-2.4
CanESM2	5	2.7	4.9	-9.8	3.1	5.4	-18.7	3.4	7.9	-3.4
CCSM4	1	1.4	0.7	-4.3	1.8	1.3	-15.1	2.1	2.9	-1.6
CCSM4	2	1.7	-0.7	-5.6	2.0	-1.1	-15.8	2.1	0.5	-4.6
CCSM4	3	1.3	-2.1	-4.1	1.7	-2.5	-14.7	1.9	1.1	-2.8
CCSM4	4	1.4	-2.7	-4.3	1.8	-4.6	-15.4	2.0	-3.0	-8.1
CCSM4	5	1.9	4.9	-6.3	2.2	2.2	-16.6	2.4	4.3	-1.8
CCSM4	6	1.5	5.0	-4.9	1.9	3.1	-15.3	2.0	5.4	1.3
CESM1-CAM5	2	1.8	4.6	-5.9	2.2	4.6	-16.5	2.5	6.9	0.7
CESM1-CAM5	3	1.3	10.1	-4.0	1.8	10.1	-14.5	2.0	10.9	7.8
CMCC-CM	1	1.4	7.9	-4.3	1.8	2.8	-15.0	2.0	8.8	5.3
CNRM-CM5	1	1.5	1.9	-4.8	2.1	1.6	-16.0	2.2	5.5	0.9
CSIRO-Mk3-6-0	1	2.4	5.2	-8.6	2.8	0.7	-18.3	3.0	1.3	-8.7
CSIRO-Mk3-6-0	2	2.3	4.2	-8.3	2.6	1.5	-17.7	2.8	4.6	-3.3
CSIRO-Mk3-6-0	3	2.1	-0.9	-7.4	2.4	-3.1	-17.6	2.7	-3.3	-11.9
CSIRO-Mk3-6-0	4	2.0	-0.2	-6.7	2.3	1.1	-17.0	2.6	4.1	-3.1
CSIRO-Mk3-6-0	5	1.9	1.2	-6.2	2.2	-0.4	-16.7	2.5	1.6	-5.1
CSIRO-Mk3-6-0	6	1.8	6.6	-6.1	2.2	6.3	-16.3	2.5	7.5	1.4
CSIRO-Mk3-6-0	7	1.7	1.0	-5.7	2.1	-0.9	-16.2	2.3	-1.4	-7.7
CSIRO-Mk3-6-0	8	1.9	6.4	-6.2	2.2	3.8	-16.3	2.5	1.0	-6.1
CSIRO-Mk3-6-0	9	1.6	-2.0	-5.0	2.0	-0.8	-16.0	2.3	1.5	-4.5
CSIRO-Mk3-6-0	10	2.0	5.5	-6.6	2.3	4.7	-16.7	2.6	6.1	-0.7
EC-EARTH	2	1.2	-0.5	-3.8	1.8	-1.0	-14.9	2.0	0.0	-4.7
EC-EARTH	8	1.4	6.5	-4.5	1.7	8.7	-14.2	1.8	13.3	11.3
EC-EARTH	9	1.9	-0.4	-6.3	2.1	-0.5	-16.3	2.2	2.4	-2.9
FGOALS-g2	1	1.7	4.3	-5.4	1.9	5.2	-15.3	2.2	6.5	1.6
FGOALS-s2	1	1.8	1.7	-5.8	1.9	4.2	-15.4	2.1	6.4	2.3
FGOALS-s2	2	2.1	5.0	-7.1	2.2	8.5	-16.2	2.4	10.8	6.0
FGOALS-s2	3	1.7	13.9	-5.6	1.9	14.1	-14.6	2.1	16.2	13.5
GFDL-CM3	1	2.4	2.8	-8.4	2.6	4.6	-17.6	2.7	8.6	1.6
GFDL-ESM2G	1	1.9	4.9	-6.5	2.1	5.4	-16.1	2.3	7.0	1.7
GFDL-ESM2M	1	0.7	2.0	-1.8	0.8	3.3	-8.5	1.0	5.8	5.5
GISS-E2-R	1	1.1	8.5	-3.2	1.2	6.1	-11.0	1.2	6.6	5.9
GISS-E2-R	2	0.7	4.7	-2.0	0.9	3.3	-8.9	0.9	3.3	2.9
HadGEM2-AO	1	2.4	5.9	-8.6	3.2	4.3	-18.8	3.8	7.5	-5.8
HadGEM2-CC	1	1.8	3.2	-6.1	2.5	0.7	-17.4	2.8	1.5	-6.9
HadGEM2-ES	1	2.2	5.0	-7.6	2.8	3.5	-18.2	2.9	6.9	-1.4
HadGEM2-ES	4	1.8	7.7	-6.0	2.4	6.2	-16.8	2.6	7.9	1.4
inmcm4	1	1.0	3.5	-2.9	1.1	2.5	-10.4	1.1	1.2	0.0
IPSL-CM5A-LR	1	2.4	-4.8	-8.7	2.6	-4.7	-18.2	2.6	-4.1	-12.6
IPSL-CM5A-LR	2	2.2	10.7	-7.5	2.4	11.0	-16.5	2.4	10.4	5.0
IPSL-CM5A-LR	3	2.6	4.1	-9.4	2.9	2.7	-18.4	3.0	2.1	-7.5
IPSL-CM5A-LR	4	2.4	0.2	-8.4	2.5	1.2	-17.6	2.5	2.7	-4.4
IPSL-CM5A-MR	1	2.2	-4.1	-7.8	2.6	0.0	-17.8	2.6	-0.1	-8.1
IPSL-CM5B-LR	1	1.8	6.3	-5.8	1.9	5.3	-15.0	1.9	5.4	1.8
MIROC-ESM	1	2.5	-1.1	-9.2	3.0	-2.4	-18.9	3.3	0.1	-11.4
MIROC-ESM-CHEM	1	2.5	-8.2	-9.0	2.9	-8.4	-19.2	3.3	-4.8	-17.1
MIROC5	1	1.6	9.4	-5.3	2.1	5.8	-15.7	2.3	4.8	-0.6
MIROC5	2	1.3	9.4	-4.2	1.7	6.0	-14.3	1.9	4.8	1.2
MIROC5	3	1.5	3.2	-4.6	1.9	1.2	-15.4	2.2	1.3	-4.1
MPI-ESM-LR	1	1.7	-5.6	-5.7	1.8	-2.9	-15.4	1.8	0.3	-3.7
MPI-ESM-LR	2	2.0	2.4	-7.0	2.1	1.0	-16.3	2.2	-0.2	-6.0
MPI-ESM-LR	3	1.7	-7.6	-5.5	1.8	-7.5	-15.6	1.9	-6.7	-11.8
MRI-CGCM3	1	1.0	0.7	-2.9	1.2	-2.4	-11.5	1.2	0.5	-1.1
NorESM1-M	1	1.8	4.1	-5.8	2.2	3.3	-16.4	2.5	3.7	-2.9

