

State of Climate Adaptation

Regional District of Kootenay Boundary – Area A

APPENDIX – CLIMATE DATA

March 2020



COLUMBIA BASIN

RDI
RURAL DEVELOPMENT INSTITUTE

Selkirk  College



Regional District of
Kootenay Boundary

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This appendix is additional climate data that supports the State of Climate Adaptation for the Regional District of Kootenay Boundary Area A. Please refer to the full report for more detail.

About the Climate Data

Climate data for RDKB Area A locations were provided by Climatic Resources Consulting, Inc. and come from two main modeling sources. Technical information is presented below. Climate projections for the 2050s in this report include two scenarios: low carbon and high carbon. Climate projections for the 2050s indicate the average for the 2041-2070 period. The low carbon scenario (RCP4.5) is considered to be optimistic and, although insufficient to maintain global temperatures to below 2°C warming above pre-industrial temperatures, would require significant international cooperation that exceeds current commitments of signatories to the Paris climate agreement.¹ The high carbon scenario (RCP8.5) is also referred to as 'business as usual'. Global emissions are still moving along a trajectory that could lead to 3 to 5°C of global warming by the end of the century, highlighting the significant gap between the emission reductions pledged by Paris Agreement signatories and the reductions required to meet the 2°C global target.² Consequently, it is important to also consider the high global emissions scenario (RCP8.5) in planning for climate change in the Columbia Basin and Boundary regions. Climate trends, i.e. rates of change, are expressed in units per century, meaning the change per 100 years.

Technical Information

Historical climate data was prepared using climate reanalysis ERA5.^{3,4} Climate reanalyses combine past observations with models to generate consistent time series of multiple climate variables.⁵ They provide a comprehensive description of the observed climate as it has evolved during recent decades, on 3D grids at sub-daily intervals. The estimates are produced for all locations on earth, and they span a long time period that can extend back several decades or more. Adjusted and Homogenized Canadian Climate Data (AHCCD) from Environment Canada provides long-term (since the early 1900s) observed data. For total annual precipitation, data from climate stations in Creston, Kaslo, Castlegar, Fauquier, Warfield and Grand Forks was referenced in addition to ERA5 data. Climate projections are based on output from an ensemble of 12 statistically downscaled Global Climate Model (GCM) projections⁶ from the Coupled Model Intercomparison Project Phase 5 (CMIP5),⁷ and downscaled using Bias Correction/Constructed Analogues with Quantile mapping recording⁸ to a resolution of 10 km by 10 km.

Representative Concentration Pathways (RCPs) are numbered (e.g. RCP8.5 or RCP4.5) according to the radiative forcing in W/m² that will result from additional greenhouse gas emissions by the end of the century. Modellers use RCPs to generate scenarios of future climate.

The following plots provide further insights on historic and projected climate for Area A. Seasons are defined as follows:

- Spring = March, April, May
- Summer = June, July, August
- Fall = September, October, November
- Winter = December, January, February

