

# Projections of climate-induced shifts in ecological zones of the Skeena Watershed

## Objectives (Schedule A)

"Projections of climate-induced shifts in ecological zones of the Skeena Watershed (Figure 1) based on high-resolution (90 x 90m) climate data for the reference period (1970s) and three future period (2020s, 2050s and 2080s) with two GCM scenarios (CGCM3 A2 and B1). "

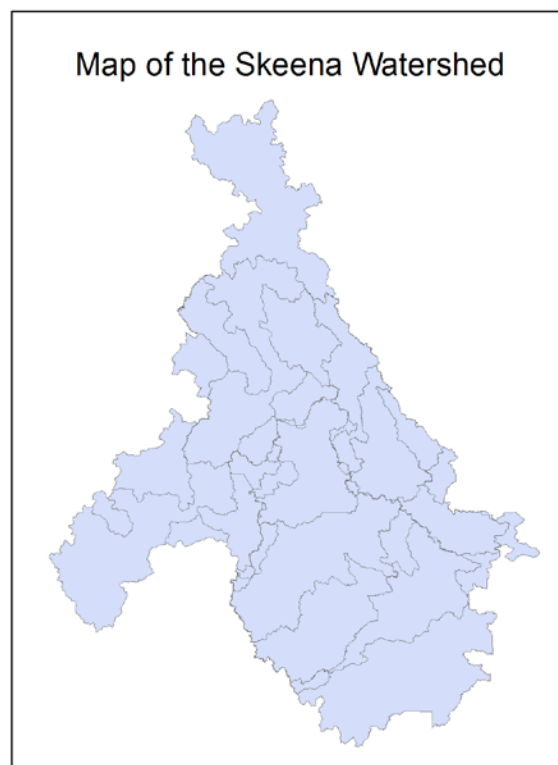


Figure 1. Map of the Skeena Watershed.

The GCM scenarios selected for this project have been changed from the two Canadian ones (CGCM3 A2 and B1) to three new ones based on the recommendations provided by Trevor Murdock at the Pacific Climate Impacts Consortium in April 2010. The three GCM scenarios include one Canadian model (CGCM3 A2 run4) and two British models (HadCM3 A2 run1 and HadGEM1 A1B run1).

The extra work induced by increasing one GCM scenario was achieved by re-allocation of the resource for completing ClimateWNA web version. The work for finishing ClimateWNA was done using other resources. All the scenarios are from the IPCC Forth Assessment.

## **Methods**

### ***Digital Elevation Model***

A digital elevation model (DEM) at the resolution of 90m (3 arc-second or 0.0008333 decimal degrees) for the Skeena Watershed area was extracted from Shuttle Radar Topography Mission (SRTM) DEM database. There are 7283 x 5278 data points for this area.

### ***Climate data generation***

The DEM was used to generate ClimateWNA input file for producing monthly, seasonal and annual climate data for the reference period (1961-1990) and three future periods (2020s, 2050s and 2080s) for the three Global Circulation Model (GCM) scenarios.

### ***Projections of climate envelopes***

The Random Forest model built for projecting BEC Zones for the entire province was used to project the BEC Zones for this area. Due to the large size of the datasets (over 14 million data points for each period), each dataset was split into 14 subsets to run the model. Outputs of the projections were jointed together for mapping in GIS and statistical analysis.

## **Results**

Projections have been completed for the reference period (Table 1 and Figure 2) and all the three GCM scenarios and three periods (Figure 3, 4 and 5). The same maps at higher resolution are attached in separate files.

Table 1. Prediction accuracy (match rate) of the BGC Zones in Skeena Watershed using the Random Forest model developed for BEC Zones for entire BC.

