

Simulated Streamflows and Basin-Wide Hydrologic Variables over Several Climate- Change Scenarios, Methow River Basin, WA

User Guide for Web Tools

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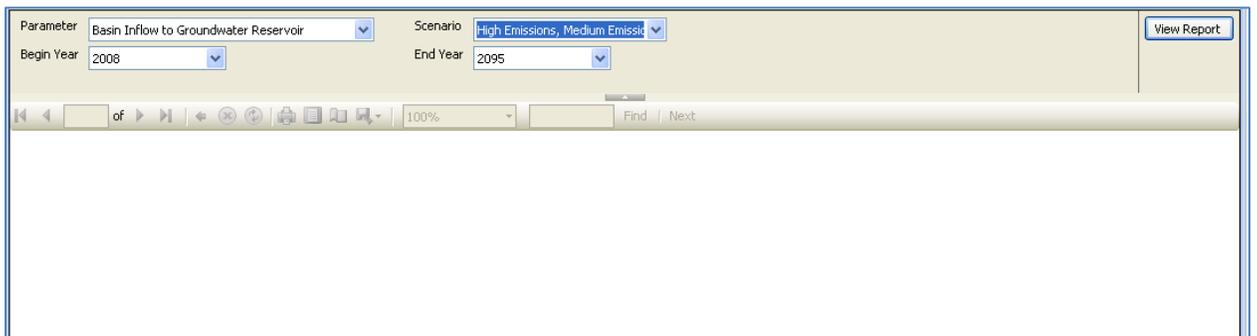
Generating Reports

Users can generate the following reports:

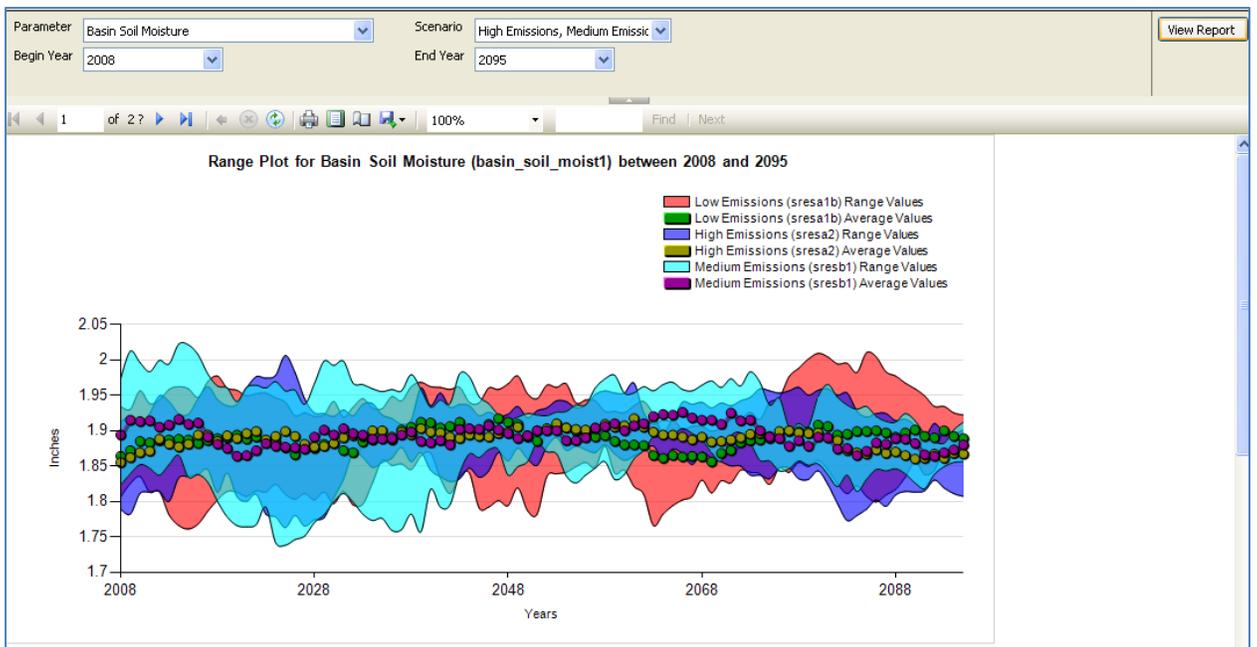
- Maps
- Range Graphs
- Line Graphs
- Box Plots
- Data Reports