Table S4. Values for changes (plotted on Figure 2) from RCP 8.5 for three ecoregions.

		OR/WA Coast Ranges			Western Cascades			Columbia Basin		
GCM	**ensemble member**	**annual ΔT (°C)**	**annual ΔP (%)**	**annual ΔI_c(%)**	**annual ΔT (°C)**	**annual ΔP (%)**	**annual ΔI_c(%)**	**annual ΔT (°C)**	**annual ΔP (%)**	**annual ΔI_c(%)**
bcc-csm1-1	1	2.8	5.5	-10.5	3.2	4.0	-18.9	3.4	3.7	-8.0
bcc-csm1-1-m	1	2.1	3.8	-7.1	2.5	4.9	-17.3	2.6	5.5	-1.7
BNU-ESM	1	3.5	-0.5	-13.6	3.7	-4.9	-20.3	3.8	-7.4	-23.1
CanESM2	1	3.2	4.0	-12.4	3.8	4.8	-19.8	4.1	5.8	-9.8
CanESM2	2	3.3	5.8	-12.6	3.8	7.6	-19.7	4.1	11.2	-3.7
CanESM2	3	3.2	7.8	-12.4	3.8	7.9	-19.7	4.1	9.2	-6.1
CanESM2	4	3.3	8.0	-12.9	3.9	8.5	-19.9	4.4	9.7	-6.9
CanESM2	5	3.4	4.2	-13.3	4.0	6.3	-20.1	4.4	9.3	-7.4
CCSM4	1	1.9	-3.0	-6.3	2.5	-1.2	-17.7	2.7	1.5	-6.7
CCSM4	2	2.0	-3.6	-6.8	2.5	-2.4	-17.7	2.6	1.7	-5.7
CCSM4	3	1.9	3.7	-6.4	2.3	3.2	-17.0	2.5	8.0	1.8
CCSM4	4	1.9	-0.4	-6.5	2.5	-2.6	-17.9	2.8	0.4	-8.4
CCSM4	5	2.2	1.9	-7.7	2.7	0.2	-18.2	3.0	4.5	-4.7
CCSM4	6	2.0	3.4	-6.8	2.5	1.9	-17.4	2.6	4.2	-3.1
CESM1-CAM5	2	2.1	6.3	-7.3	3.0	7.6	-18.4	3.4	10.1	-1.0
CESM1-CAM5	3	2.3	9.3	-8.2	3.1	10.6	-18.3	3.4	13.7	3.7
CMCC-CM	1	1.7	12.7	-5.8	2.2	9.1	-16.0	2.4	18.7	14.8
CMCC-CMS	1	2.3	11.1	-8.1	2.5	10.9	-17.0	2.7	13.3	7.1
CNRM-CM5	1	1.8	8.6	-6.1	2.5	7.9	-17.0	2.6	13.1	7.5
CNRM-CM5	2	1.7	-1.0	-5.6	2.3	-0.1	-17.1	2.4	3.5	-2.5
CNRM-CM5	4	1.6	8.4	-5.3	2.3	7.7	-16.4	2.4	10.4	5.4
CNRM-CM5	6	2.1	-3.0	-7.2	2.8	-2.0	-18.6	2.9	0.6	-8.9
CNRM-CM5	10	2.0	5.1	-6.8	2.7	0.4	-18.1	2.8	2.3	-5.9
CSIRO-Mk3-6-0	1	2.6	-0.4	-9.5	3.1	-3.7	-19.2	3.4	-2.5	-15.4
CSIRO-Mk3-6-0	2	2.4	-0.6	-8.8	2.8	-2.2	-18.6	3.1	-0.5	-11.2
CSIRO-Mk3-6-0	3	2.7	6.3	-10.1	3.1	4.7	-18.7	3.4	5.9	-5.4
CSIRO-Mk3-6-0	4	2.4	-3.4	-8.6	2.8	-2.1	-18.5	3.1	1.6	-8.6
CSIRO-Mk3-6-0	5	2.2	2.9	-7.7	2.7	-1.0	-18.1	3.0	-2.1	-12.6
CSIRO-Mk3-6-0	6	2.2	0.2	-7.5	2.6	-0.1	-17.8	2.9	1.6	-7.3
CSIRO-Mk3-6-0	7	1.9	6.3	-6.6	2.4	5.5	-16.9	2.7	5.0	-2.4
CSIRO-Mk3-6-0	8	2.3	0.2	-8.3	2.7	-1.2	-18.2	3.0	-1.5	-11.7
CSIRO-Mk3-6-0	9	2.2	4.3	-7.8	2.8	1.8	-18.2	3.1	1.8	-8.5