BEC zone	Area (mha)	Match rate (%)
BAFA	0.868	69.5
CMA	0.406	46.1
CWH	1.169	82.7
ESSF	3.815	91.0
ICH	1.016	94.4
MH	0.936	85.3
SBPS	0.096	97.7
SBS	4.378	93.9
SWB	0.022	65.7

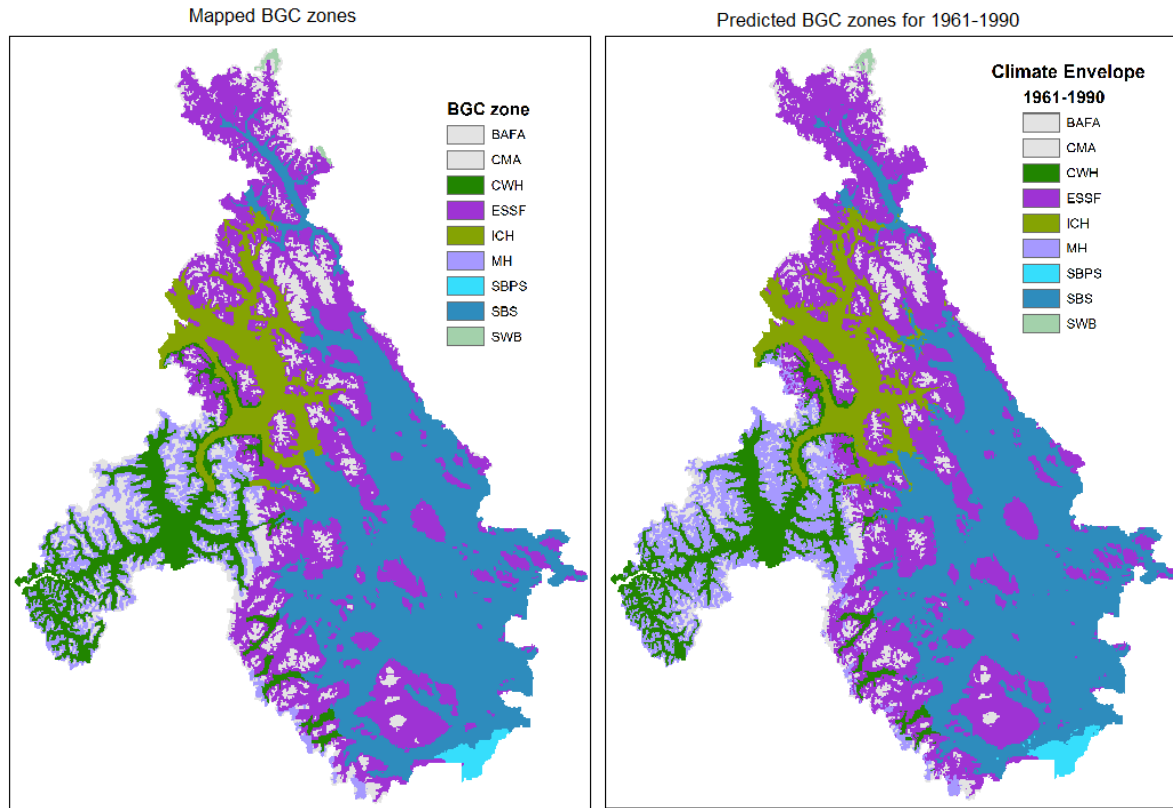


Figure 2. Maps of currently mapped and predicted BGC zones for the reference period (1961-1990). The predicted BGC zones are actually the climate envelopes (or climate niches) of the BGC zones.