To generate all reports, users will perform the following steps:

1. Select options from the dropdown lists on the upper left side of the screen as shown below:



2. Click the View Report Button on the upper right side of the screen as shown below:



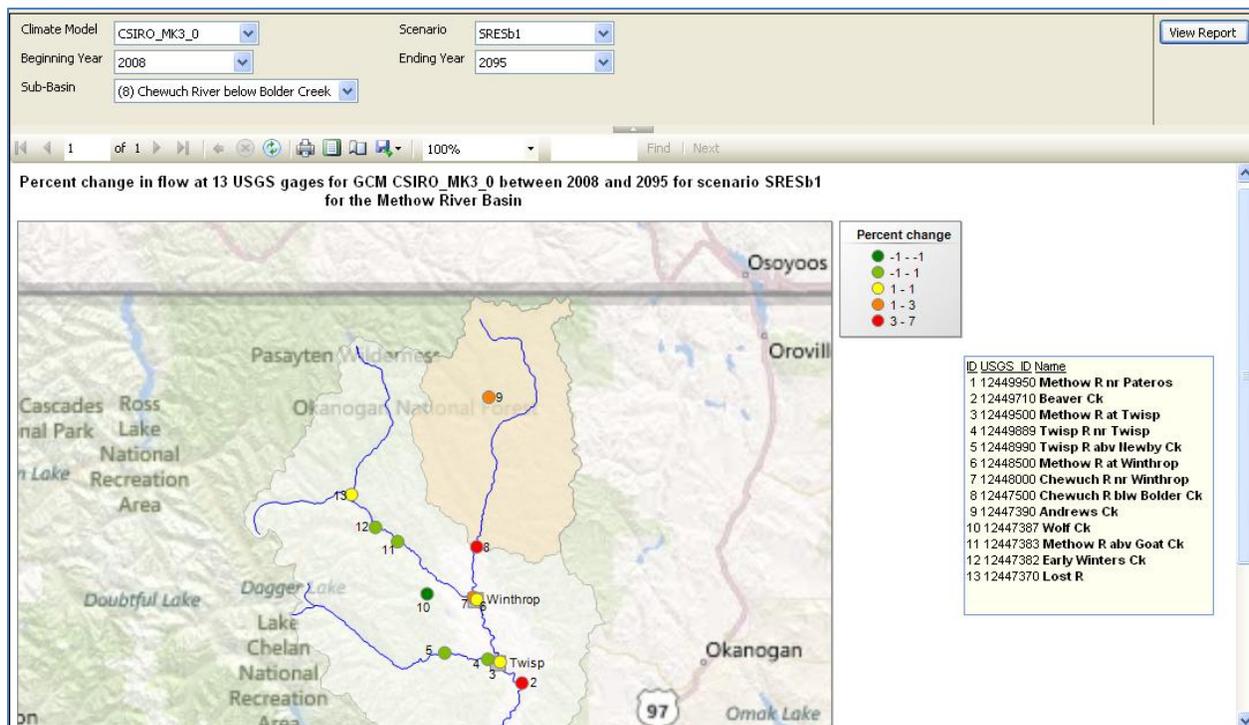
Each report and the associated options will be described in more detail in the sections below.

Maps

The Web map report shows the percent difference in flow between two user-selected years for all

simulation sites in the Methow River basin for any greenhouse gas emission scenario and general circulation model combination.

The screenshot below shows the percent change in flow for all 13 USGS gages for the selected Climate Model, Greenhouse Gas Emission Scenario, Year Range, and Sub-basin. Note the sub-basin shaded in pink on the map. This is the sub-basin selected from the drop down box.