CSIRO-Mk3-6-0	10	2.4	5.5	-8.5	2.9	2.4	-18.5	3.3	2.5	-8.9
FGOALS-g2	1	2.1	5.7	-7.4	2.5	7.9	-17.1	2.9	9.8	2.1
FGOALS-s2	1	2.8	10.5	-10.5	3.1	12.0	-18.3	3.3	15.3	5.8
FGOALS-s2	2	3.0	6.7	-11.3	3.2	9.5	-18.7	3.4	13.5	3.1
FGOALS-s2	3	2.6	5.0	-9.6	3.0	6.0	-18.4	3.2	8.3	-1.8
FIO-ESM	1	1.5	6.8	-4.7	1.7	4.2	-14.4	1.9	0.4	-3.9
FIO-ESM	2	1.4	8.0	-4.4	1.6	6.7	-13.6	1.7	4.4	1.4
FIO-ESM	3	1.4	10.0	-4.5	1.7	6.7	-13.9	1.9	2.2	-1.6
GFDL-CM3	1	2.8	8.7	-10.6	3.1	10.6	-18.4	3.3	14.3	5.0
GFDL-ESM2G	1	2.2	3.3	-7.6	2.4	5.4	-17.0	2.6	7.4	1.0
GFDL-ESM2M	1	1.3	0.4	-4.2	1.6	0.2	-14.2	2.0	0.7	-3.8
GISS-E2-H	1	1.5	13.3	-4.7	1.7	8.6	-14.0	1.8	5.7	2.6
GISS-E2-H	2	2.2	-3.2	-7.5	2.0	13.3	-15.2	1.7	15.2	14.0
GISS-E2-R	1	1.5	5.2	-4.9	1.7	3.4	-14.3	1.7	4.8	2.1
GISS-E2-R	2	1.1	5.6	-3.2	1.3	3.9	-12.2	1.4	3.5	1.7
HadGEM2-AO	1	3.4	7.8	-13.2	4.2	4.3	-20.5	4.8	5.2	-14.6
HadGEM2-CC	1	2.9	1.1	-10.9	3.7	-1.9	-20.1	4.0	1.1	-14.6
HadGEM2-ES	1	3.1	4.8	-11.6	3.7	2.4	-19.9	3.9	6.8	-7.4
HadGEM2-ES	2	3.0	2.7	-11.5	3.7	2.3	-19.9	4.0	7.0	-7.8
HadGEM2-ES	3	2.8	-2.1	-10.5	3.6	-4.8	-20.3	4.0	-1.5	-17.2
HadGEM2-ES	4	2.8	3.6	-10.2	3.6	1.7	-19.7	3.9	5.1	-9.5
inmcm4	1	1.4	-1.8	-4.5	1.6	-2.7	-14.1	1.6	-3.4	-7.0
IPSL-CM5A-LR	1	3.1	-2.9	-11.8	3.3	-1.9	-19.6	3.4	0.2	-11.9
IPSL-CM5A-LR	2	3.2	11.1	-12.1	3.4	13.3	-18.8	3.5	14.2	3.1
IPSL-CM5A-LR	3	3.3	11.4	-13.0	3.6	10.0	-19.2	3.7	7.1	-5.9
IPSL-CM5A-LR	4	3.3	0.8	-12.9	3.5	2.5	-19.6	3.6	6.3	-6.2
IPSL-CM5A-MR	1	3.1	4.2	-11.9	3.6	9.2	-19.2	3.7	8.8	-3.8
IPSL-CM5B-LR	1	2.5	7.5	-9.2	2.7	4.6	-17.8	2.7	1.5	-6.8
MIROC-ESM	1	3.0	2.4	-11.6	3.6	-0.2	-19.8	4.0	0.9	-14.7
MIROC-ESM-CHEM	1	3.2	-3.4	-12.5	3.8	-5.1	-20.4	4.1	-2.5	-19.6
MIROC5	1	2.1	9.0	-7.4	2.6	8.8	-17.3	2.9	10.1	2.5
MIROC5	3	2.0	1.2	-7.0	2.5	0.8	-17.5	2.7	2.9	-4.7
MPI-ESM-LR	1	2.3	-5.4	-8.0	2.5	-2.9	-17.9	2.6	1.6	-6.1
MPI-ESM-LR	2	2.6	-3.9	-9.5	2.8	-2.6	-18.6	2.9	-1.0	-10.5
MPI-ESM-LR	3	2.2	-5.3	-7.7	2.4	-4.8	-17.7	2.5	-3.8	-11.6
MRI-CGCM3	1	1.3	0.2	-4.2	1.5	-2.9	-13.8	1.6	1.0	-1.9
NorESM1-M	1	1.9	5.3	-6.3	2.5	5.0	-17.3	2.8	6.2	-1.7