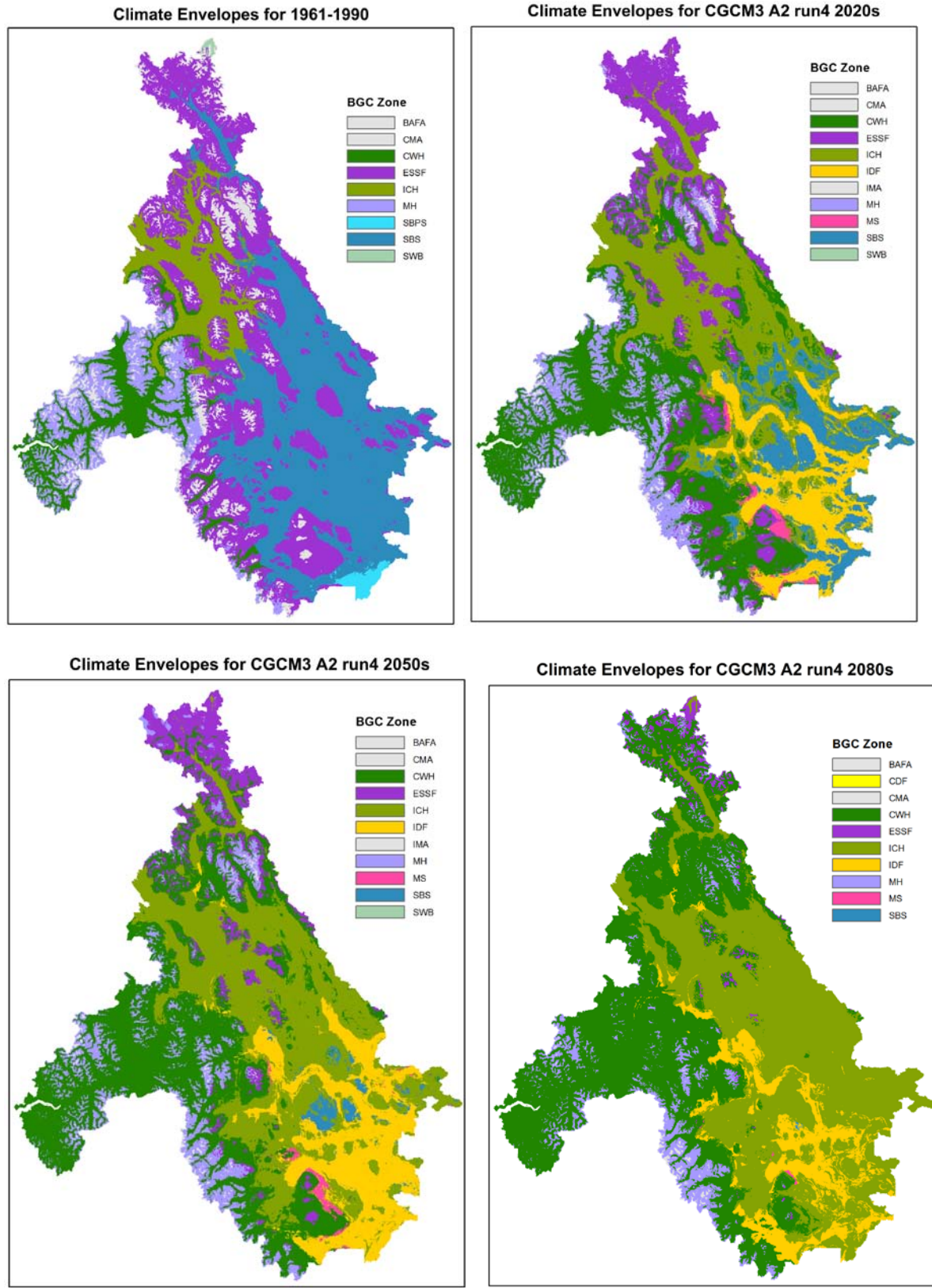


Figure 3. Projected shifts in climate envelopes for different BGC zones based on CGCM3 A2 run4 for the periods of 2020s, 2050s and 2080s.