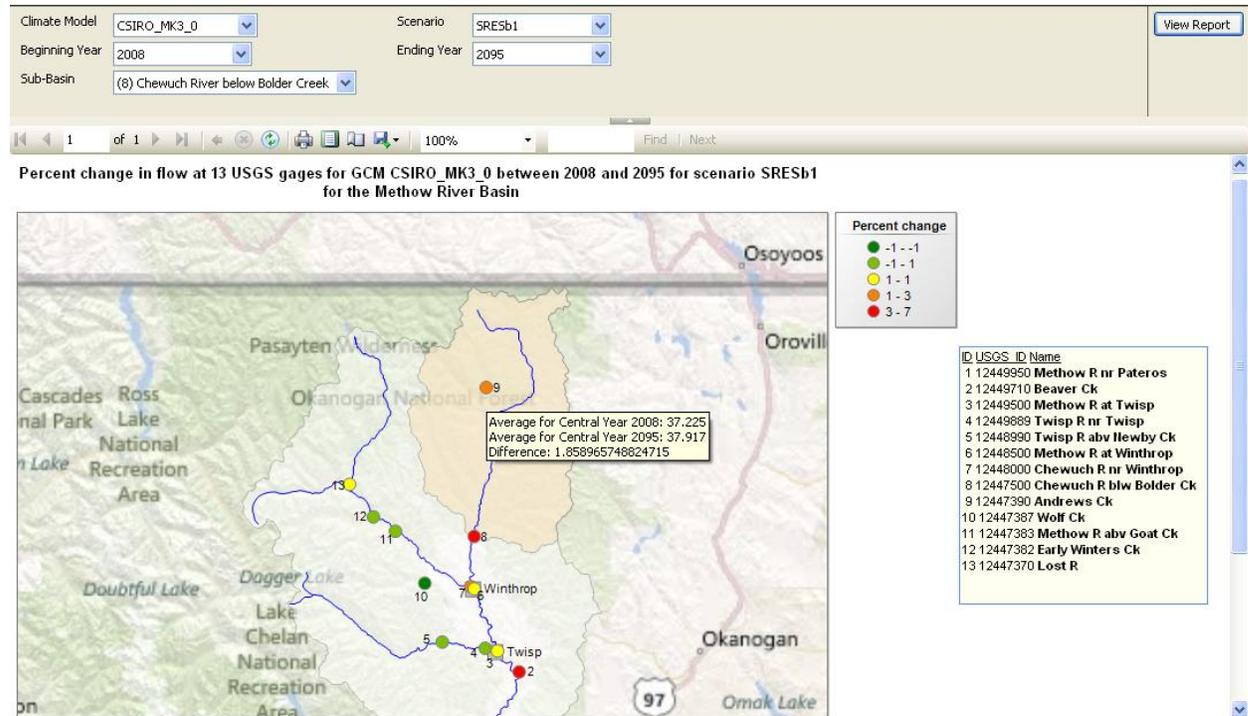


Selecting Map Difference Report Options

- Climate Model (Single Select DropDown).** The user can select one Climate Model from the dropdown box. For more detail on the different Climate Models, see Appendix A.
- Scenario (Single Select DropDown).** The user can select one of the Greenhouse Gas Emission Scenarios (High, Medium, and Low) from the multiselect dropdown box. For more detail on the different scenarios, see Appendix B.
- Begin Year and End Year (Single Select DropDown).** Users can drilldown on specific timeframes or they can see the trends for the overall study period from 2008 to 2095. Selecting a shorter timeframe gives the user more detail on specific timeframes of interest. For example, selecting the timeframe between 2010 (Begin Year) and 2020 (End Year) will expand the graphs along the x-axis and will enable the user to see more detail than the time period between 2008 and 2095. However, if the user would like to see the overall trend for the study period, he/she can leave the default values of 2008 (Begin Year) and 2095 (End Year) unchanged.
- Sub-Basin.** The user can select to highlight a specific sub-basin on the map.