Historic and projected average annual temperature

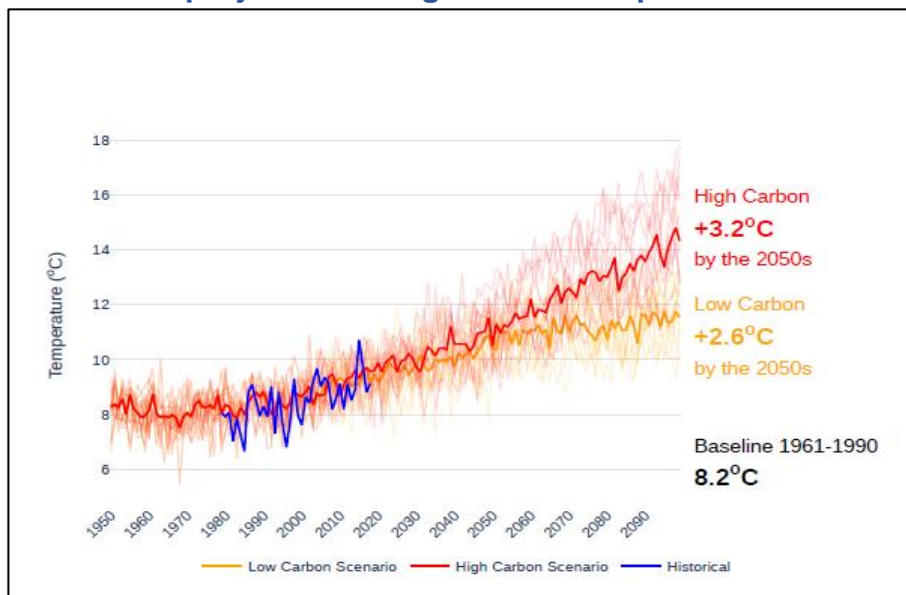


Figure 1.1
Fruitvale

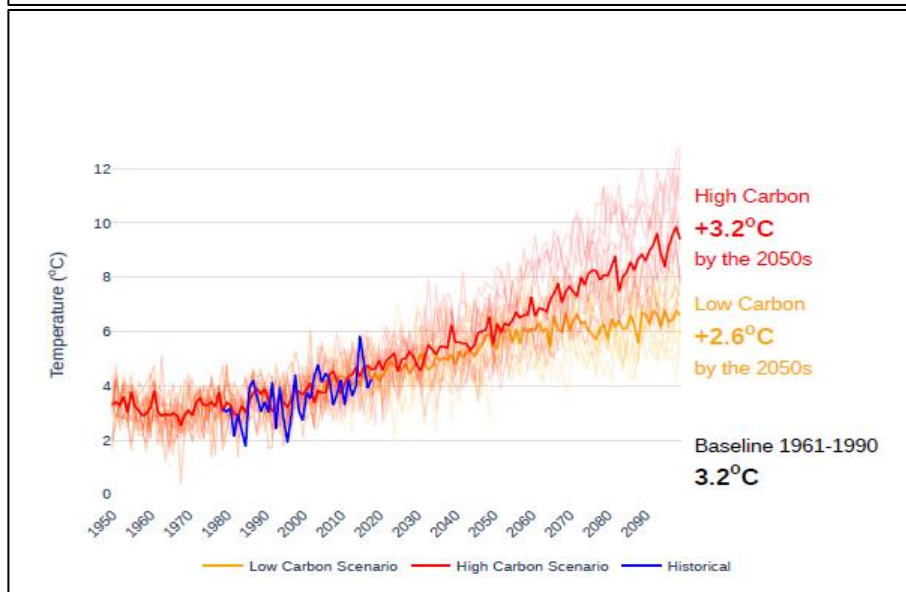


Figure 1.2
Kelly Creek Watershed

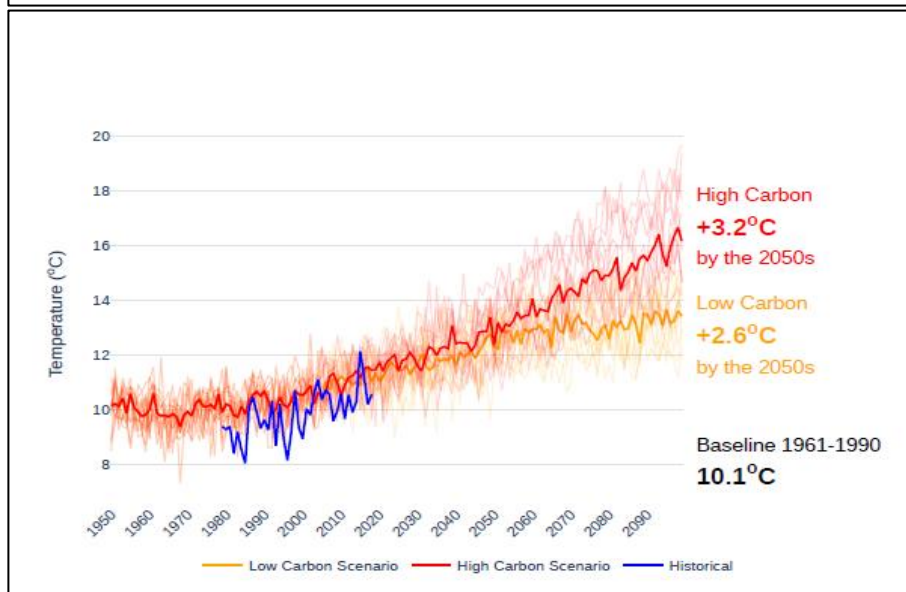


Figure 1.3
Columbia Gardens

Historic and projected average spring temperature

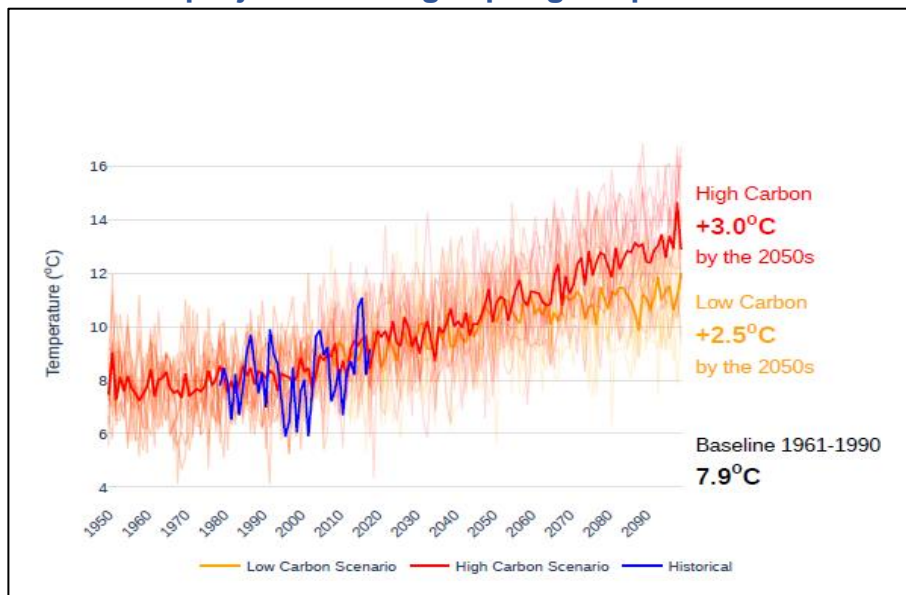


Figure 2.1
Fruitvale

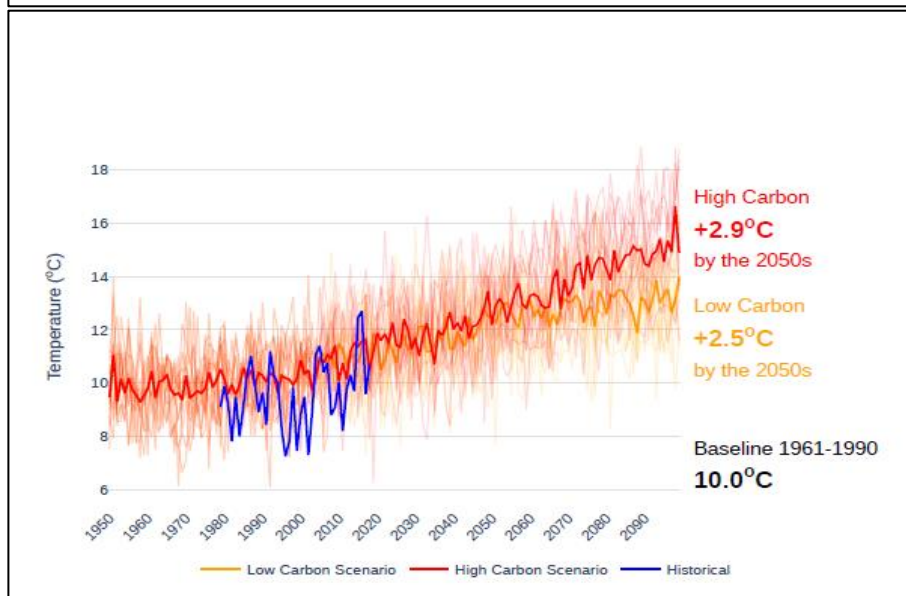


Figure 2.2
Kelly Creek Watershed

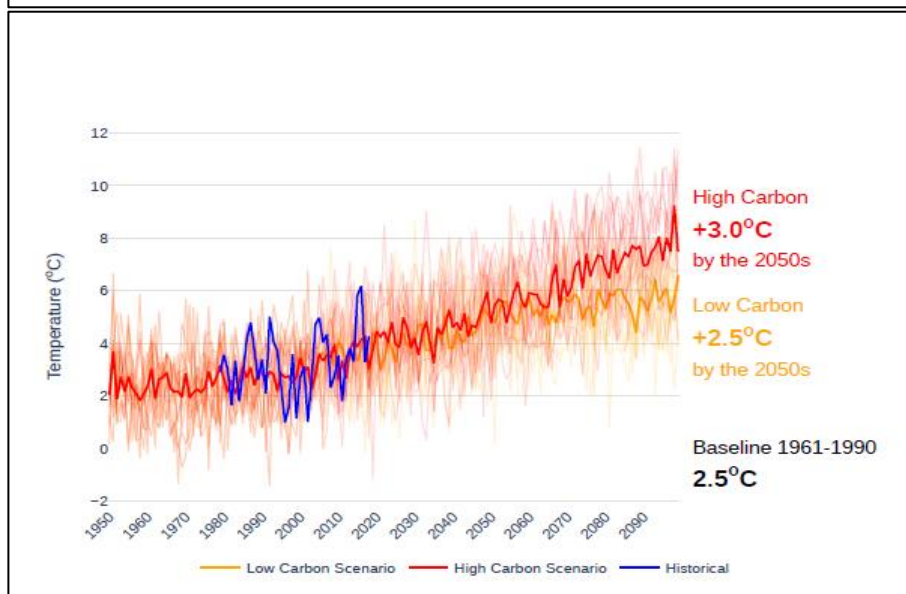


Figure 2.3
Columbia Gardens

Historic and projected average summer temperature

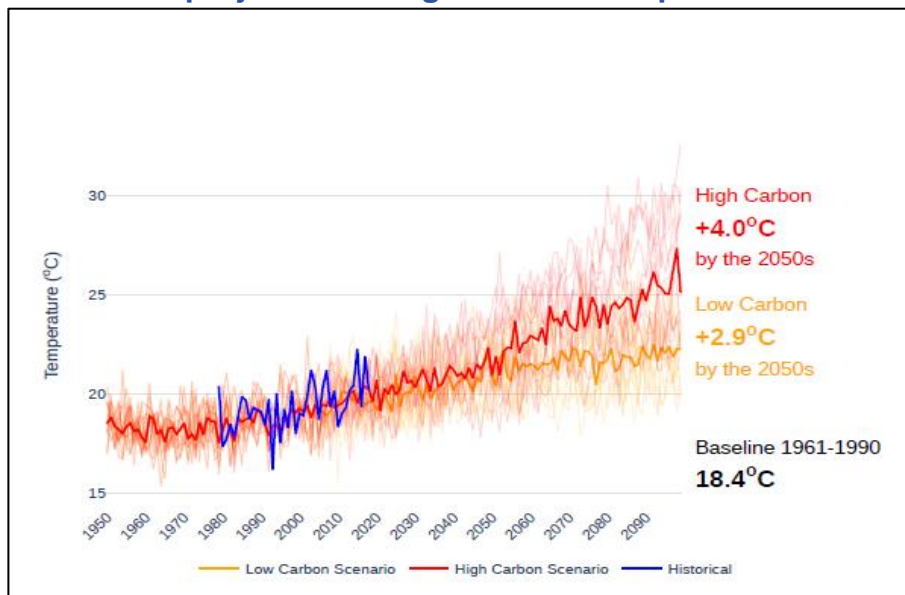


Figure 3.1
Fruitvale

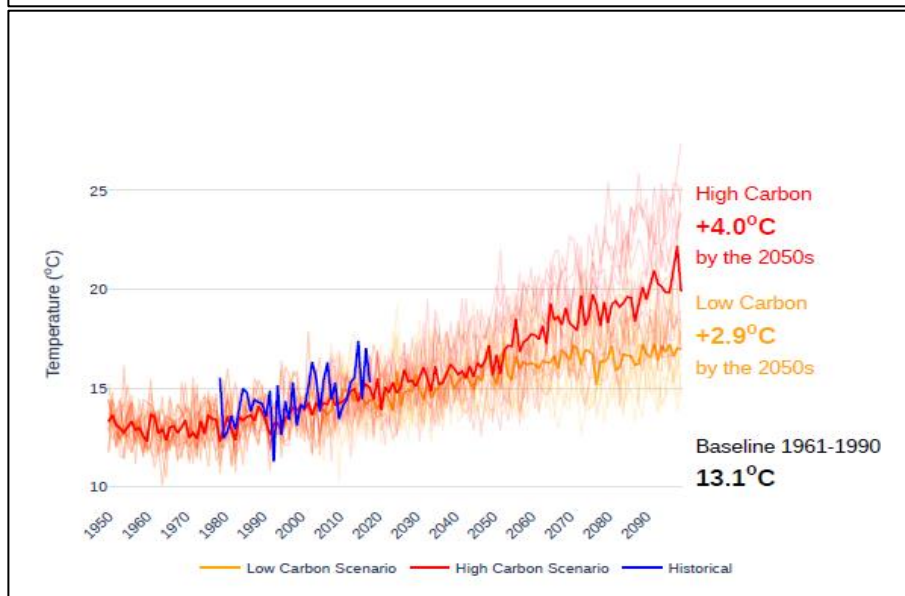


Figure 3.2
Kelly Creek Watershed

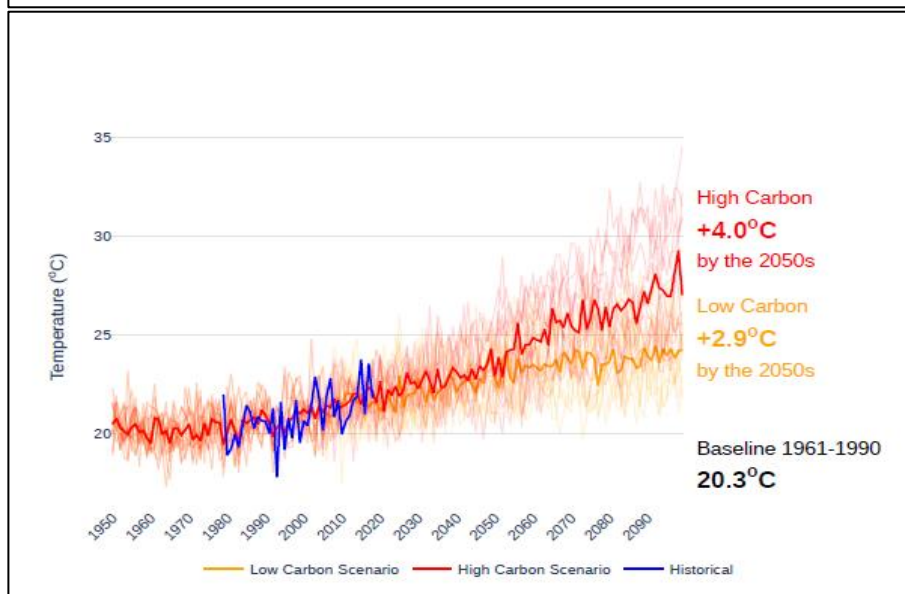


Figure 3.3
Columbia Gardens

Historic and projected average fall temperature

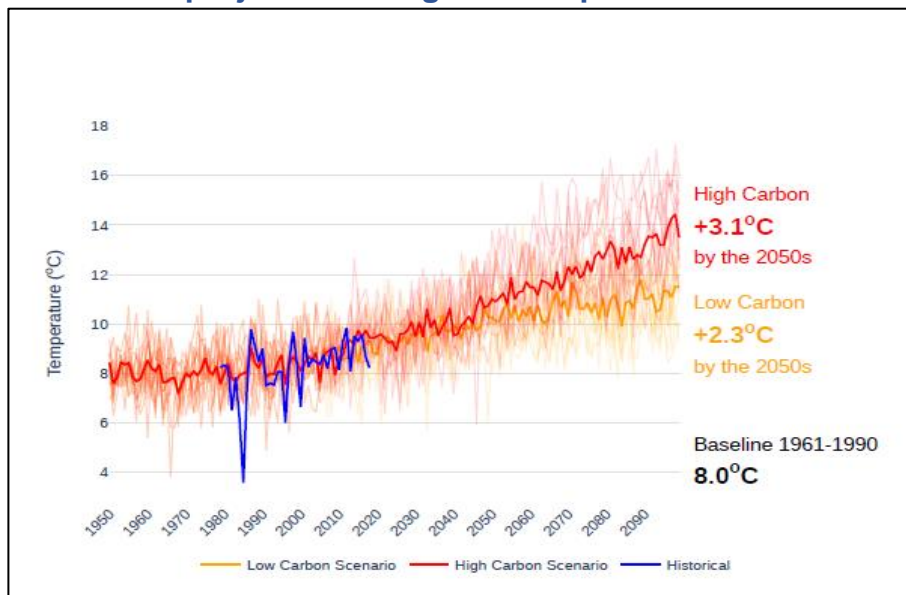


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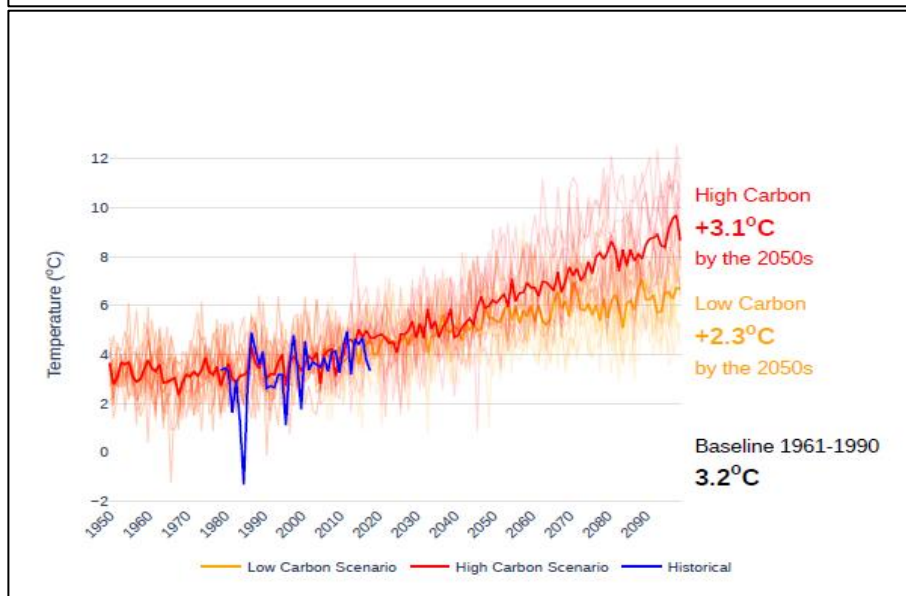