Table S5. Curve fitting equation coefficients (as seen in Figure 3). These equations are used to create isolines in Figures 1 and 2 and S and ε values used in calculating histograms in Figure 4. Temperature sensitivities: $S(\Delta T) = b0 + b1*\Delta T + b2*\Delta T^2$. Precipitation elasticities: $\varepsilon(\Delta P) = a$.

	b0	b1	b2	a
Willamette	-18.0	4.30	-0.388	1.63
Yakima	-20.9	0.350	0.213	1.64
Upper Columbia	7.76	-2.25	0.0875	1.05
OR/WA Coast Ranges	-2.35	-0.634	0.0518	-0.00
Western Cascades	-12.9	2.99	-0.263	0.063
Columbia Basin	0.420	-1.68	0.150	1.15

Defining seasons of influence

Streamflow in a specific season is driven by seasonal temperature (T) and precipitation (P) values (not annual values), and the time of year that most influences seasonal streamflow varies depending on a watershed's hydrology. *Vano et al.* [2015] investigated how T and P changes in four seasons (October-December, January-March, April-June, and July-September) influenced streamflow in each month of the year. Results were presented as 'bubble diagrams' (see figure 7 in *Vano et al.* [2015]). The size of the bubble indicates the monthly sensitivity for warming (or wetting) incurred from each of the four seasons (see *Vano et al.* [2015] for details).