Viewing the Data

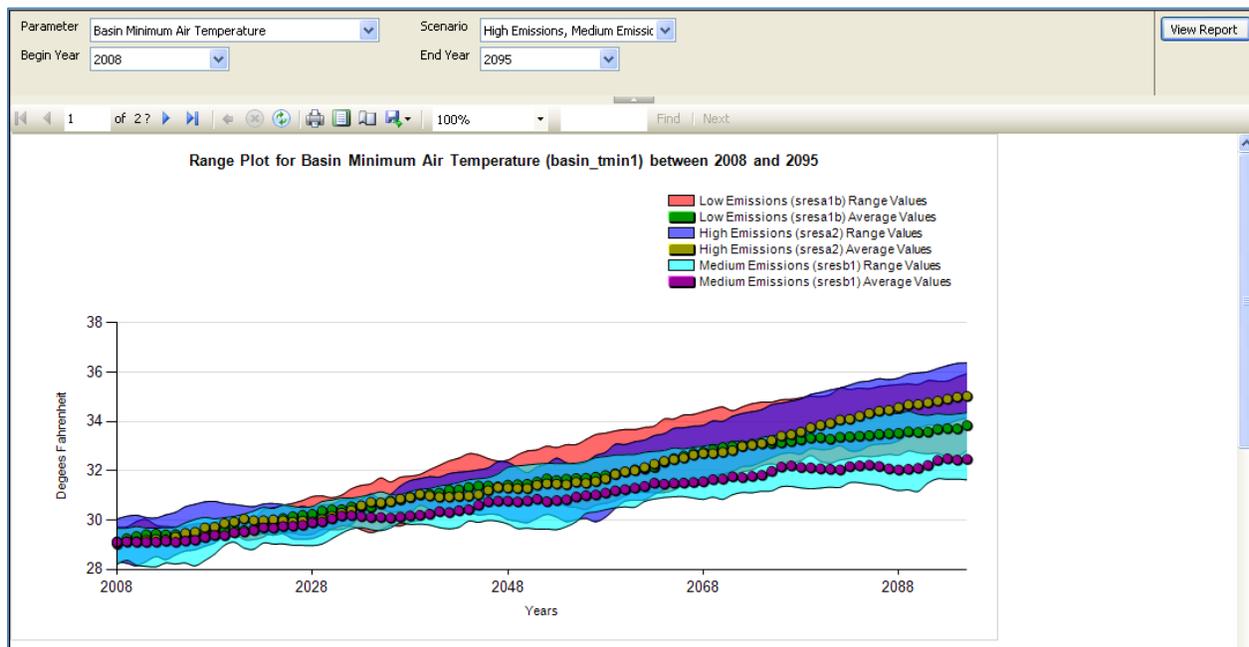
- **Hover over the data points on the Map.** Users can hover the mouse over specific data points (circles) on the map to get the averages for the beginning central year, ending central year, and the difference between them. This information is shown below:



Range Graphs

A range graph shows the selected variable over time. The “range” is a composite of the general circulation models represented in the line graphs for given greenhouse gas emission scenarios. The top, average, and bottom parts of the range represent the highest, average, and lowest of the five general circulation model 11-year window values, respectively.

The following range graph shows the basin minimum air temperature for all greenhouse gas emissions scenarios (high, medium, low) over the time period of the study (2008 to 2095).