Figure 4.2
Kelly Creek Watershed

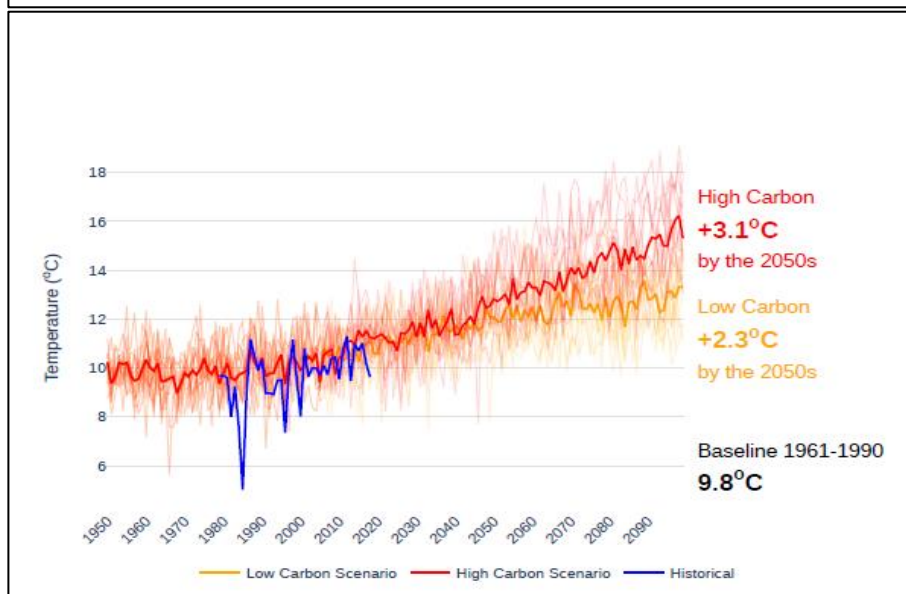


Figure 4.3
Columbia Gardens

Historic and projected average winter temperature

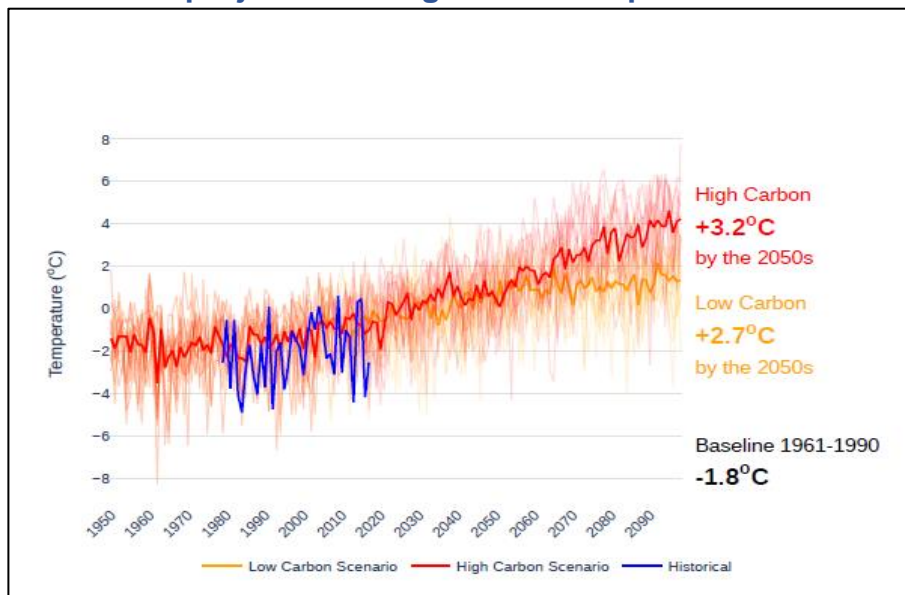


Figure 5.1
Fruitvale

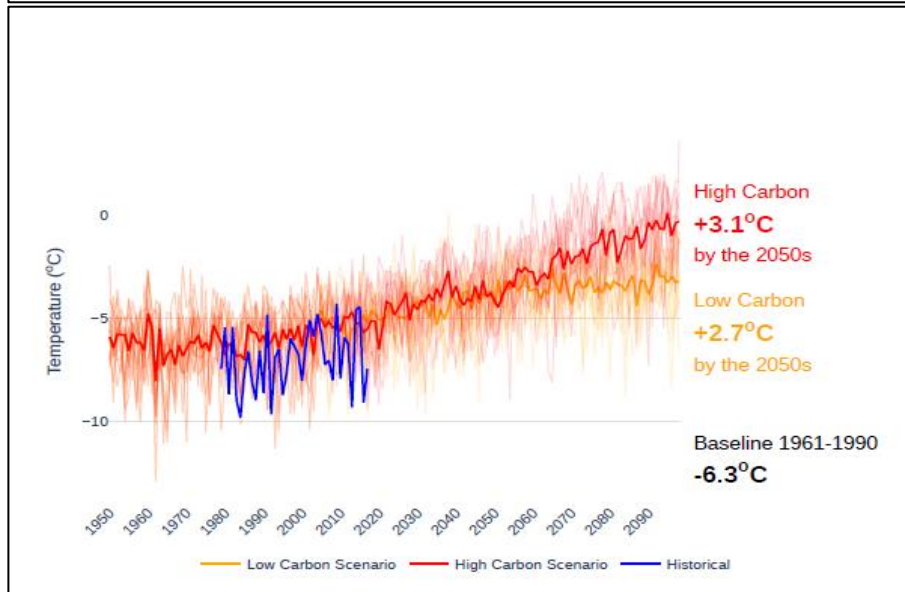


Figure 5.2
Kelly Creek Watershed

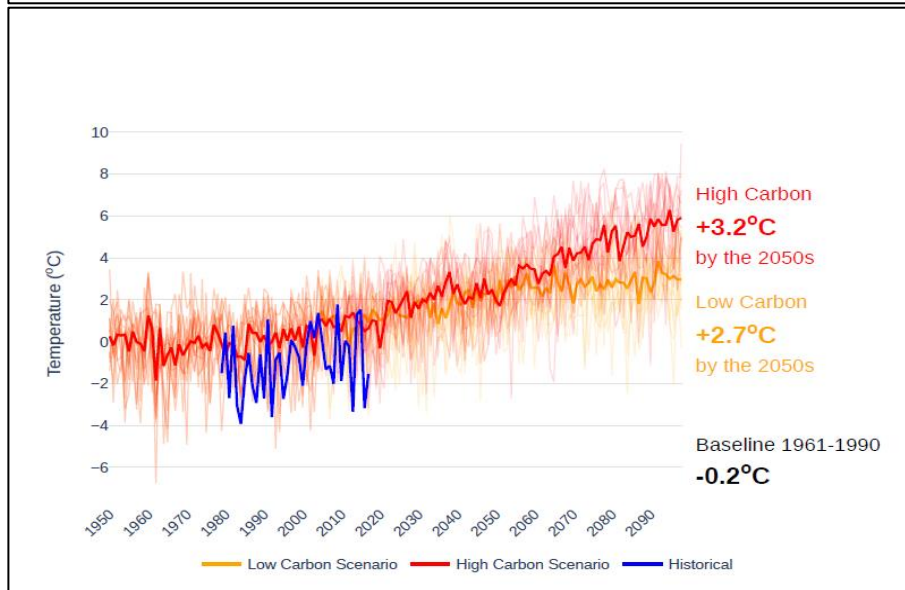


Figure 5.3
Columbia Gardens

Historic and projected annual number of days over 30 °C

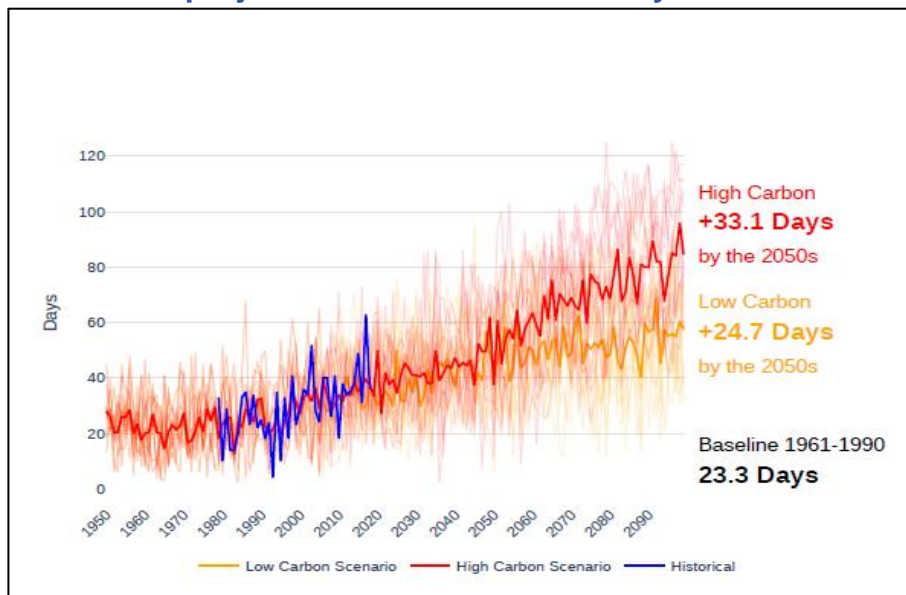


Figure 6.1
Fruitvale

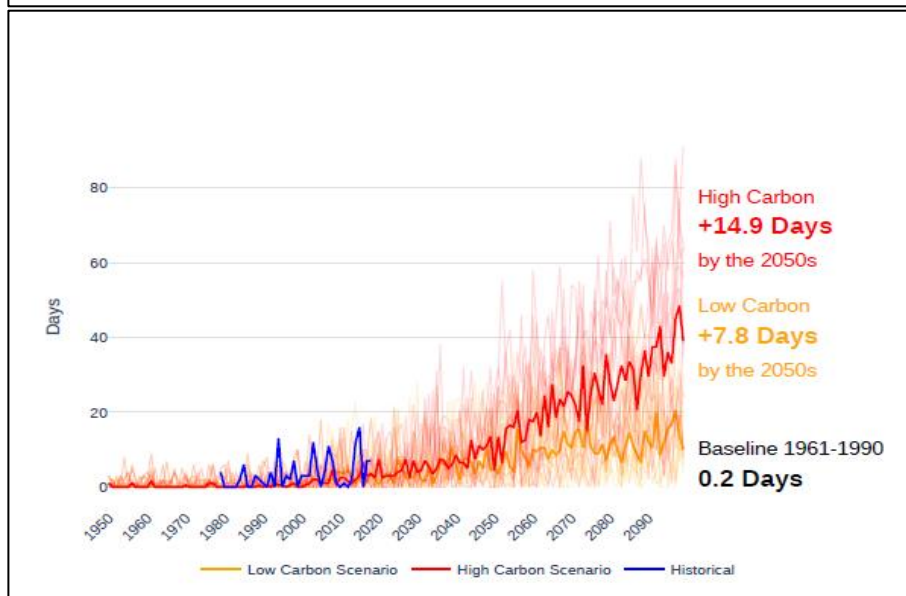


Figure 6.2
Kelly Creek Watershed

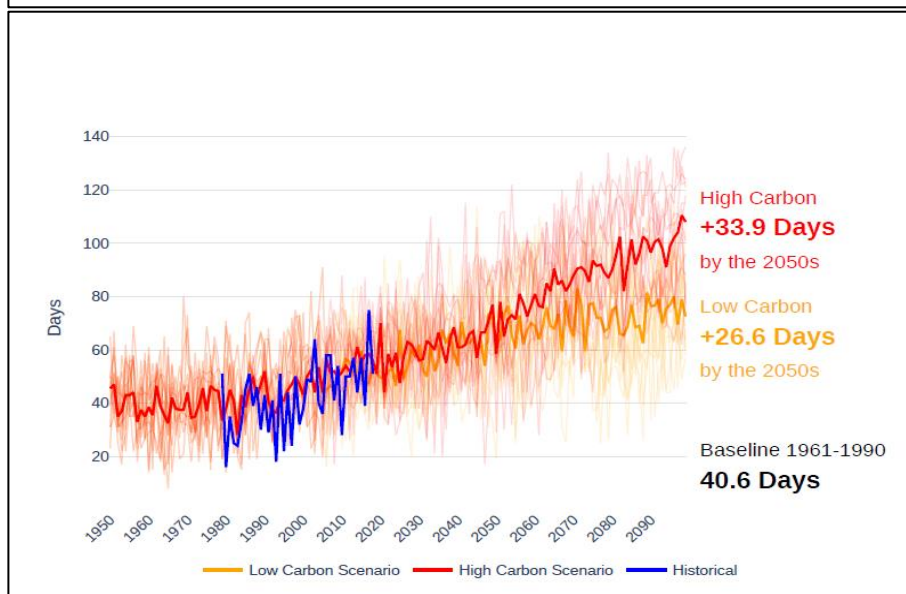


Figure 6.3
Columbia Gardens

Historic and projected number of summer days over 30°C

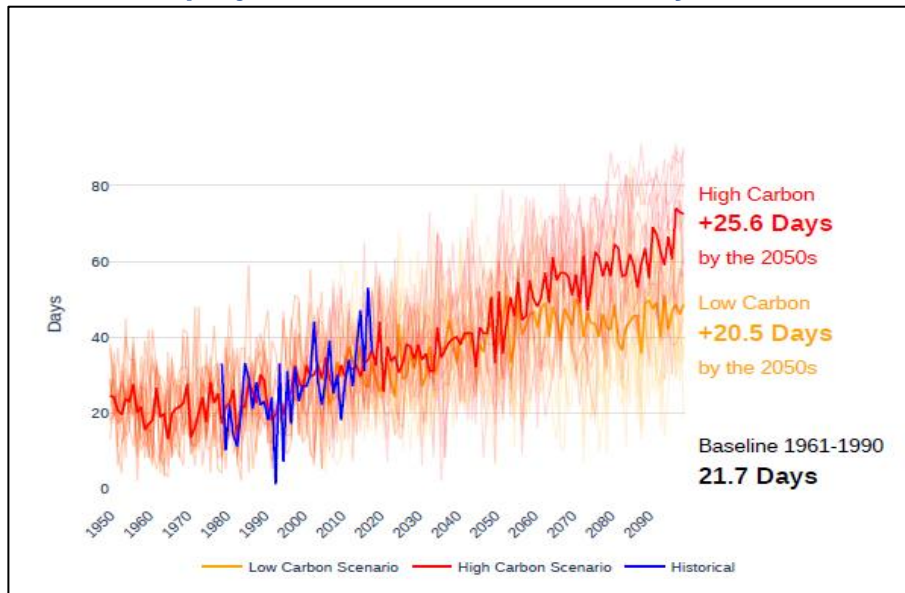


Figure 7.1
Fruitvale

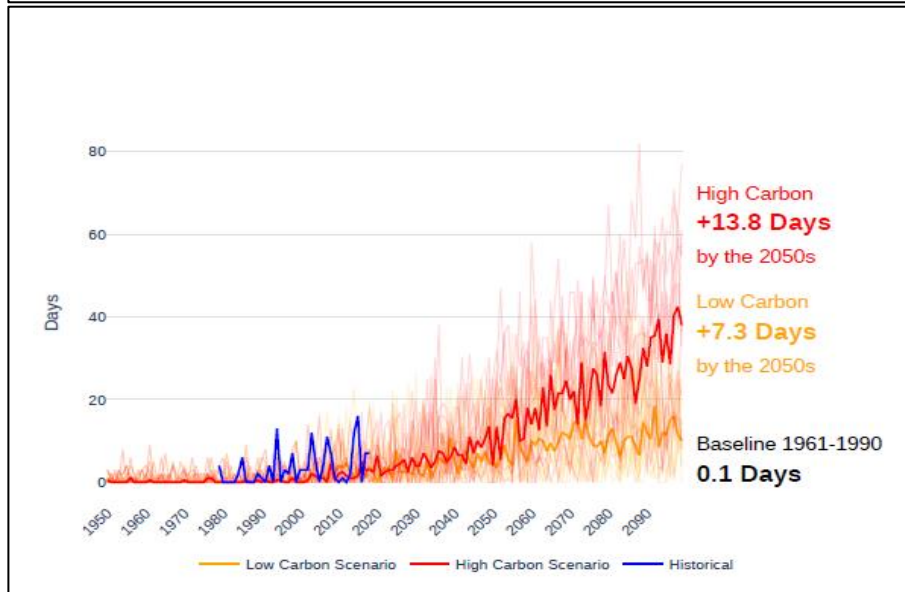


Figure 7.2
Kelly Creek Watershed

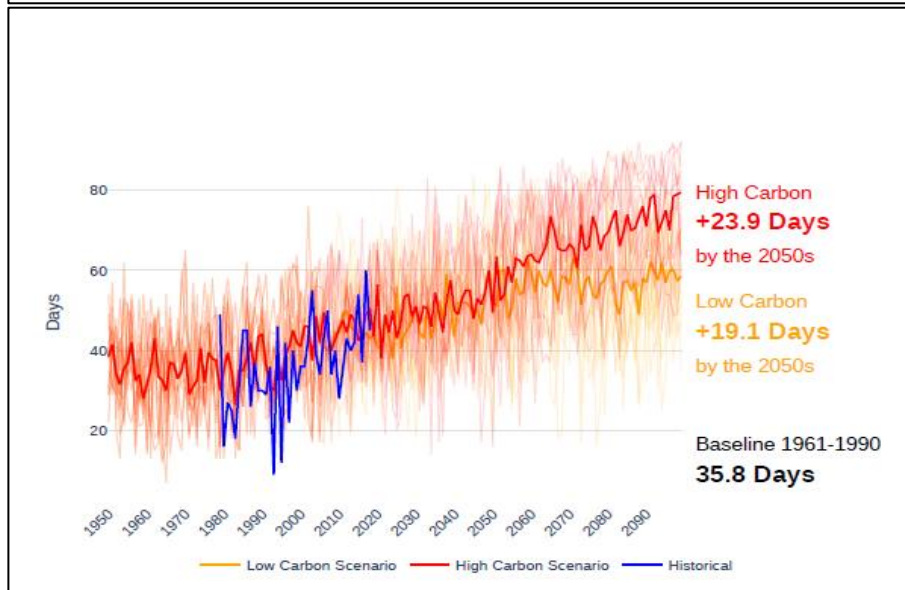


Figure 7.3
Columbia Garden

Historic and projected annual number of days with maximum temperature over 90th percentile in the 1961-1990 period

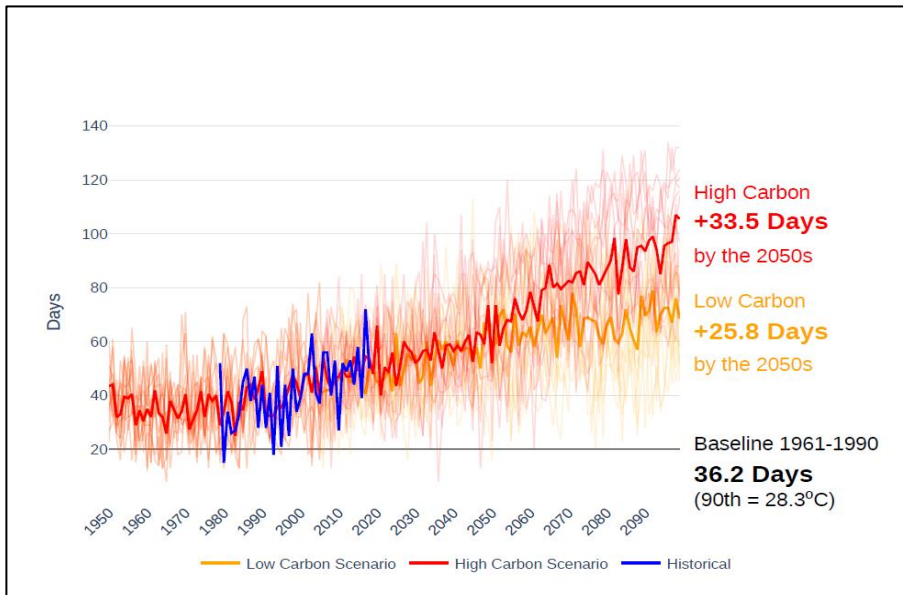


Figure 8.1
Fruitvale

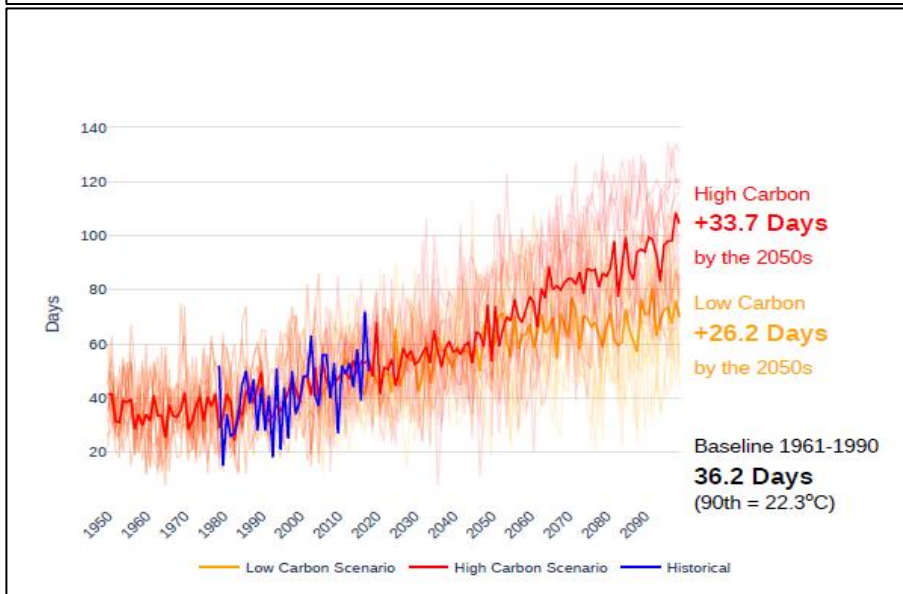


Figure 8.2
Kelly Creek Watershed

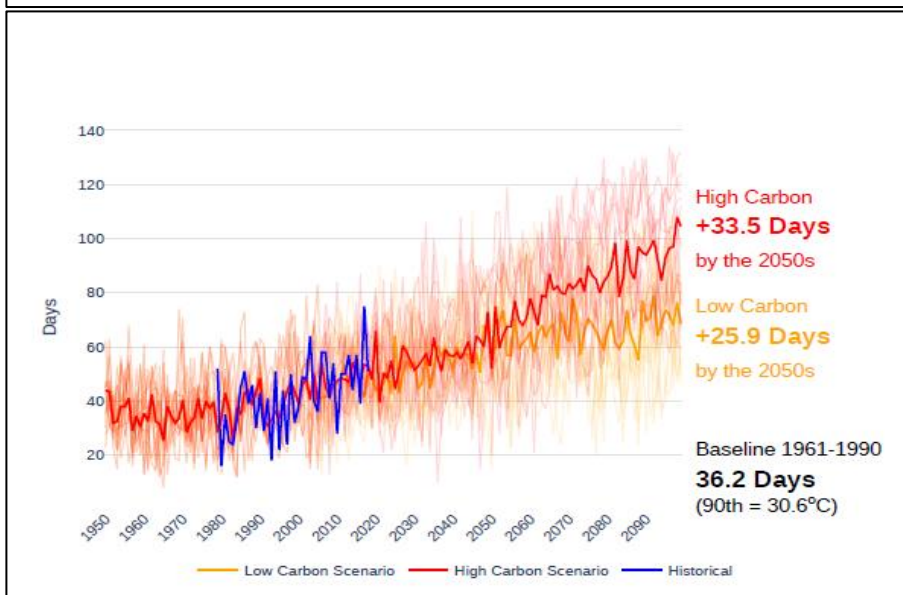


Figure 8.3
Columbia Gardens

Historic and projected number of summer days with maximum temperature over 90th percentile in the 961-1990 period