We used these seasonally applied changes to identify the seasons where T and P change have the greatest influence on streamflow. Specifically, we calculated the percent each of the four seasons contributed to the management-relevant streamflow in each watershed (June-August for the Willamette, April-September in the Yakima, and April-June in the Upper Columbia). If the season contributed to more than 20% of the streamflow change, we included that season in the "seasons of influence" (Table S6).

Table S6. Seasons of influence evaluation

	Seasons of influence, T	R^2 (for ΔT)	Seasons of influence, P	R^2 (for ΔP)	T contribution[A]	Spearman rank correlation
Willamette	ONDJFMAMJ	0.95	JFMAMJ	0.61	86% (63-100%)	0.81
Yakima	ONDJFMAMJ	0.92	ONDJFM	0.92	87% (60-99%)	0.95
Upper Columbia	AMJ	0.71	ONDJFMAMJ	0.83	56% (11-98%)	0.82

[A] The median, minimum, and maximum amounts that temperature change, $S(\Delta T)T$ in equation (3), influences streamflow change.

For vegetation carbon, the season of influence concept is less applicable and therefore not evaluated. Unlike streamflow where the response can be delayed due to snow accumulation and melt, increased plant growth is immediately accumulated in total live vegetation carbon, while loss to fire and respiration is immediately deducted. Therefore, monthly responses to annually applied change also reflect how seasonally applied changes would respond. Also, because total live vegetation carbon is a stock, not a flux, its sensitivities to ΔT and ΔP are relatively stable throughout the year.

Comparison of annual vs. seasons of influence ΔT_{GCM} and ΔP_{GCM}

We evaluated how results of where individual GCMs lie on the spectrum of streamflow change differed if we used only ΔT_{GCM} and ΔP_{GCM} from the seasons of influences vs. annual ΔT_{GCM} and ΔP_{GCM} values. In these comparisons, we used *RCP4.5* scenarios with a total of 61 runs, including multiple runs from some GCMs. In general, we found that the position of GCMs on Figure 1 changed only slightly when seasons of influence were used. R^2 values between annual values and seasons of influence for both ΔT_{GCM} and ΔP_{GCM} were high (Table S6), especially for T in the Willamette and Yakima. It is these correlations, especially considering that T has the largest influence on streamflow change in these watersheds (median of 86% and 87% respectively), as calculated by equation (3), that translate to only slight differences in Figure 1. Correlations with P are also large, especially in the Yakima and Upper Columbia, which also helps explain only slight differences in Figure 1 with seasons of influence (vs. annual), especially for springtime streamflows in the Upper Columbia, where P contributes more to streamflow change, as calculated by equation (3) (T contributions range from 11 to 98% with a median of 56%).

We also tested how the order of GCMs based on estimated streamflow would differ with annual ΔT_{GCM} and ΔP_{GCM} vs. seasons of influence ΔT_{GCM} and ΔP_{GCM}. We used the Spearman rank test with all 61 GCMs ordered according to ΔI_q (from equation (3)). As the high Spearman rank correlation coefficients indicate, the order of GCM runs do not change by much. For example, in the Yakima, the average change in rank is four places, with even smaller changes in the tails of the distribution. In the Willamette and Upper Columbia, the average change in rank is greater (nine and eight places respectively), but changes in rank in the tails of the distribution are similarly half as large.

In practice, annual ΔT_{GCM} and ΔP_{GCM} and influential seasons ΔT_{GCM} and ΔP_{GCM} give similar results, although the exact GCMs selected depend on the selection criteria. If, for example, GCMs in the Yakima were selected to (1) be the highest and lowest streamflow values that (2) have a performance ranking of 10 or less, both ΔT_{GCM} and ΔP_{GCM} calculations would result in the selection of the same two GCMs. Other selection criteria will likely result in the selection of different GCMs; however, because there is little difference in how GCMs are ordered, the GCMs selected will be in the same range of the distribution (e.g. high, medium, or low streamflow values).