

Detailed Description of the Databases on Biodiversity, Climate, and Soil Used By CC-Bio to Study the Effects of Climate Change on Quebec Biodiversity

Data on **birds** come from two sources: 1) The “Étude des Populations d’Oiseaux du Québec” database (ÉPOQ) compiles observations from amateur birders in Quebec and is North America’s longest running bird checklist compilation program [1,2]. The database contains approximately 7.5 million records collected from >520,000 checklists and 7,300 localities; 2) The Breeding Bird Survey (BBS) is a standardized breeding season roadside survey along randomly chosen routes across North America [3] during which volunteers make 50 three-minute stops every 0.8 km along prescribed routes, recording all birds seen or heard. The geographical coverage in Quebec is similar between ÉPOQ and BBS (mostly south of 51 °N), although more information is available in the northern part of the province in ÉPOQ than in BBS. Data from the past 35 years was used from both sources. Data on **amphibians and reptiles** comes from three sources: 1) *Atlas des amphibiens et des reptiles du Québec* (AARQ) is equivalent to ÉPOQ in that it is a checklist compilation program that gathers observations from amateur herpetologists in Quebec and contains approximately 70,000 records from >300 herpetologists with geographical coverage limited primarily to the southern portion of the province, where most species occur and where most observers live; 2) The National Amphibian Atlas provides species distribution data for the United States at the county level based on museum records and published records for 289 amphibian species; 3) The Atlantic Canada Conservation Data Center provides information about species distribution at the county level for the Canadian province of New Brunswick. Data on **trees** come from three sources: (1) the “Placettes-Échantillons Temporaires” (PET) dataset which contains measurements of tree volume and abundance on 130,000 plots of the Ministère des Ressources naturelles et de la Faune du Québec (MRNF) in Southern Quebec (approximately <53 ° Lat N), (2) the “Placettes-Échantillons Permanentes” (PEP) which contains measurements of tree volume and abundance on 12,000 sampling units of MRNF, and (3) the Forest Inventory and Analysis (FIA) program of the United States Department of Agriculture Forest Service (USDA FS) which gives the abundance of 134 tree species on a 20 km x 20 km grid for the United States. Information on **plants other than trees** is retrieved from all major herbarium collections (>100,000 specimens) in Quebec and the north-eastern United States, the National Herbarium of Canada, the ecological survey database of the MRNF (30,000 plots in southern Quebec; [4]), the Environment Canada database on the Biodiversity portrait of the St. Lawrence, the Inventory of Natural Capital from the Ministère du Développement Durable, de l’Environnement et des Parcs du Québec (MDDEP), the USDA PLANTS Database, and the Global Biodiversity Information Facility (GBIF). Herbarium records generally include information about the sampling locality, collection date, and phenology for specimens with flowers or seeds, but the majority of specimens have yet to be digitized. All digitized plant data is stored in the Actaea database [5] administered by the CC-Bio project. Data on **threatened and vulnerable species** come from the Centre de données sur le patrimoine naturel du Québec (CDPNQ), or Quebec Conservation Data Centre which is a member of NatureServe and one of the three main Conservation Data Centers in Canada. CDPNQ gathers all occurrences of threatened and vulnerable species in Quebec [6].

We use data on **beaver** distribution based on 161 aerial helicopter surveys of regional abundance, covering 74% of their 1.1 million km² range in Quebec. The large scale beaver abundance data in combination with the abiotic and biotic explanatory variables available from the survey regions makes this a unique dataset for assessing impacts of climate change on the abundance and distribution of a long-lived mammal.

Data on **past climate** come from Environment Canada archived station data sets. The main climatic variables (annual, monthly and daily temperatures and precipitation) are available for 120 locations across Canada, starting in 1940. Data on **current climate** is provided by the USDA Forest Service and comes from interpolation by Anusplin software of observations from meteorological stations. Data are available for all of North America on a 1 km x 1 km grid and were aggregated on a 20 km x 20 km grid for our needs. Data on **future climate** is provided by Ouranos in the form of 70 climatic scenarios generated from eleven General Climate Models (GCMs) and one Regional Climate Model (RCM). GCM data are made available by the Program for Climate Model Diagnosis and Intercomparison [7] and simulated climate data are projected in response to three projected future greenhouse gas emission scenarios (SRES family A2, A1b and B1 scenarios; [8]). Several runs were available for each model. The RCM used was the Canadian Regional Climate Model (CRCM) developed at Ouranos, which performs climatic simulations at a ~45 km scale grid resolution [9,10] under the A2 greenhouse gas emission scenario. Climatic data from one CRCM run covering North America were included in the analyses. Data were rescaled at a 20 km x 20 km grid for our needs. GCM data are IPCC's 4th Assessment Report (AR4) realizations but CRCM data come from more recent realizations than the AR4.

In addition to the above databases, data describing the **edaphic environment** (e.g., geology, geomorphology, drainage structure) comes from the "Système d'information écoforestière (SIEF)", a digitized database provided by MRNF, and from the USDA SSURGO dataset which offers highly detailed soil mapping for the United States (scale ranges from 1:12,000 to 1:63,360). Finally, digitized maps of the distribution of wetlands > 1 ha are available through Ducks Unlimited [11].

References

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