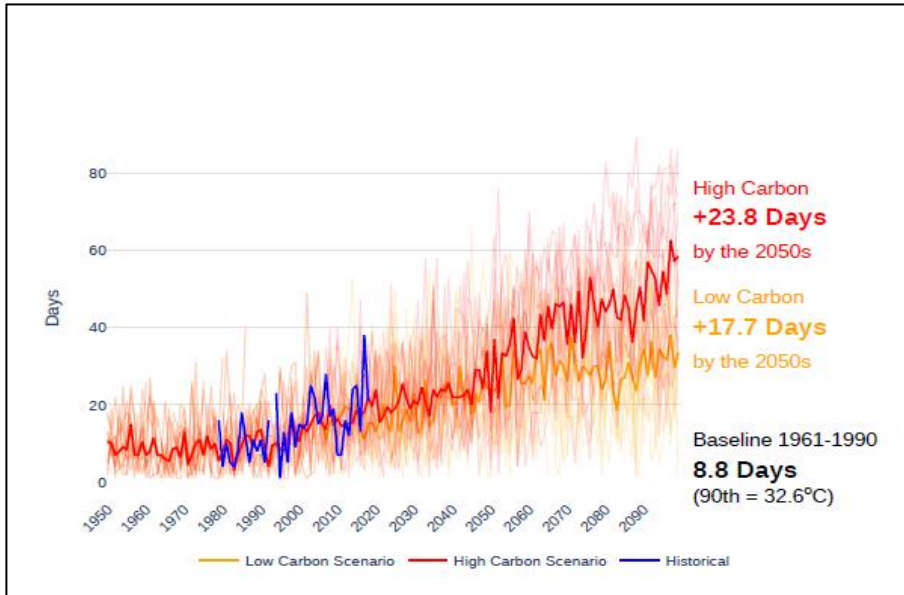


Figure 9.1
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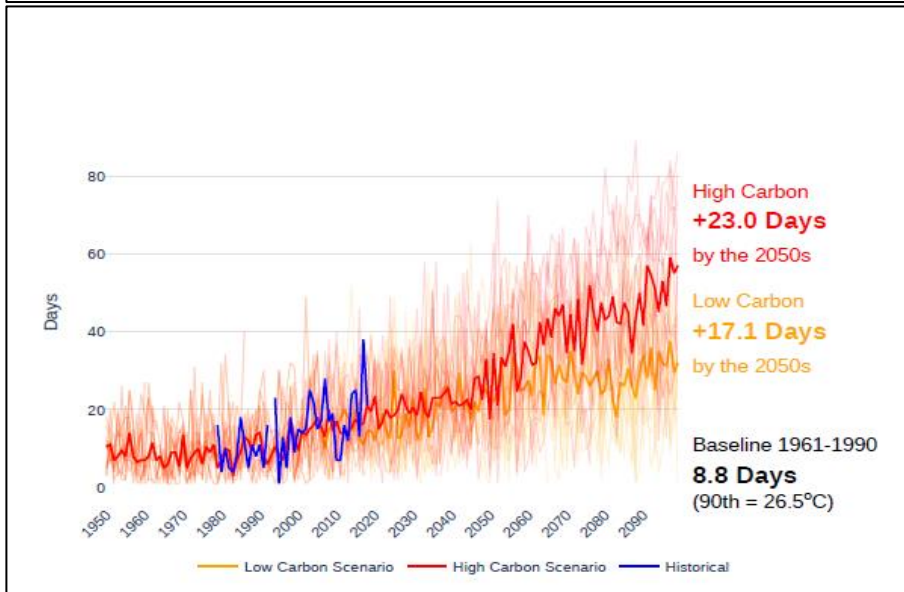


Figure 9.2
Kelly Creek Watershed

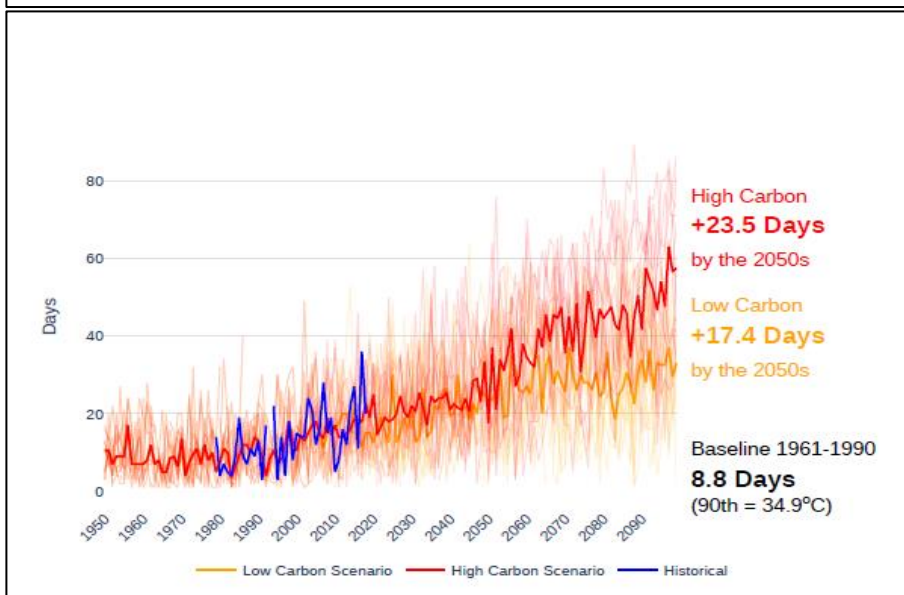


Figure 9.3
Columbia Gardens

Historic and projected annual number of daily freeze-thaw cycles

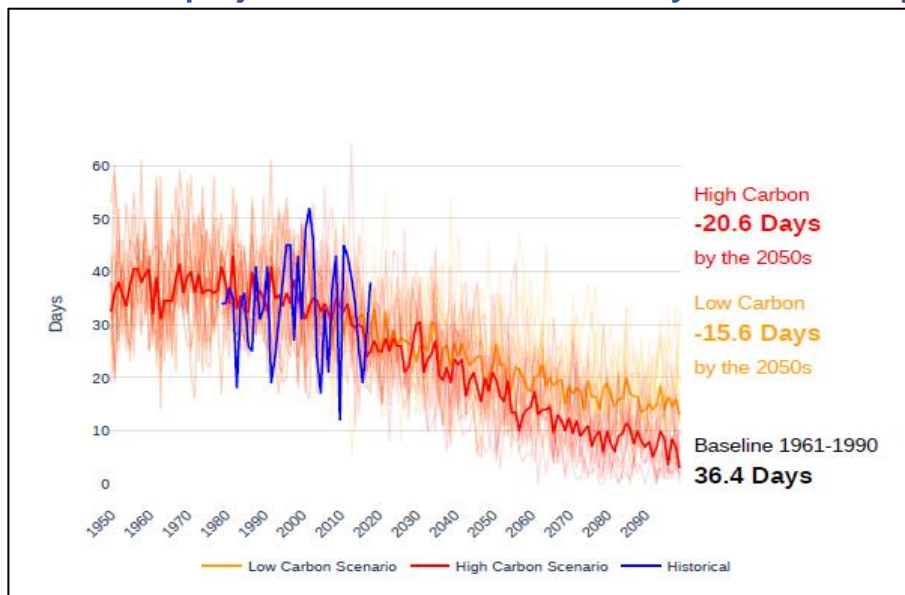


Figure 10.1
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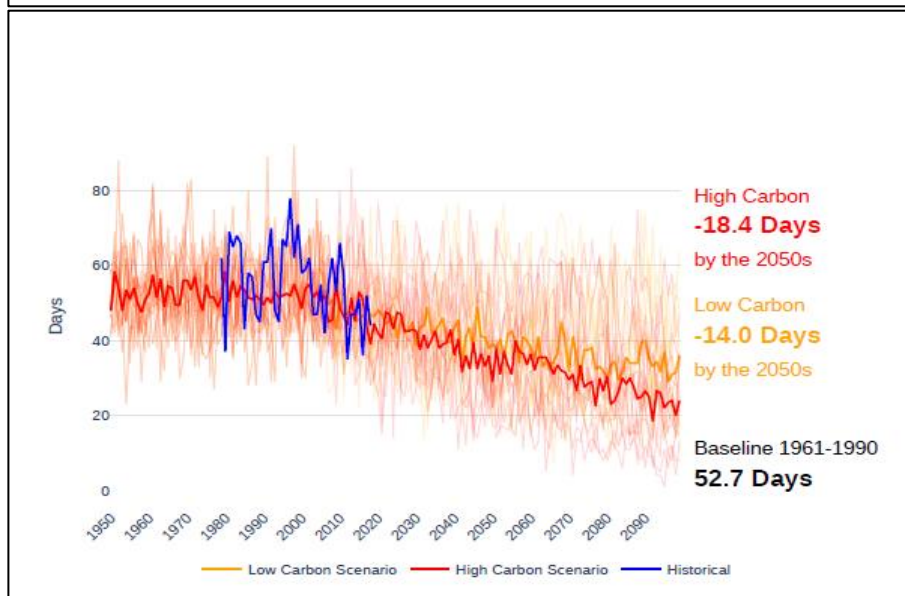


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Kelly Creek Watershed

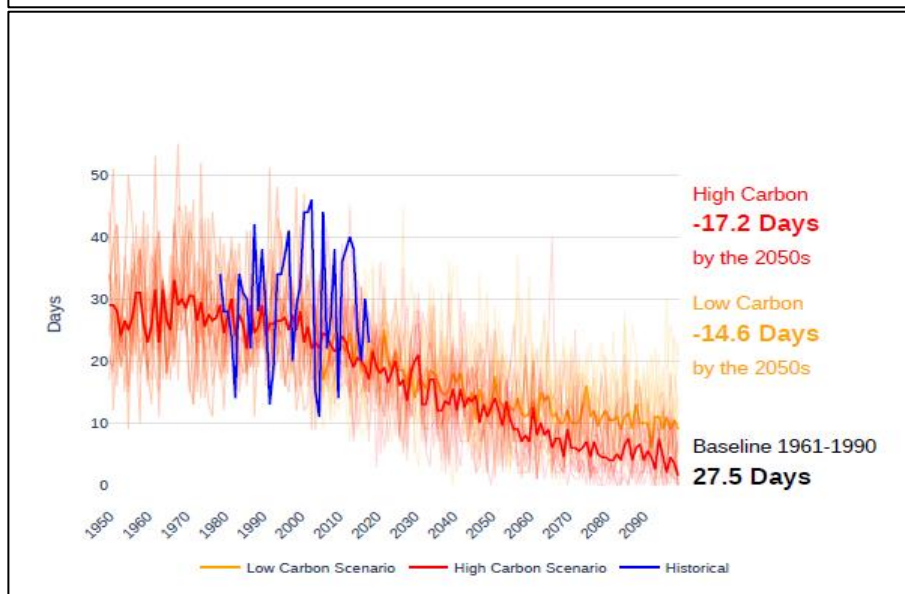


Figure 10.3
Columbia Gardens

Historic and projected number of daily freeze-thaw cycles in winter

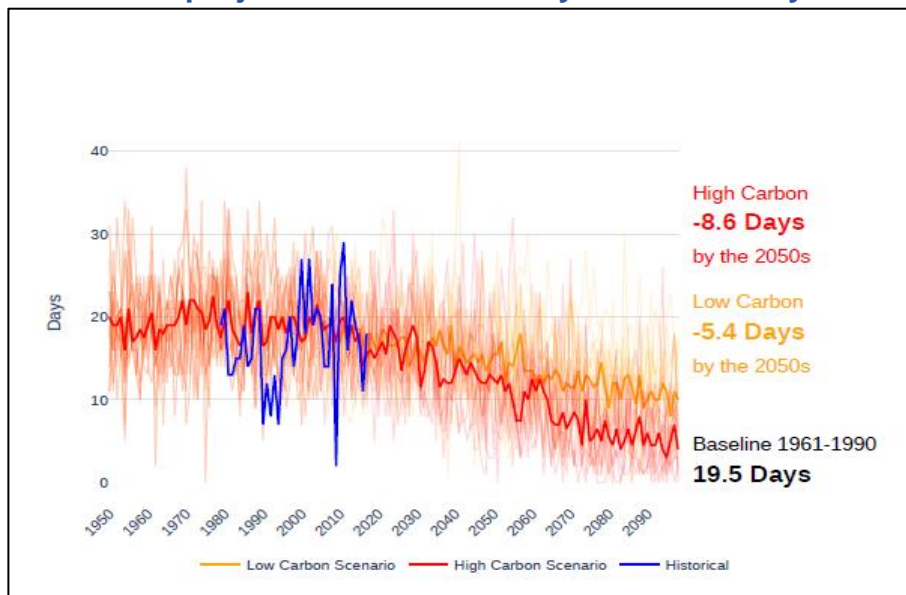


Figure 11.1
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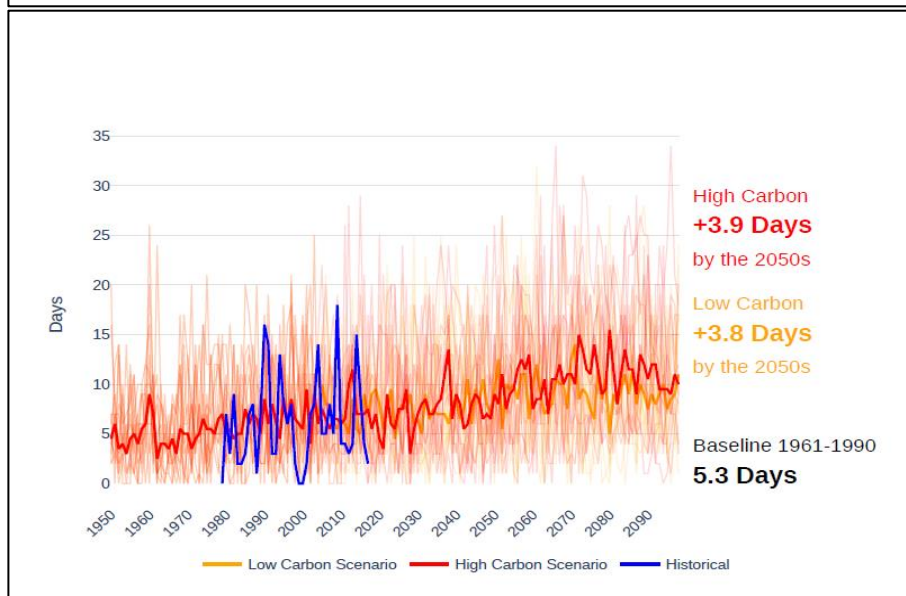