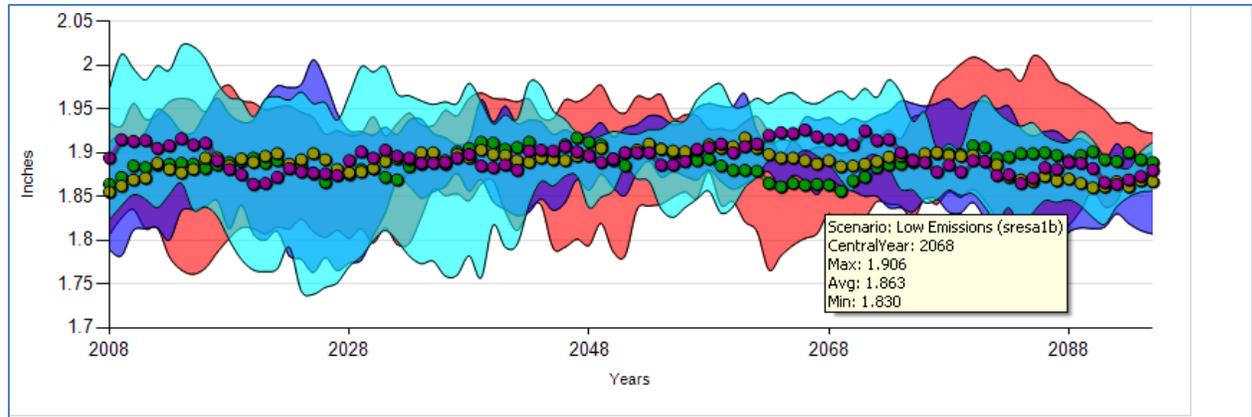
Selecting Range Graph Options

- Parameter (Single Select DropDown).** The user can select one model parameter from the dropdown list. Model parameters might include segment variables, with simulated streamflow corresponding to 13 USGS-operated streamflow gaging stations, and basin-wide variables such as soil moisture, temperature, or percent snow-covered area. For more detail on the different model parameters, see Appendix C.
- Scenario (Multi-Select DropDown).** The user can select one or more of the Greenhouse Gas Emission Scenarios (High, Medium, and Low) from the multiselect dropdown box. Users can simultaneously view two or three scenarios superimposed on each other or they can drill down on one specific scenario. For more detail on the different scenarios, see Appendix B.
- Begin Year and End Year (Single Select DropDown).** Users can drilldown on specific timeframes or they can see the trends for the overall study period from 2008 to 2095. Selecting a shorter timeframe gives the user more detail on specific timeframes of interest. For example, selecting the timeframe between 2010 (Begin Year) and 2020 (End Year) will expand the graphs along the x-axis and will enable the user to see more detail than the time period between 2008 and 2095. However, if the user would like to see the overall trend for the study period, he/she can leave the default values of 2008 (Begin Year) and 2095 (End Year) unchanged.

Viewing the Data

Users can view the data in two ways:

- Hover over the data points within the graphs.** Users can hover the mouse over specific data points (circles) on the middle (averages) line graphs for each scenario to get information about the scenario, central year, high, low, and average values associated with each point on the graph as shown below:



- **View the data report below the graph.** All the data that were used to generate the graphs are available below the charts on the reports. This data and graphs can be downloaded to different file formats, including Excel, Word, and PDF. For more information about exporting data to different file formats, see the section Exporting Reports.

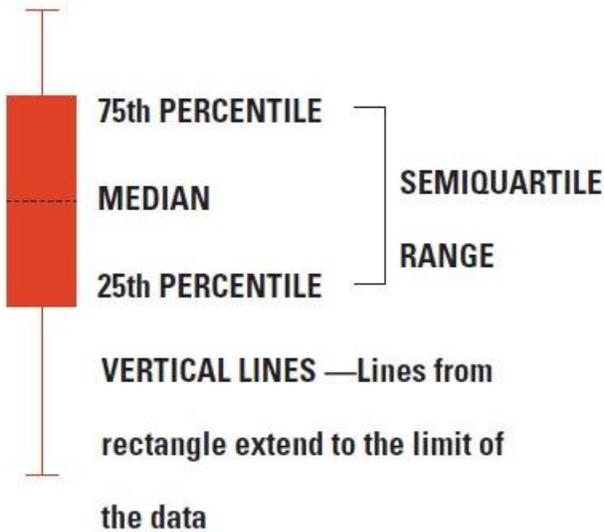
BoxPlots

A single boxplot represents the distribution of simulated daily values for all general circulation models and greenhouse gas emission scenario combinations for a given month of the year. Boxplots include the following statistics. **High Whisker.** Highest data point (or highest outlier).

