PROJECT BACKGROUND

The annual crop water requirement, the minimum amount of water that has to be applied by irrigation to keep soil just moist during the growing season, is dependent upon the climate of the region. Because of the hot & dry summers on Vancouver Island there is an annual climatic moisture deficit (Figure 1), which is the additional amount of precipitation in summer that is needed to satisfy the evaporative demand and keep the soil moist. In fact part of the demand is satisfied by water stored in the soil, the maximum soil water deficit (Figure 2), which depends upon the soil texture and thickness. The annual crop water requirement (Figure 3) is the annual climatic moisture deficit (Figure 1) minus the maximum soil water deficit (Figure 2).

CURRENT ANNUAL CROP WATER REQUIREMENT (1981-2010)

The current annual crop water requirement (Figure 3) varies significantly across Vancouver Island. In most regions, shown in green in Figure 3, there is little need for irrigation during the year. However, on the east and south-east margins of the Island and in major valleys where most people live and agricultural land is situated (agricultural land reserve) there is a significant requirement for crops to be watered, to a depth of typically 200-300 mm annually (warm colours in Figure 3). The calculated results match well with actual amounts reported in most regions, especially from Victoria to the Comox Valley.

FUTURE CHANGES IN ANNUAL CROP WATER REQUIREMENT (to 2100)

How climate change will impact the annual crop water requirement has been calculated with the average predictions from three global circulation models (GCMs), namely CanESM2, CCSM4 & HadGEM2-ES for two climate change scenarios, RCP 4.5 and RCP 8.5, developed by the Intergovernmental Panel on Climate Change (IPCC). RCP 4.5 (Figure 4) is a stabilization scenario where atmospheric levels of carbon dioxide level off by 2100, which is possible if society changes soon to a low-carbon economy. RCP 8.5 (Figure 5) is a high emissions scenario, where carbon dioxide emissions continue to increase, causing more global warming.

The predicted increase in the annual crop water requirement above the 1981 -2010 reference period is shown in Figures 4 & 5. This is the additional amount of water above current levels (Figure 3) that would be required to maintain adequate soil moisture for crops in a warming climate. For each climate change scenario three future periods are shown; 2011-2040 (Figures 4a & 5a), 2041-2070 (Figures 4b & 5b) and 2071-2100 (Figures 4c & 5c). The results show that the annual crop water requirement will generally increase with both scenarios, to a larger amount with the high emissions scenario at any given location. The highest increases are along the eastern margin of the Island and are centred around Campbell River and in major interior valleys. The highest predicted increases are more than double the current requirement. This will potentially place a significant stress on water supplies where a large increase in crop water requirement is needed.

OTHER INFORMATION

Projected Coordinate System:
BC Albers

Datum: NAD 1983

Created by: Alan Gilchrist,
Department of Geography,
Vancouver Island University,
Nanaimo, BC, Canada

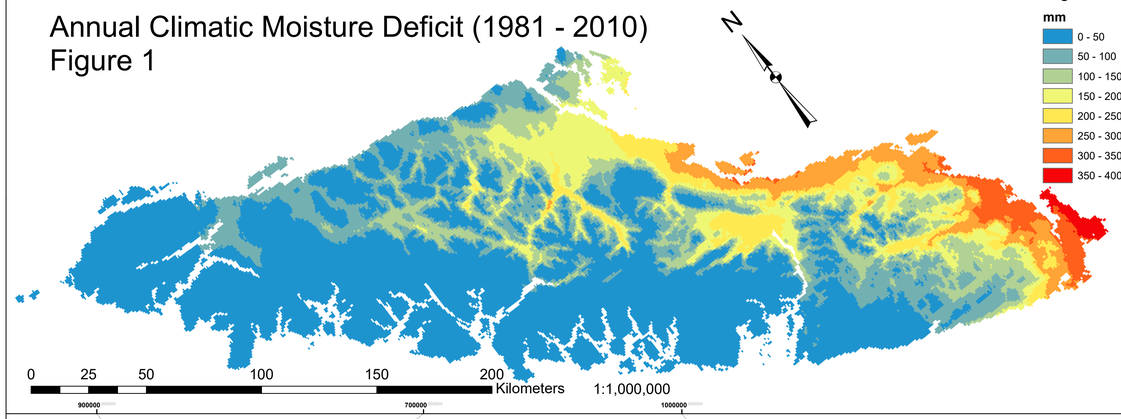
See https://wordpress.viu.ca/gilchrisa/

Data Sources:
BC Ministry of Forests,
Lands a nd Natural Resource Operations,
Natural Resources Canada (NRCan),
BC Integrated Land Management Bureau (ILMB),
Forest Renewal BC,
ClimateBC,
BC Geological Survey (BCGS),
Geological Survey of Canada (GSC),
BC Watershed Atlas