Figure 11.2
Kelly Creek Watershed

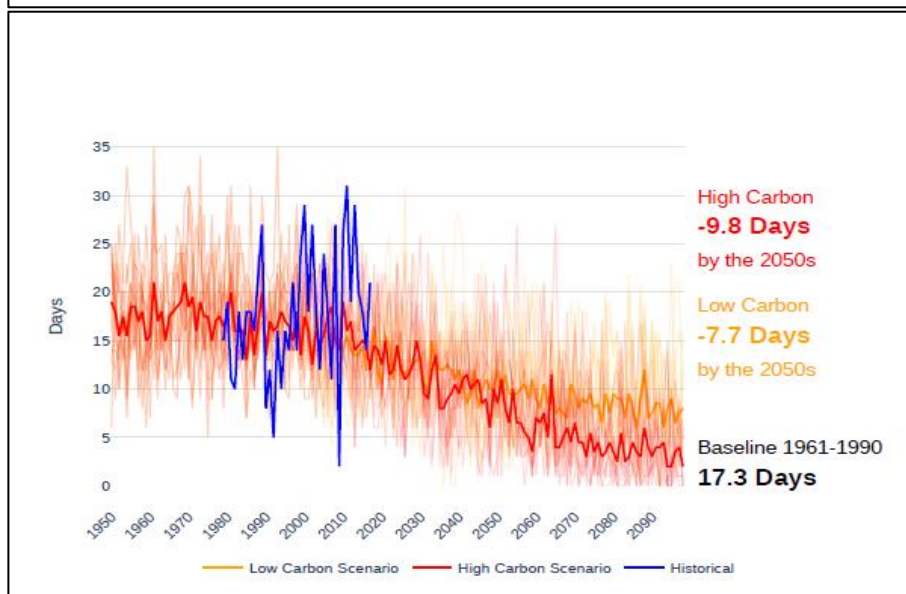


Figure 11.3
Columbia Gardens

Historic and projected growing season length

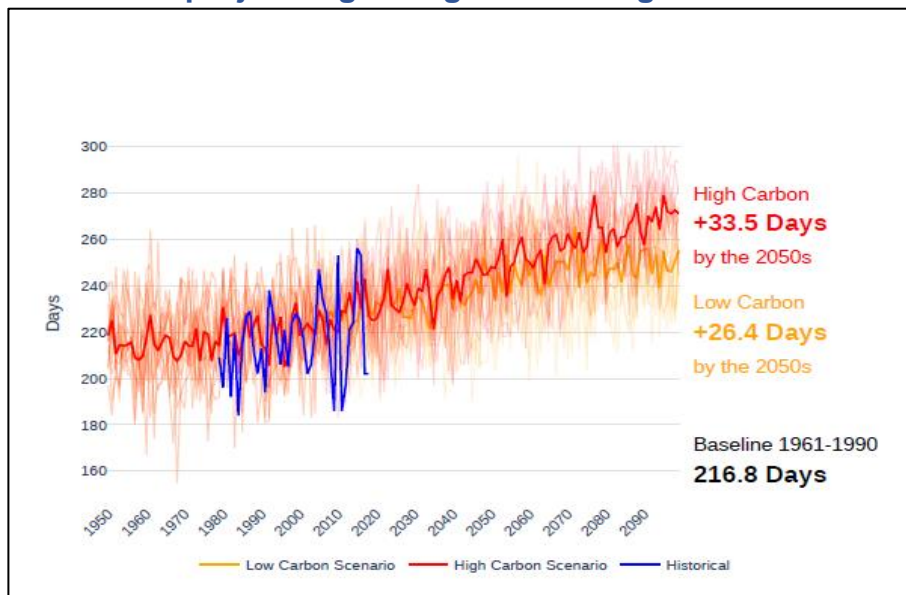


Figure 12.1
Fruitvale

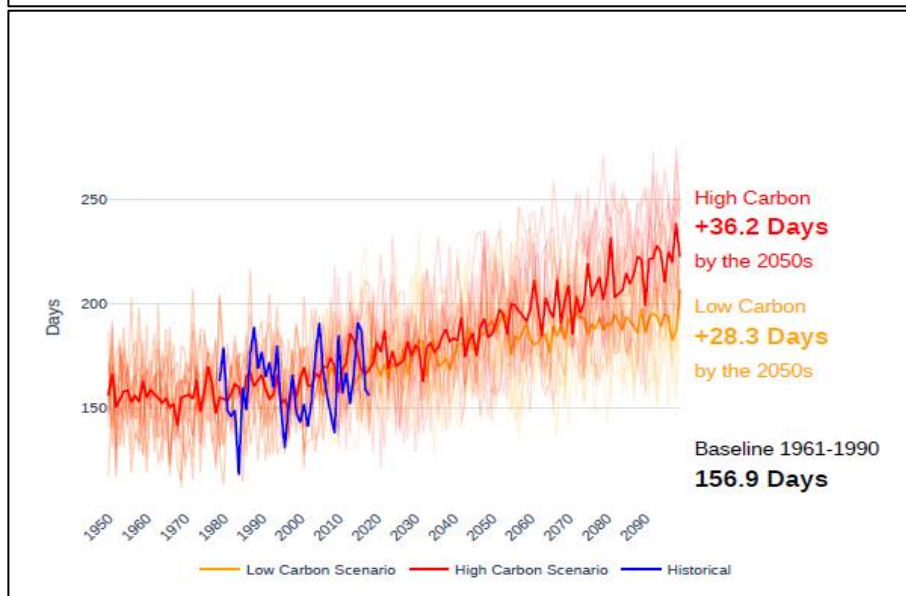


Figure 12.2
Kelly Creek Watershed

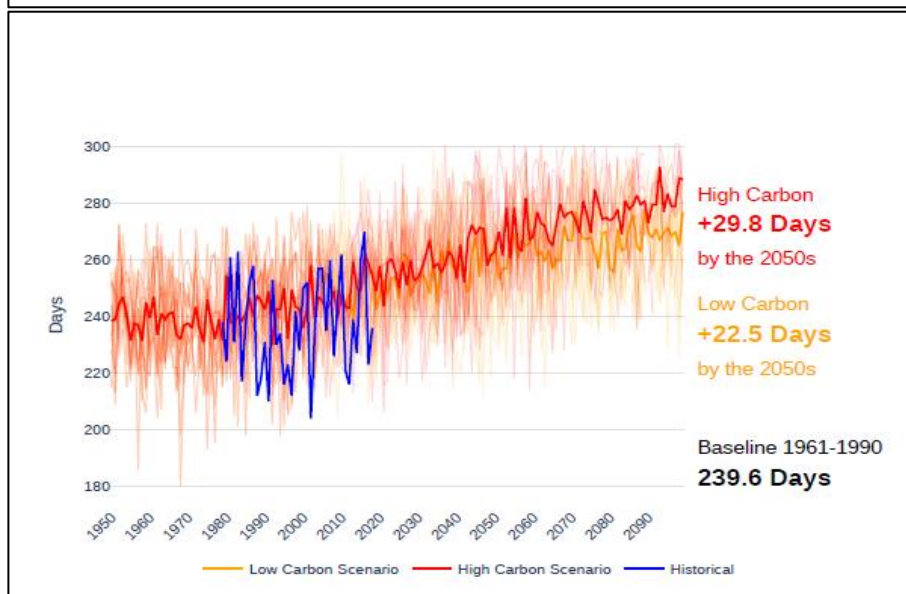


Figure 12.3
Columbia Gardens

Historic and projected growing degree days

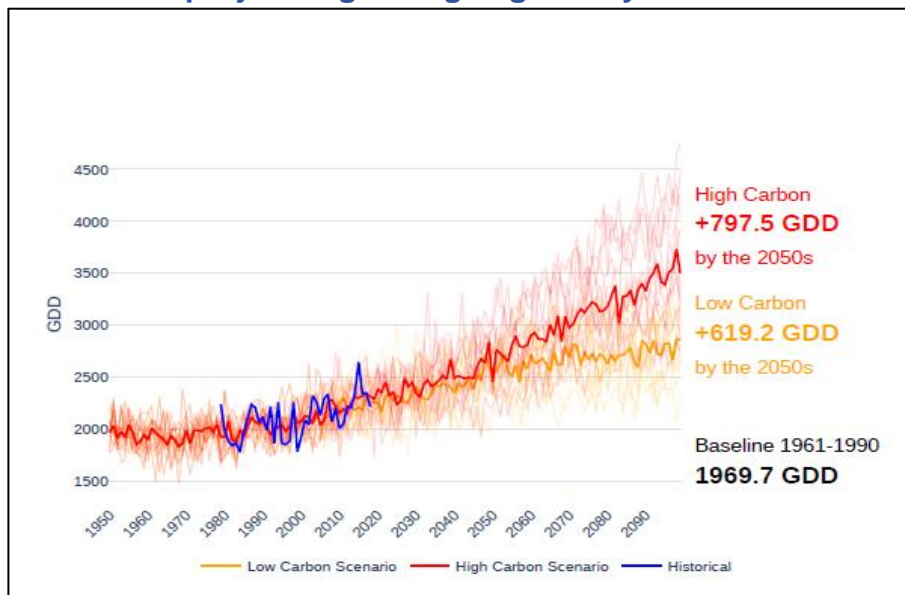


Figure 13.1
Fruitvale

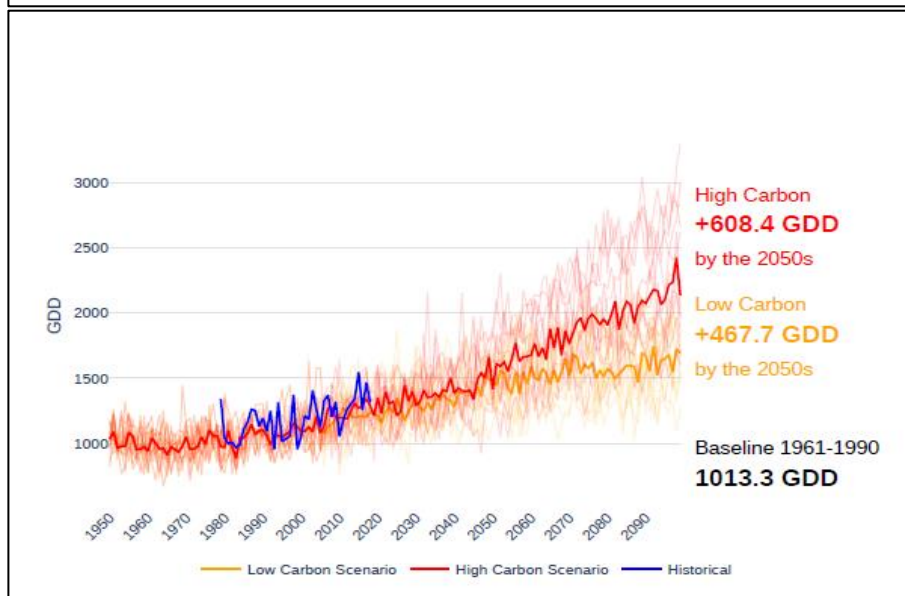


Figure 13.2
Kelly Creek Watershed

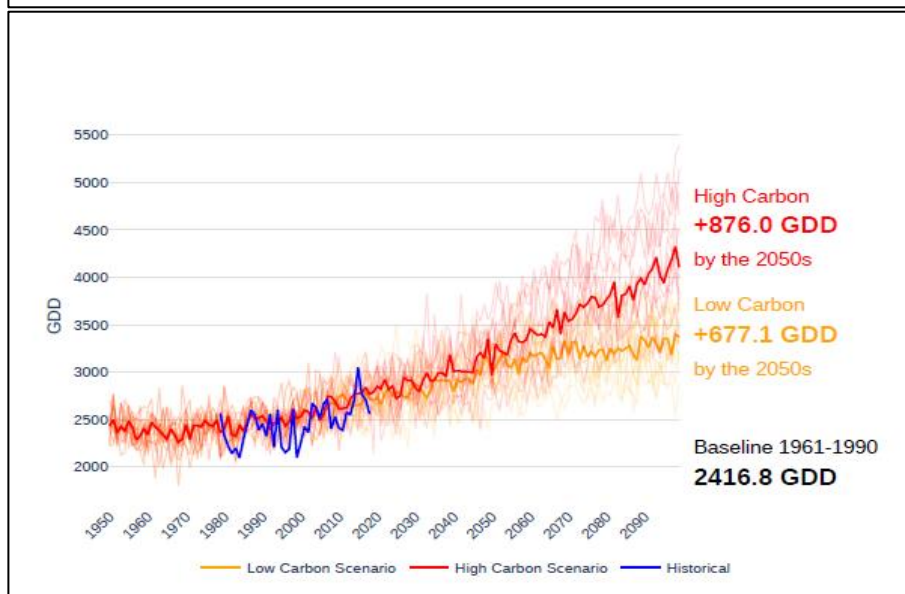


Figure 13.3
Columbia Gardens

Historic and projected total annual precipitation

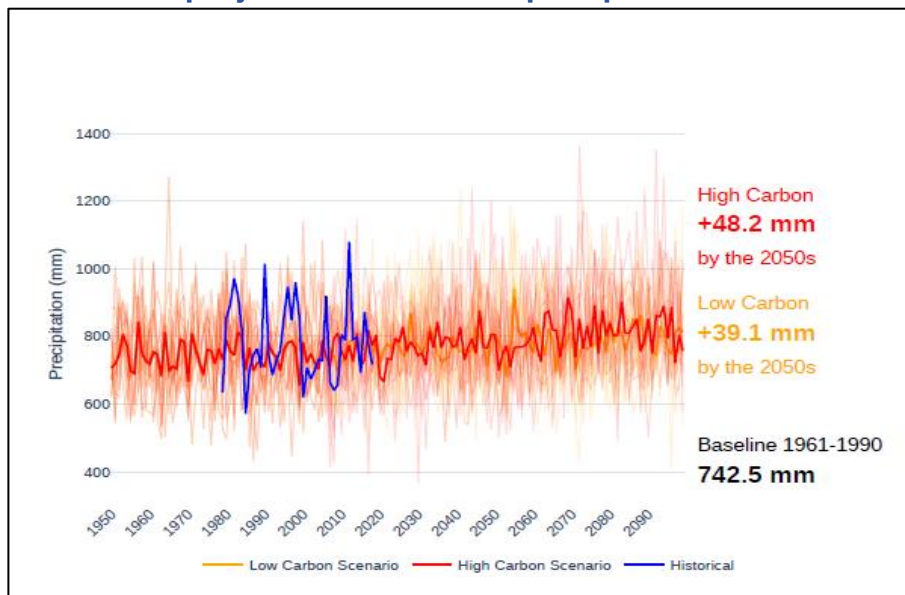


Figure 14.1
Fruitvale

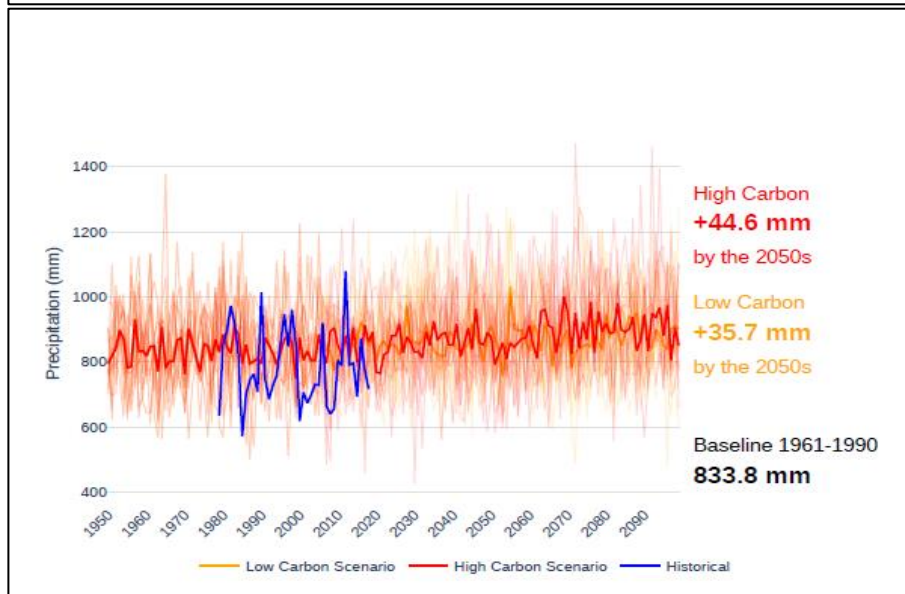


Figure 14.2
Kelly Creek Watershed

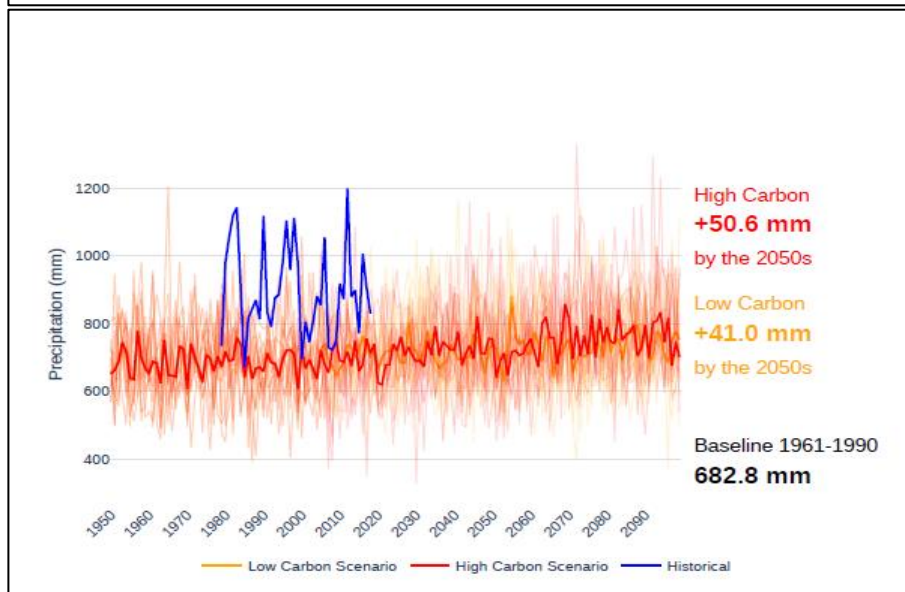


Figure 14.3
Columbia Gardens

Historic and projected total spring precipitation

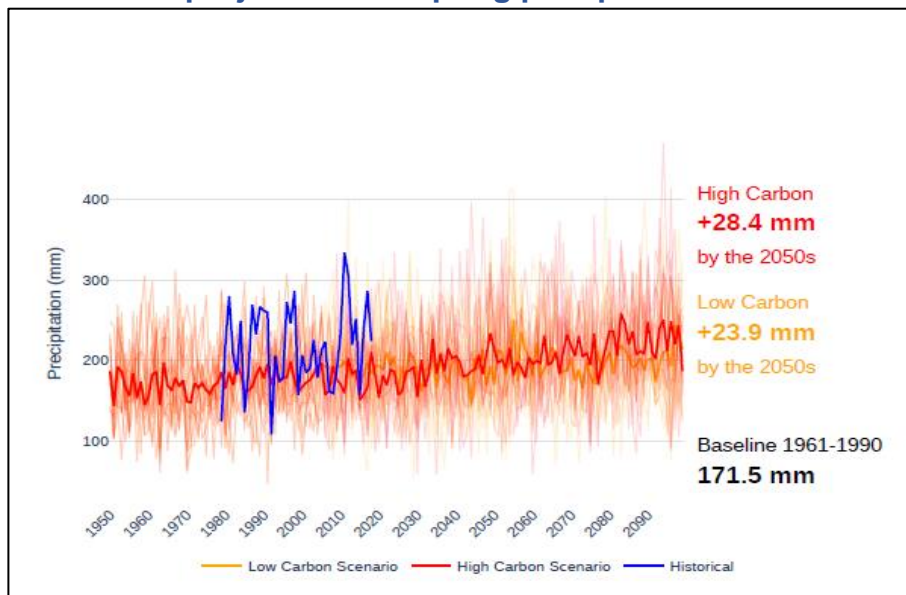


Figure 15.1
Fruitvale

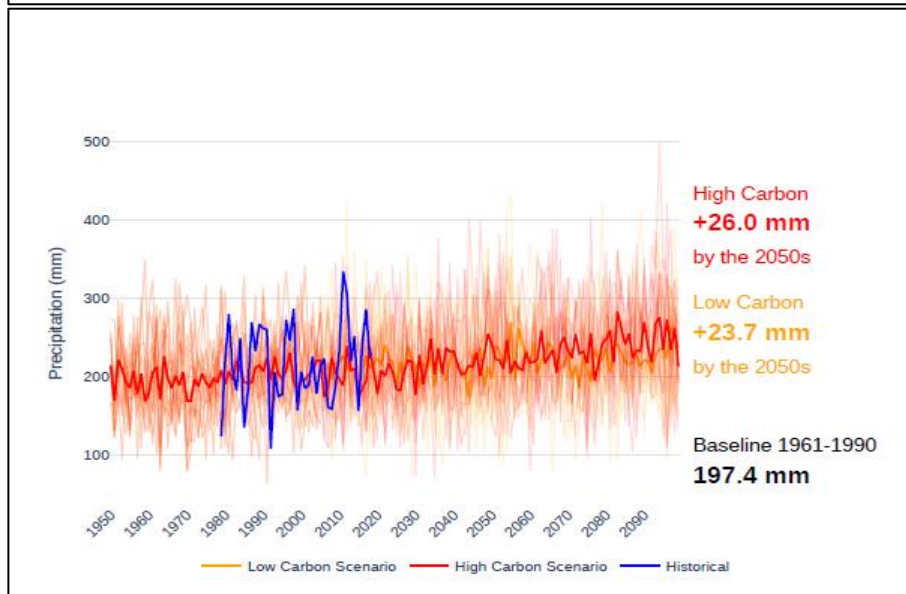


Figure 15.2
Kelly Creek Watershed

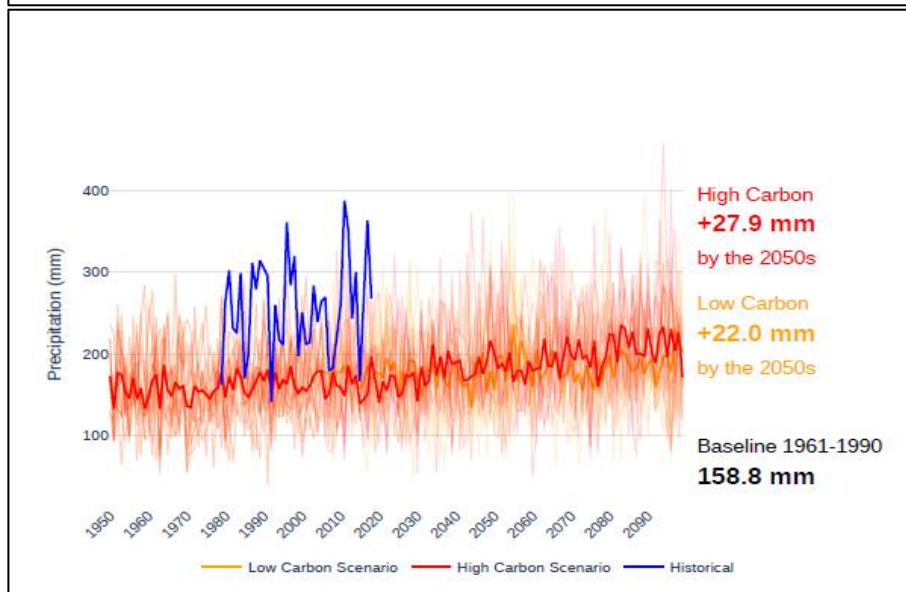


Figure 15.3
Columbia Gardens