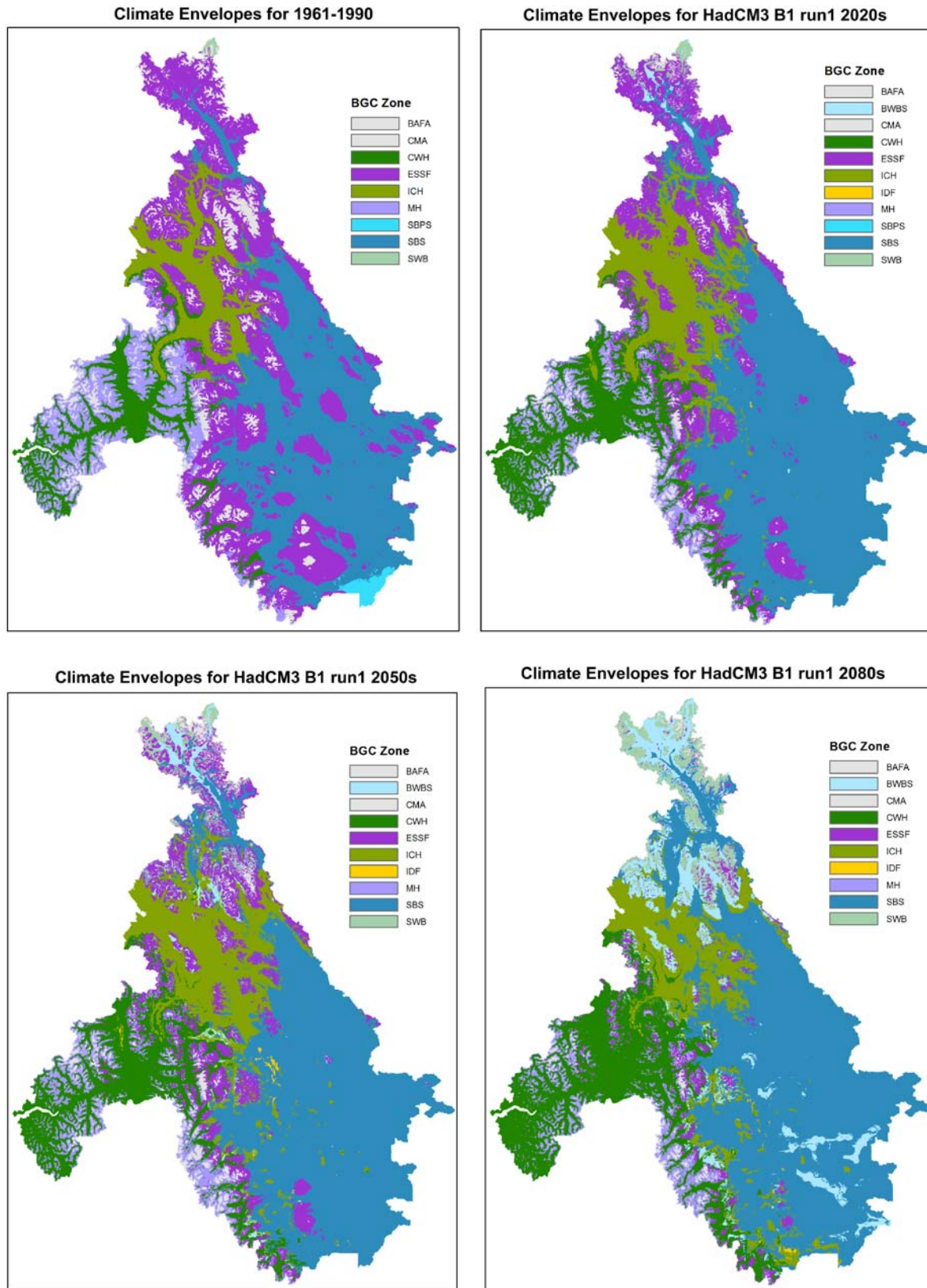


Figure 4. Projected shifts in climate envelopes for different BGC zones based on HadCM3 B1 run1 for the periods of 2020s, 2050s and 2080s.