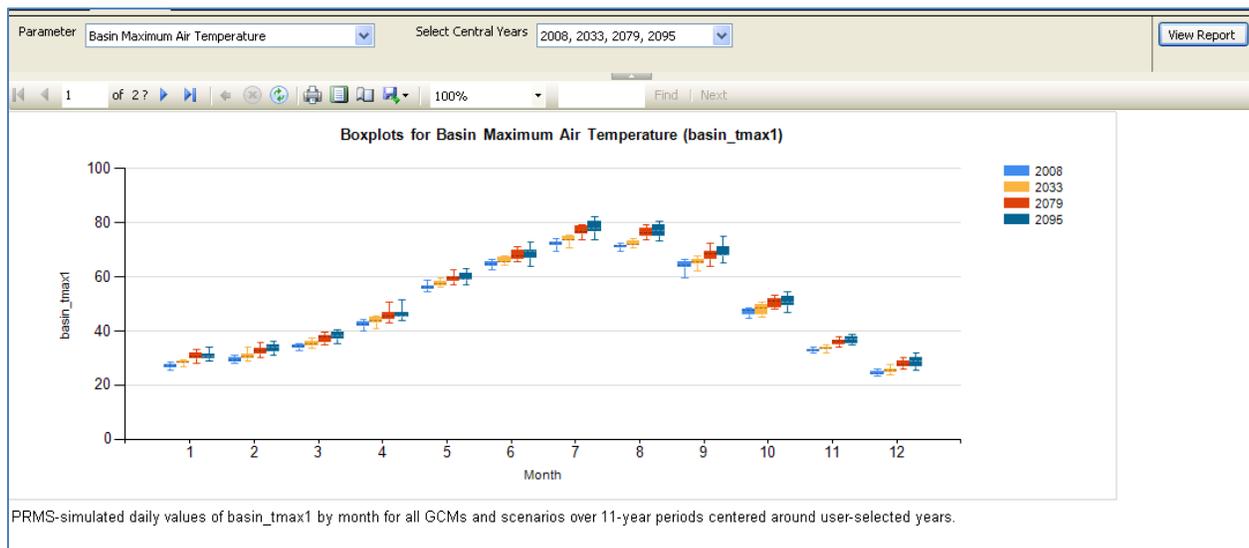
- **75th Percentile.** 75% of the values are below the 75th Percentile.
- **Median.** 50% of the values are below the Median.
- **25th Percentile.** 25% of the values are below the 25th Percentile.
- **Low Whisker.** Lowest data point (or lowest outlier).

Each statistic is shown in the diagram below:

EXPLANATION



The boxplots for the Basin Maximum Air Temperature for the years 2008, 2033, 2079, and 2095 are shown below