Historic and projected total summer precipitation

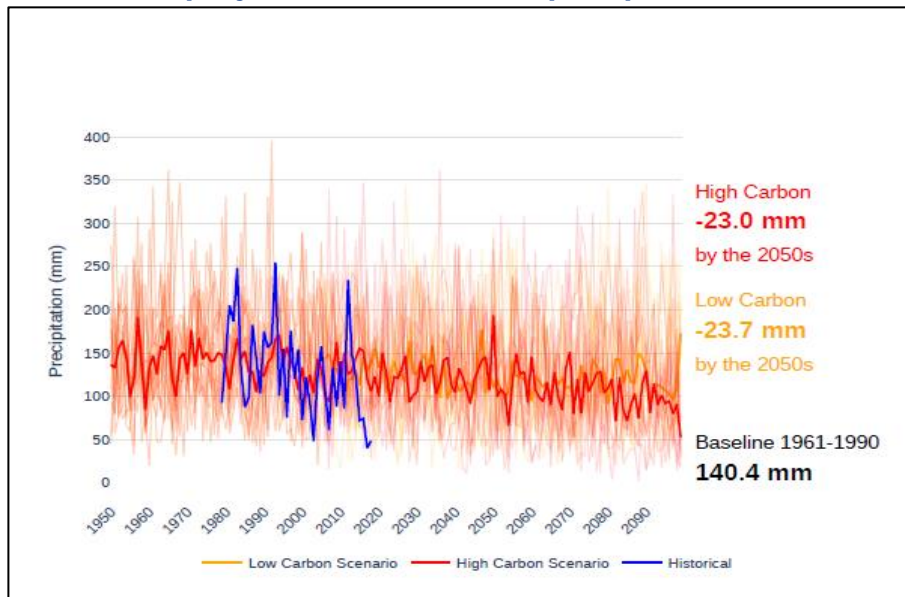


Figure 16.1
Fruitvale

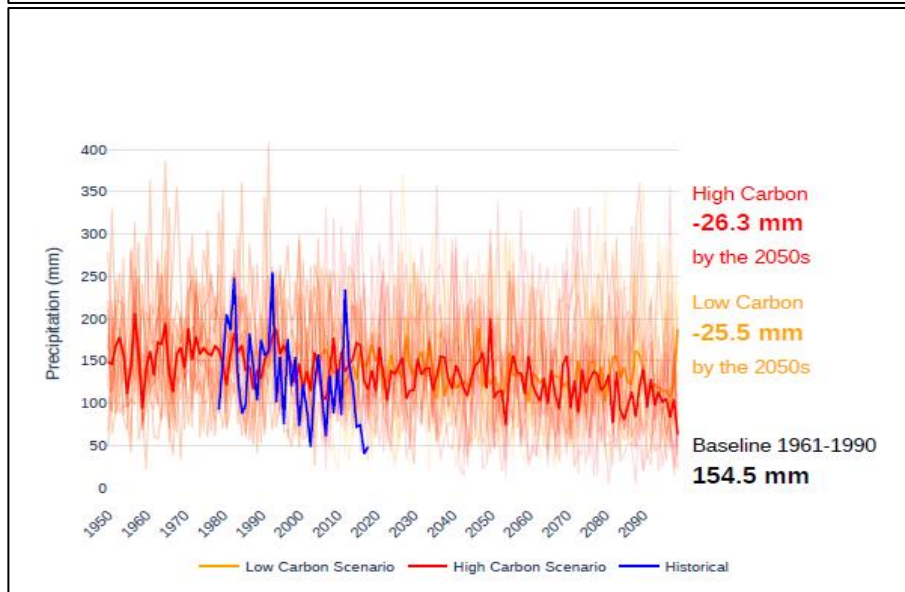


Figure 16.2
Kelly Creek Watershed

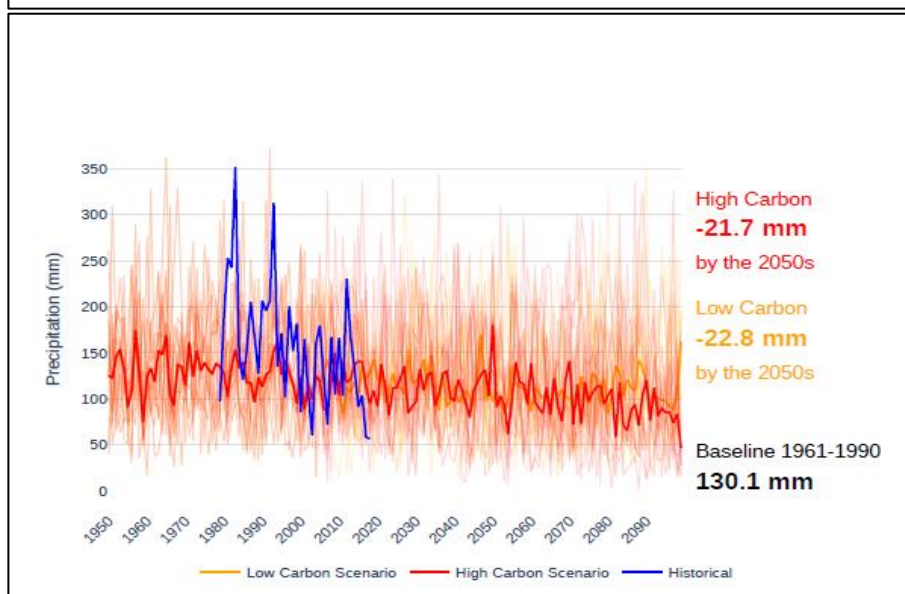


Figure 16.3
Columbia Gardens

Historic and projected total fall precipitation

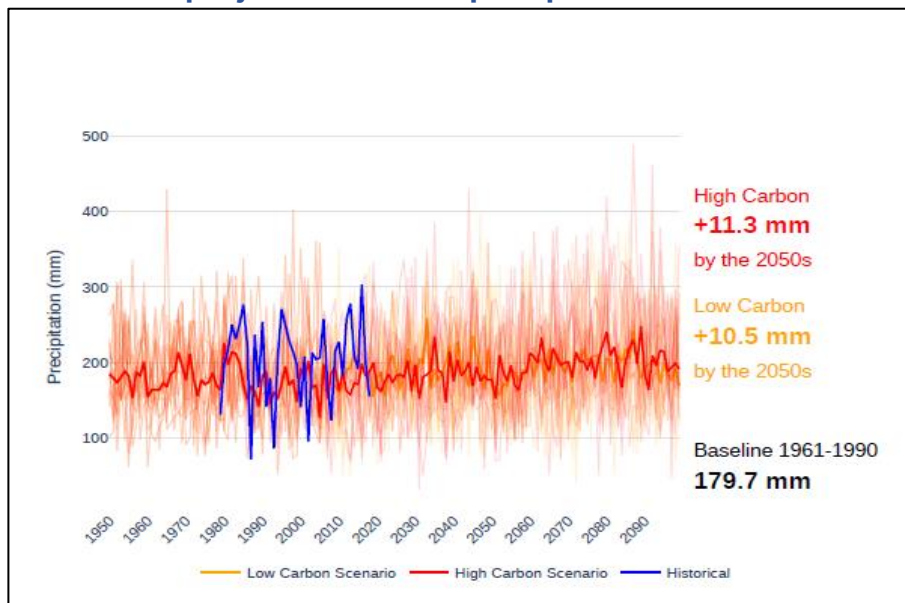


Figure 17.1
Fruitvale

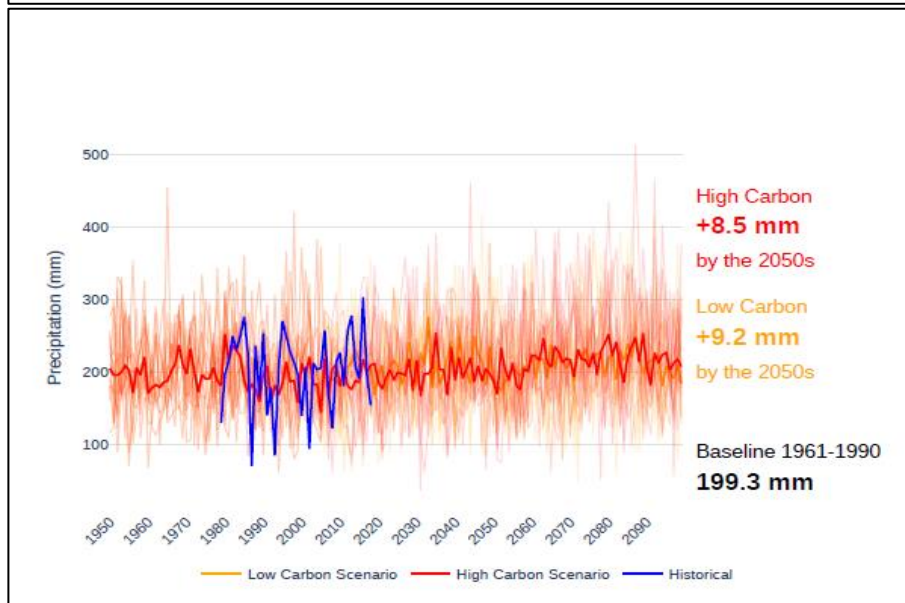


Figure 17.2
Kelly Creek Watershed

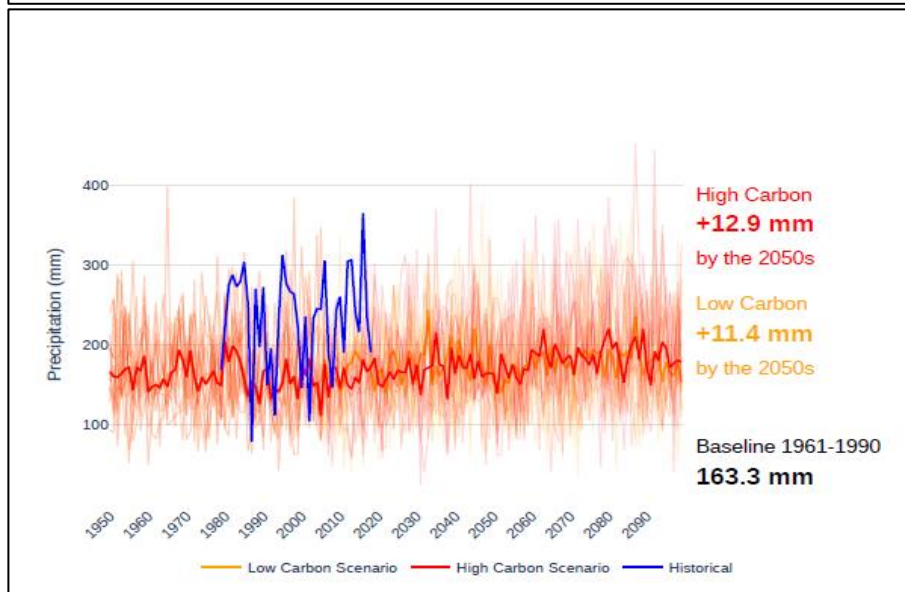


Figure 17.3
Columbia Gardens

Historic and projected total winter precipitation

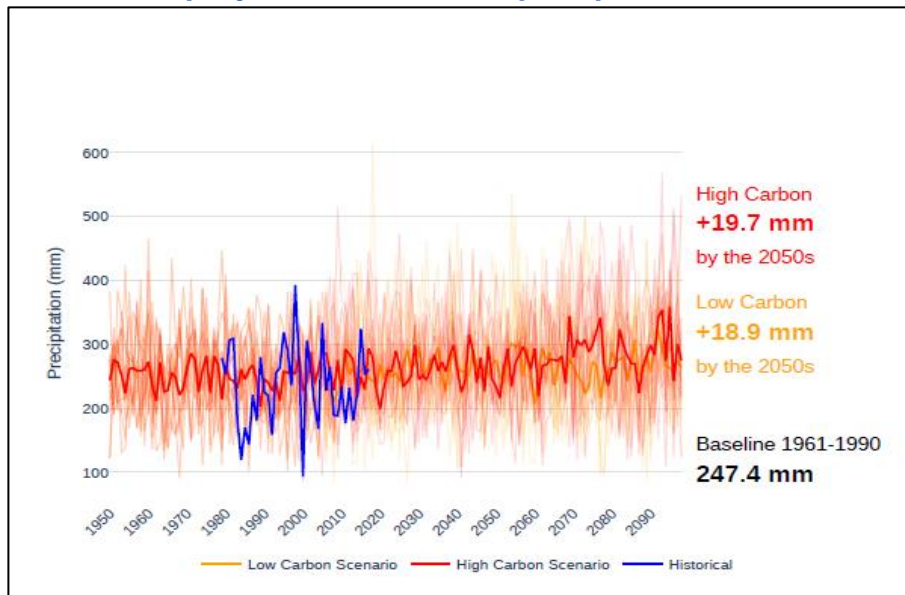


Figure 18.1
Fruitvale

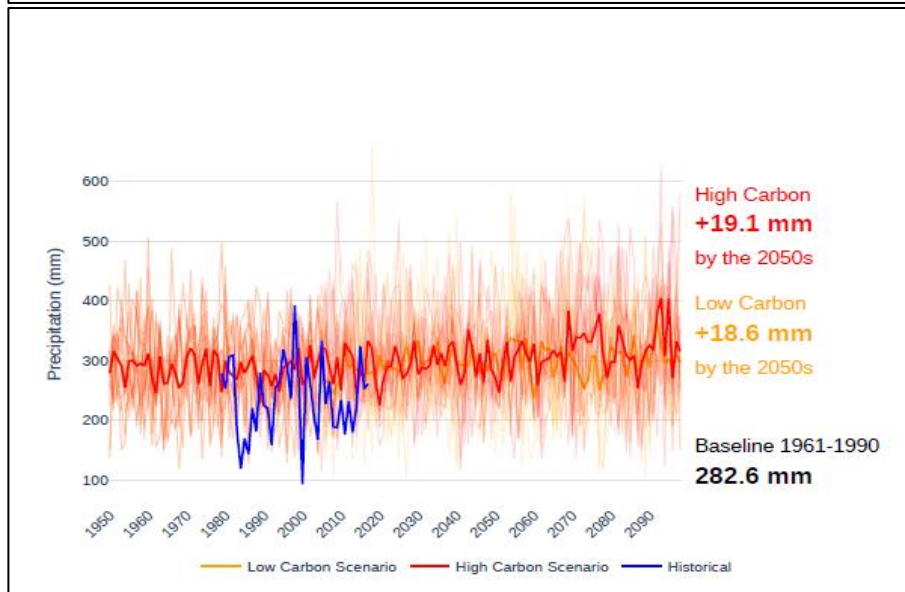


Figure 18.2
Kelly Creek Watershed

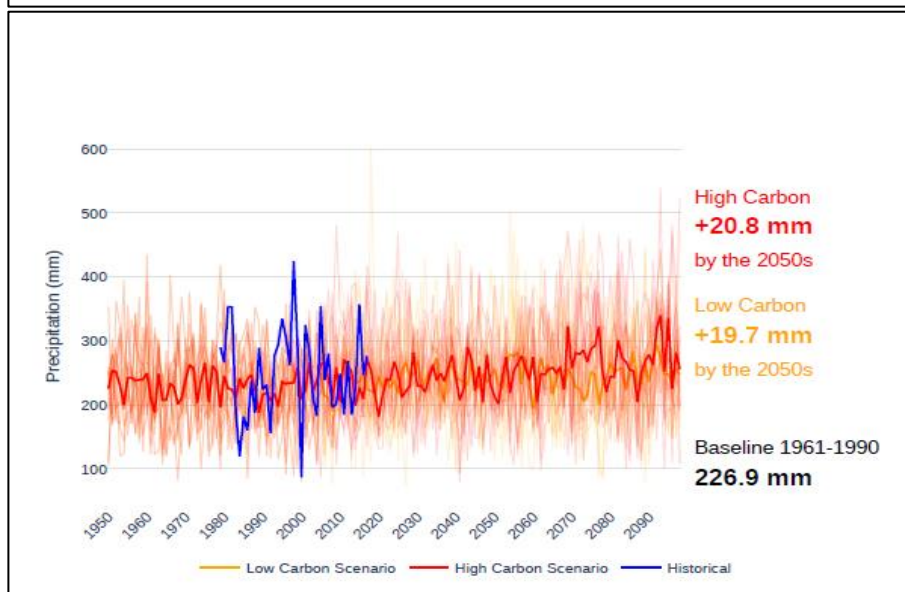


Figure 18.3
Columbia Gardens

Historic and projected maximum 1-day precipitation

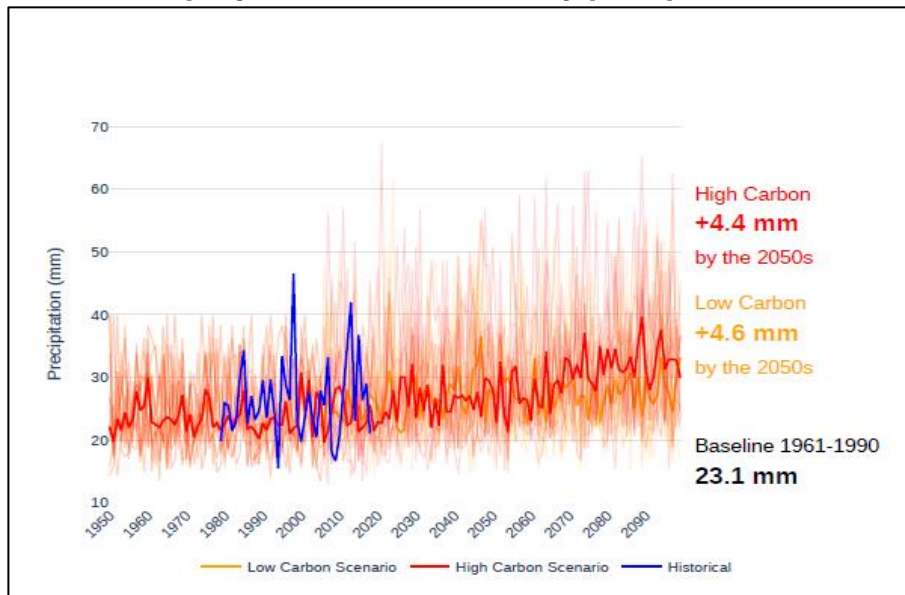


Figure 19.1
Fruitvale

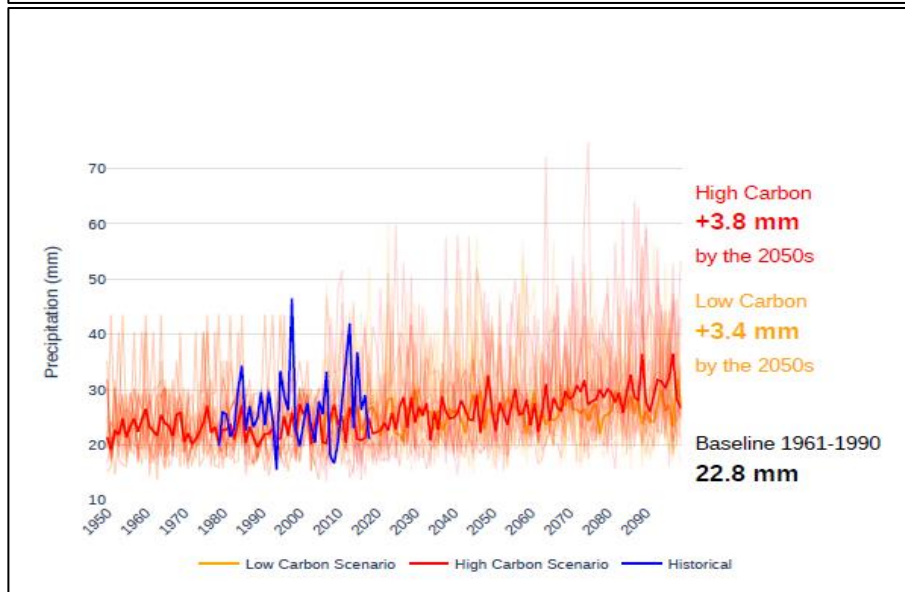


Figure 19.2
Kelly Creek Watershed

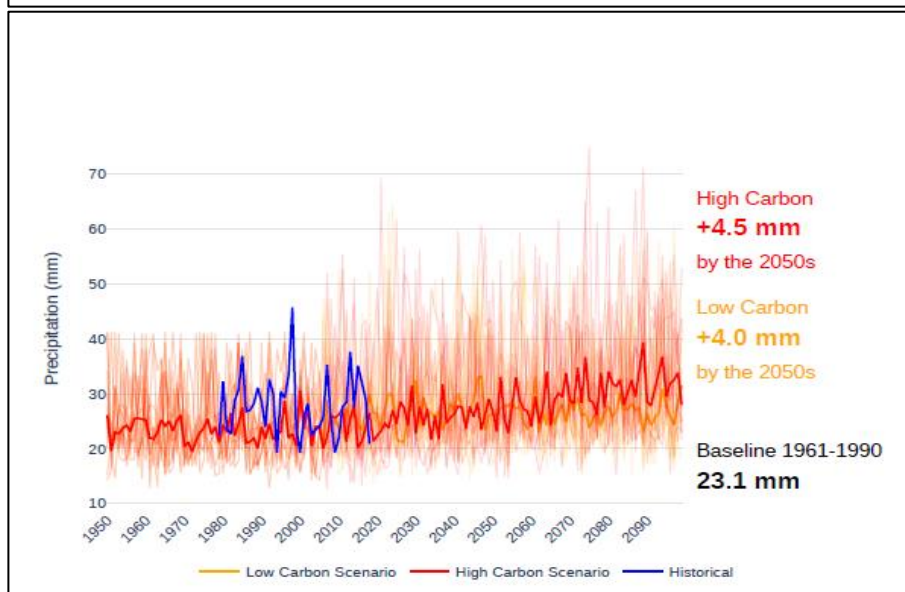


Figure 19.3
Columbia Gardens

Historic and projected maximum dry spell length

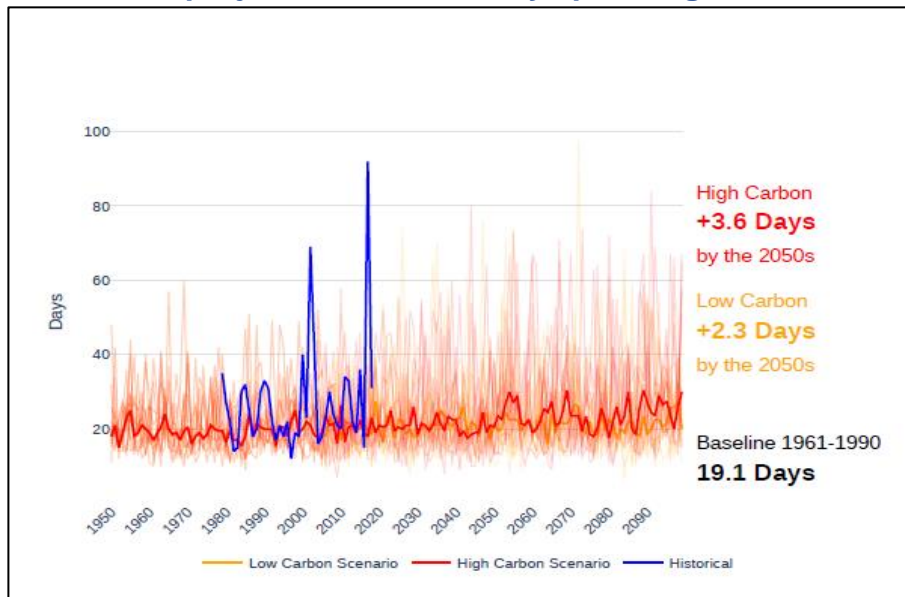