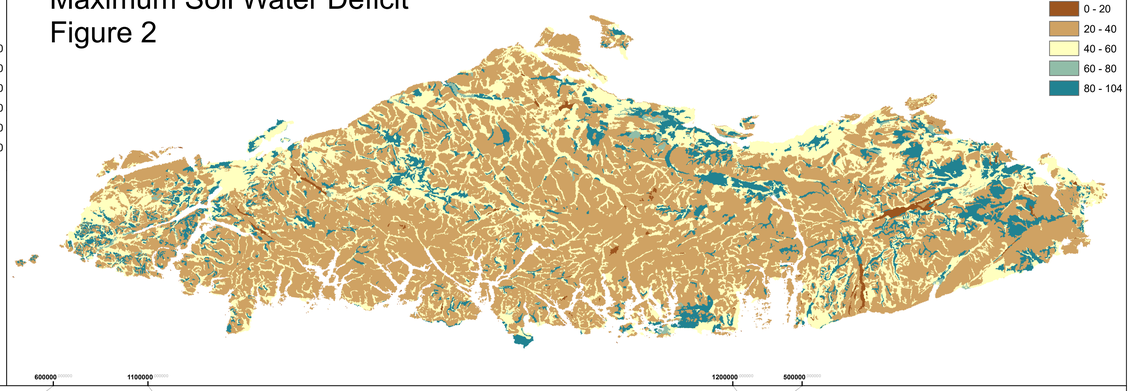
Date: September 13, 2017

VIU

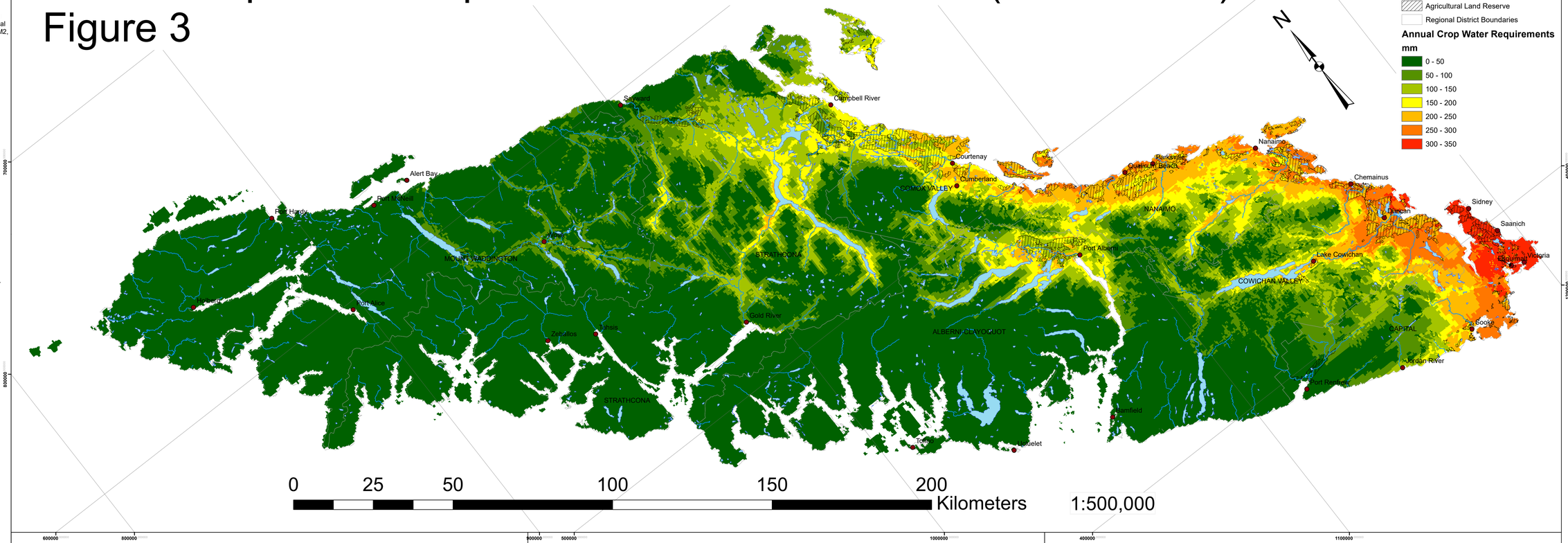
Annual Climatic Moisture Deficit (1981 - 2010)
Figure 1