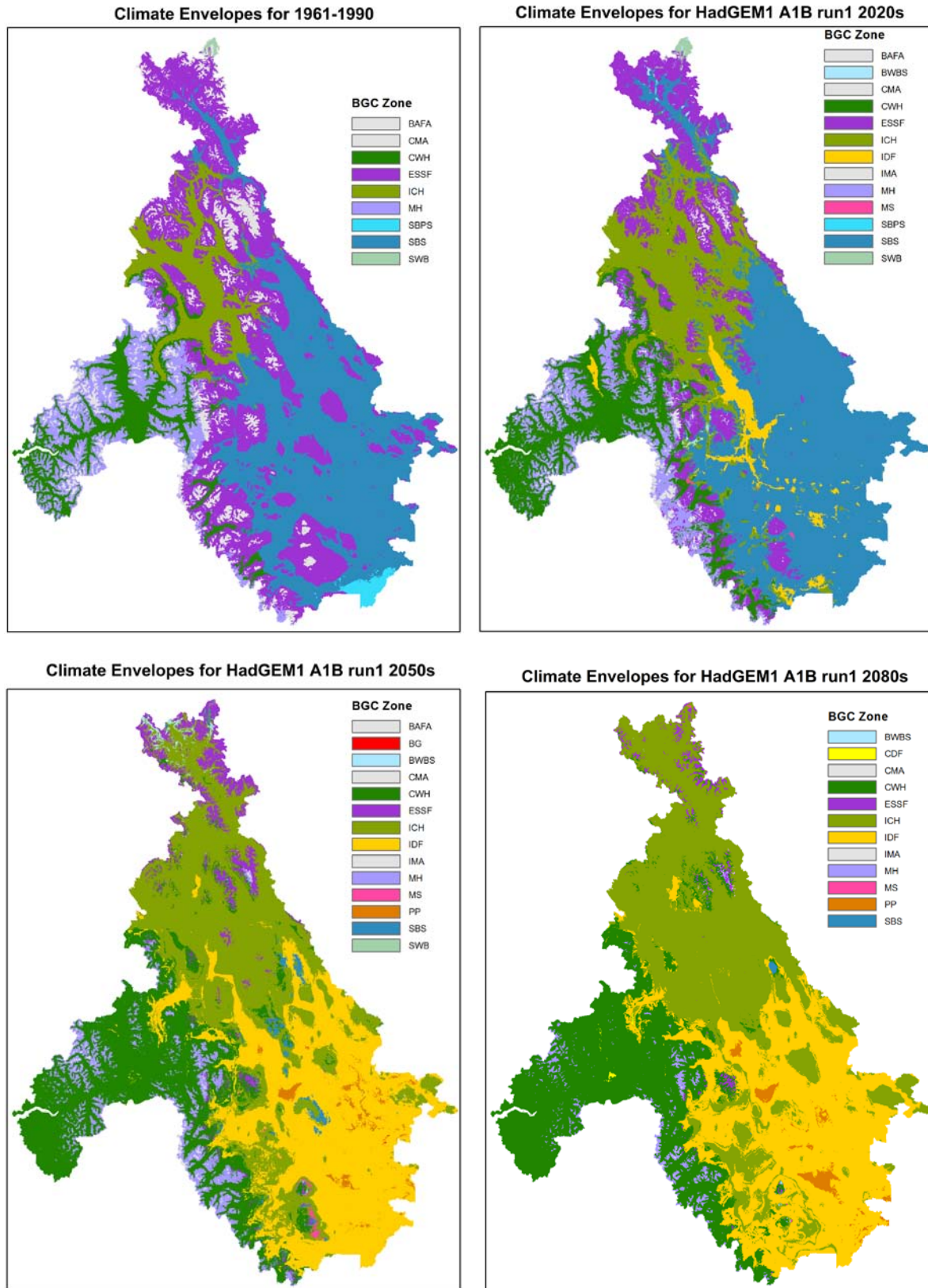


Figure 5. Projected shifts in climate envelopes for different BGC zones based on HadGEM1 A1B run1 for the periods of 2020s, 2050s and 2080s.

Additional resultant materials:

1. High resolution maps for each of these maps shown above are attached in separate files.
2. GIS raster files for these maps and for subzone and variant are available for request.
3. A spreadsheet file (1.65GB) contains all projections at BGC variant level is available for request.