Figure 20.1
Fruitvale

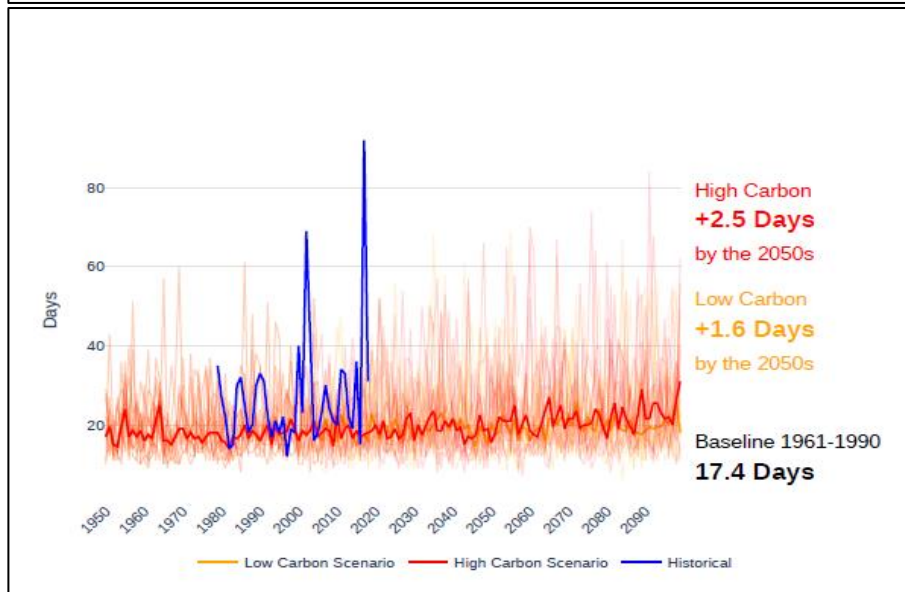


Figure 20.2
Kelly Creek Watershed

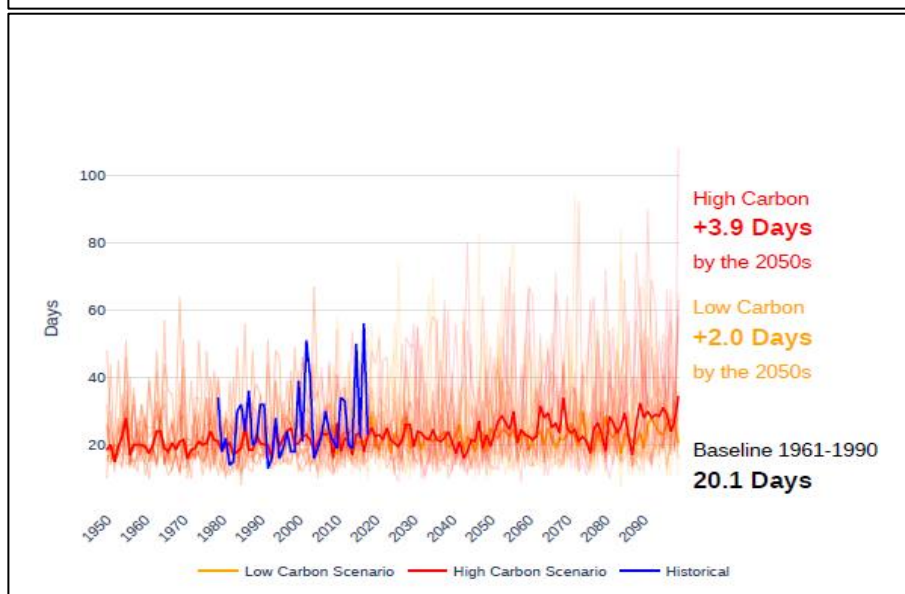


Figure 20.3
Columbia Gardens

Historic and projected annual precipitation above the 95th percentile in the 1961-1990 period

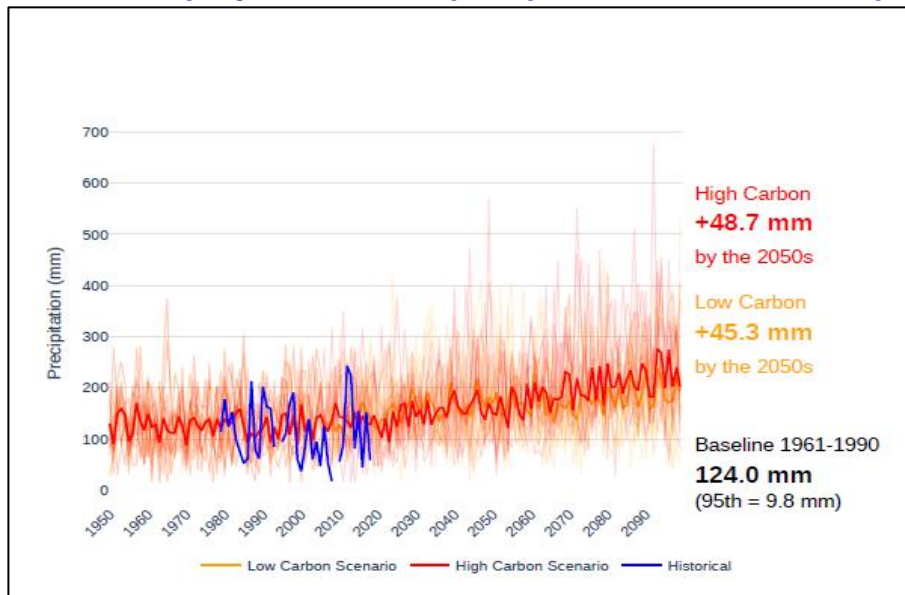


Figure 21.1
Fruitvale

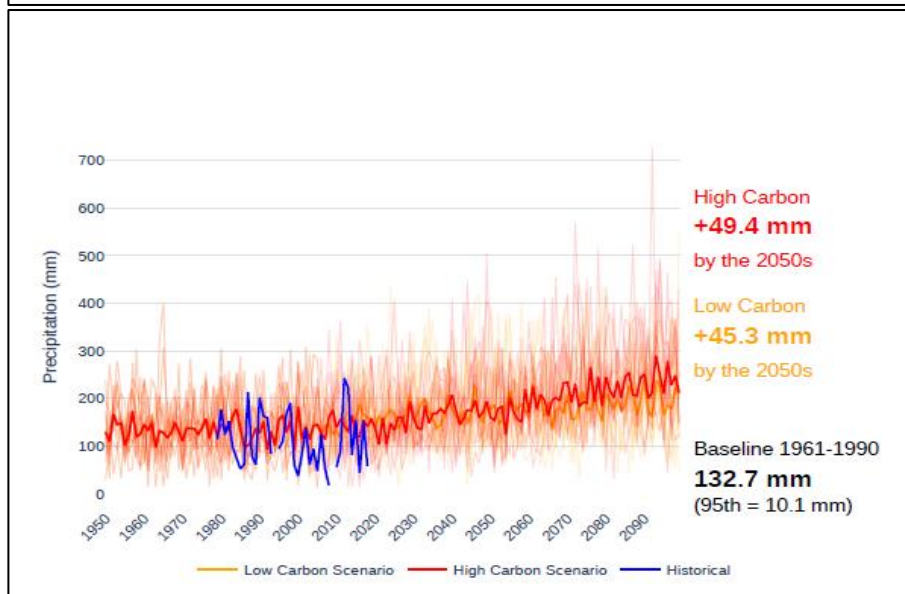


Figure 21.2
Kelly Creek Watershed

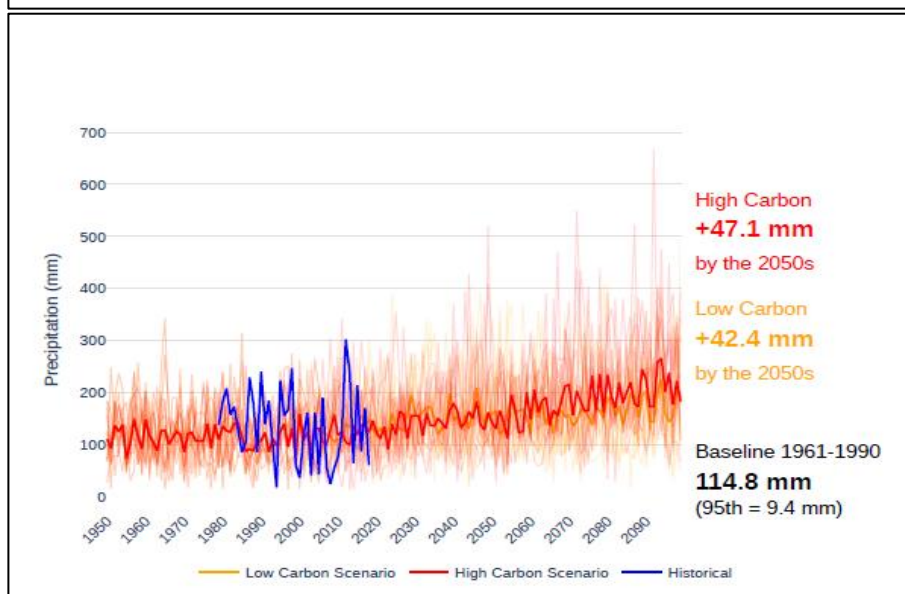


Figure 21.3
Columbia Gardens

Historic and projected number of days of precipitation above the 95th percentile in the 1961-1990 period

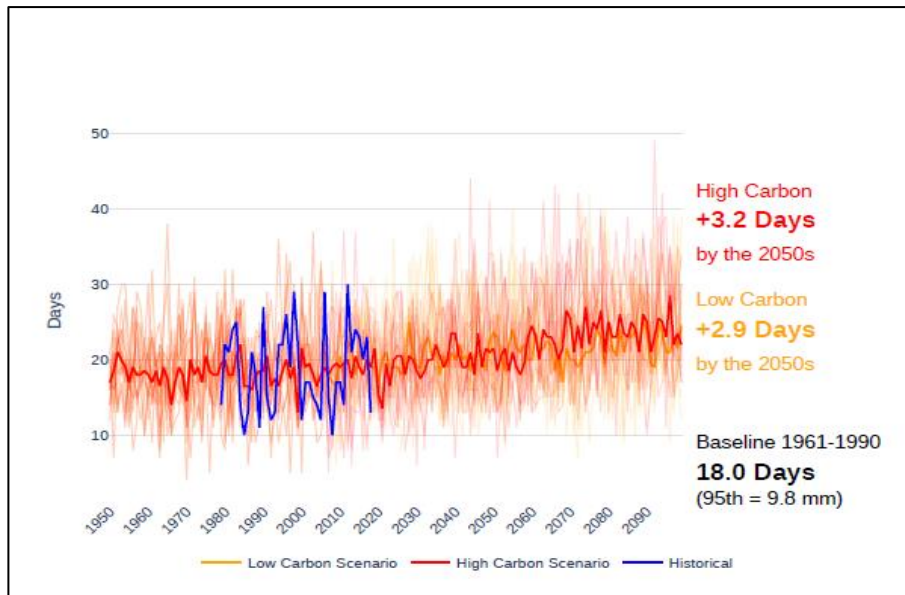


Figure 22.1
Fruitvale

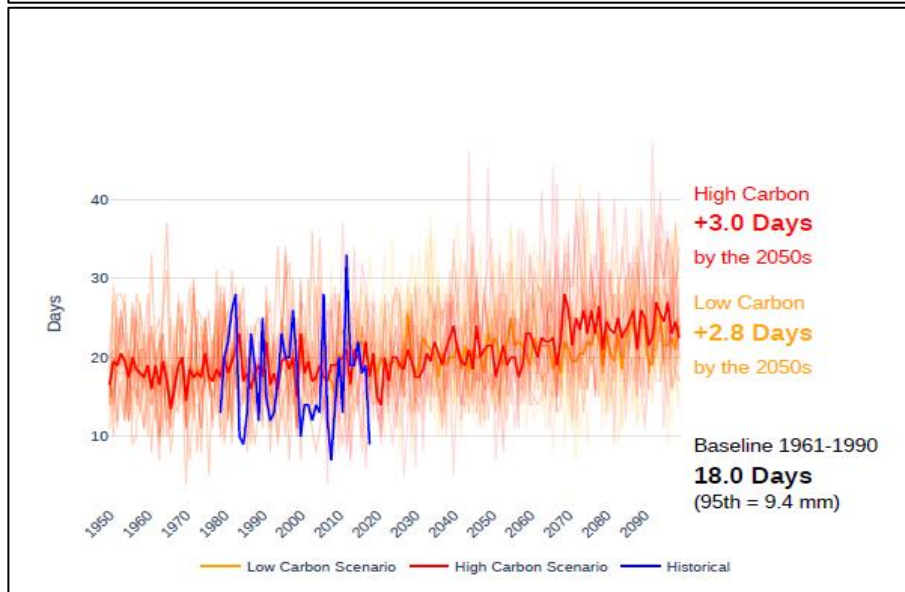


Figure 22.2
Kelly Creek Watershed

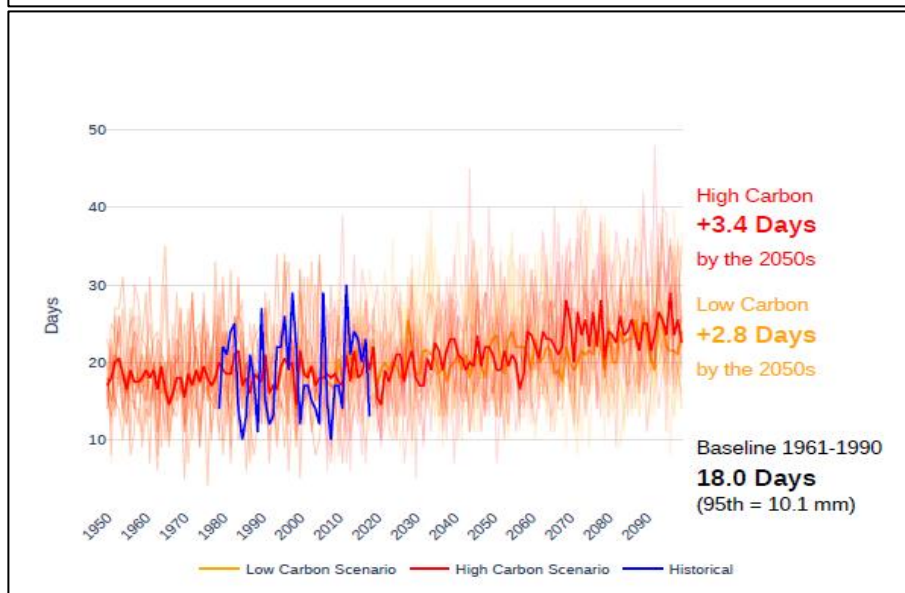


Figure 22.3
Columbia Gardens

¹ United Nations Framework Convention on Climate Change. (2019). *The Paris Agreement*. Retrieved from <https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement>

² Knutti, R., Rogelj, J., Sedláček, J. et al. (2016). A scientific critique of the two-degree climate change target. *Nature Geoscience*, 9, 13–18. doi:10.1038/ngeo2595