Maximum Soil Water Deficit
Figure 2



Annual Crop Water Requirement - Vancouver Island (1981 - 2010)
Figure 3



Future Change in Annual Crop Water Requirement - Stabilization Scenario

Figure 4a. RCP 4.5 (2011-2040)

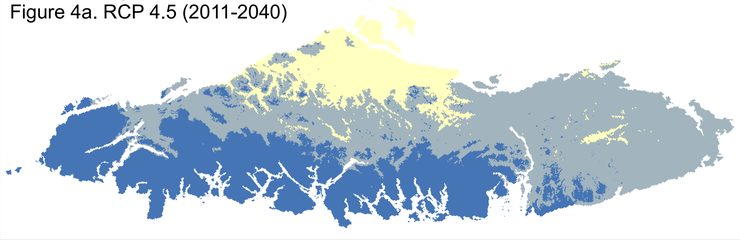


Figure 4b. RCP 4.5 (2041-2070)

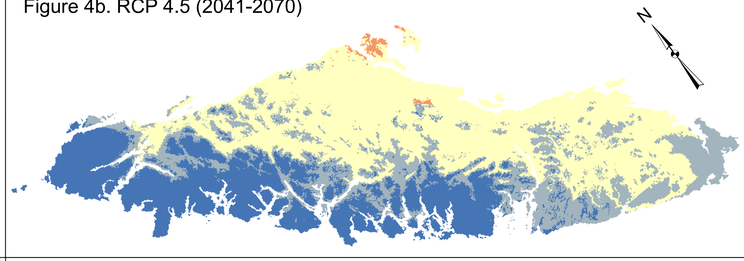
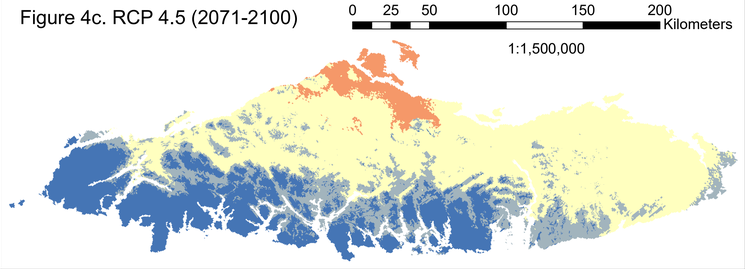


Figure 4c. RCP 4.5 (2071-2100)



Future Change in Annual Crop Water Requirement - High Emission Scenario

Figure 5a. RCP 8.5 (2011-2040)

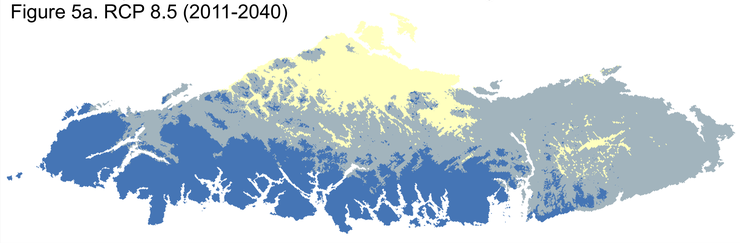


Figure 5b. RCP 8.5 (2041-2070)

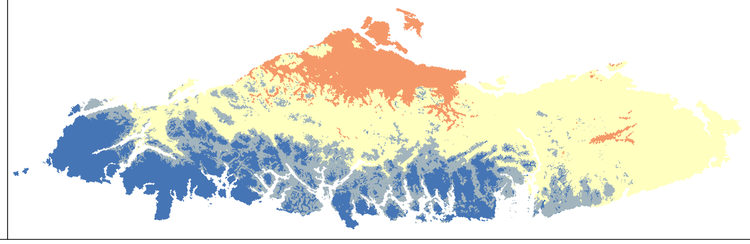


Figure 5c. RCP 8.5 (2071-2100)