³ European Centre for Mid-range Weather Forecasts (ECMWF). *ERA5 data documentation*. Retrieved from <https://confluence.ecmwf.int/display/CKB/ERA5+data+documentation#ERA5datadocumentation-Introduction>

⁴ Copernicus Climate Change Service (C3S). (2017). *ERA5: Fifth generation of ECMWF atmospheric reanalyses of the global climate*. Copernicus Climate Change Service Climate Data Store (CDS), Accessed August 2019. <https://cds.climate.copernicus.eu/cdsapp#!/home>

⁵ Climate Change Service. (n.d.). *Climate reanalysis*. Retrieved from <https://climate.copernicus.eu/climate-reanalysis>

⁶ Pacific Climate Impacts Consortium. (n.d.). *Statistically downscaled GCM scenarios - BCCAQv2*. Retrieved from https://data.pacificclimate.org/portal/downscaled_gcms/map/

⁷ Taylor, K.E., Stouffer, R.J., and Meehl, G.A. (2012). An overview of CMIP5 and the experiment design. *Bulletin of the American Meteorological Society*, 93, 485–498. doi:10.1175/BAMS-D-11-00094.1

⁸ Werner, A.T. and Cannon, A. J. (2016) Hydrologic extremes – an intercomparison of multiple gridded statistical downscaling methods. *Hydrology and Earth System Sciences*, 20, 1483-1508. doi:10.5194/hess-20-1483-2016