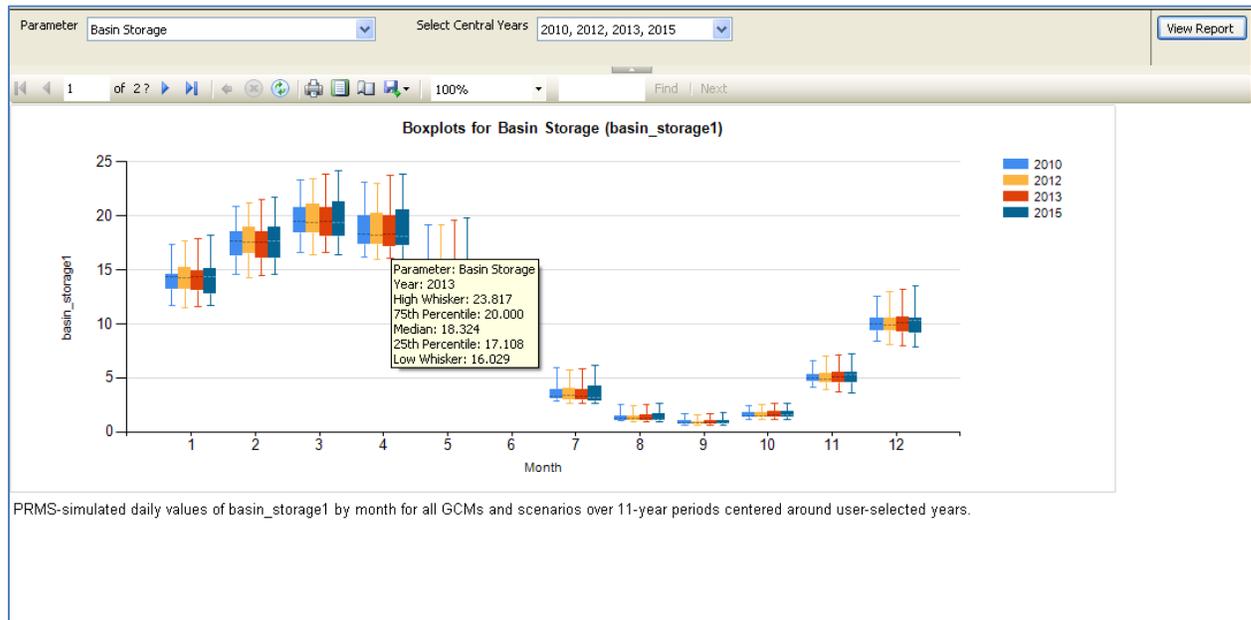
Selecting BoxPlot Options

- Parameter (Single Select Dropdown).** The user can select one model parameter from the dropdown list. Model parameters might include segment variables, with simulated streamflow corresponding to 13 USGS-operated streamflow gaging stations, and basin-wide variables such as soil moisture, temperature, or percent snow-covered area. For more detail on the different model parameters, see Appendix C.
- Year (Multi-Select DropDown).** The user can select one or more Central Years ranging from the year 2008 to 2095. Users can select all of the years or any combination of individual years.

Viewing the Data

Users can view the data in two ways:

- Hover over the boxplots.** Users can hover the mouse over each boxplot associated with each year to get specific information for the selected Model Parameter, Year, High Whisker, 75th Percentile, Median, 25th Percentile, and Low Whisker as shown below:

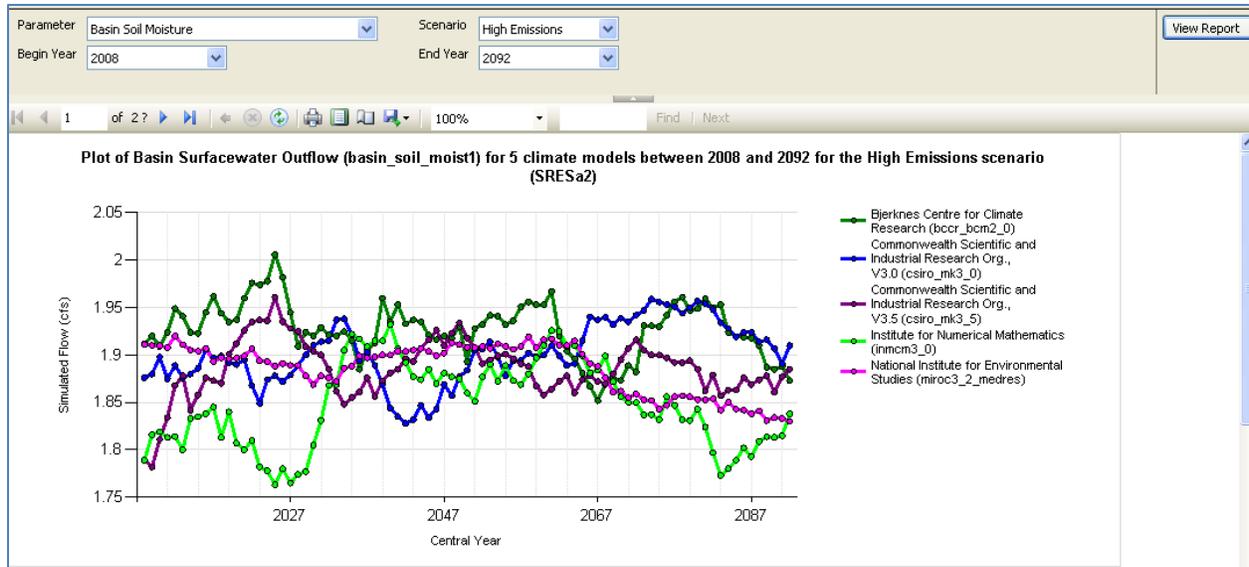


- View the data report below the graph.** All the data that were used to generate the graphs are available below the charts on the reports. This data and graphs can be downloaded to different file formats, including Excel, Word, and PDF. For more information about exporting data to different file formats, see the section Exporting the Reports.

Line Charts

A line chart plots the average value of a selected variable for each of the five general circulation models over time for a selected greenhouse gas emission scenario.

The line chart below shows the average basin soil moisture for the five general circulation models over the selected years for the selected greenhouse gas emission scenario (high emissions).



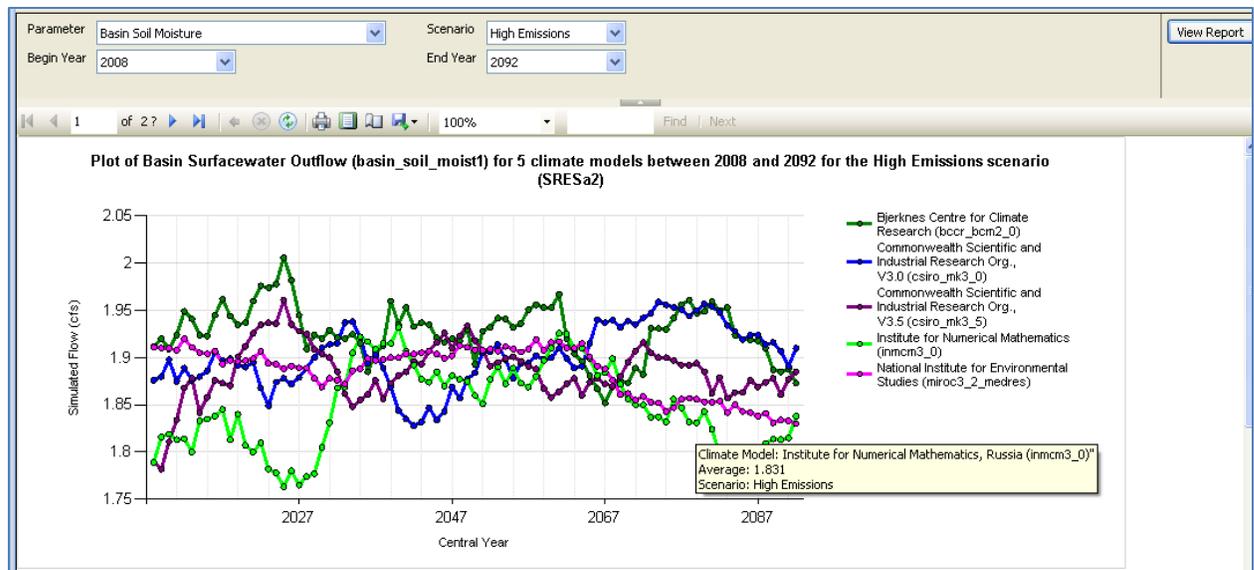
Selecting Line Chart Options

- Parameter (Single Select Dropdown).** The user can select one model parameter from the dropdown list. Model parameters might include segment variables, with simulated streamflow corresponding to 13 USGS-operated streamflow gaging stations, and basin-wide variables such as soil moisture, temperature, or percent snow-covered area. For more detail on the different model parameters, see Appendix C.
- Scenario (Single Select DropDown).** The user can select one Greenhouse Gas Emission Scenario (High, Medium, and Low) from the dropdown box. For more detail on the different scenarios, see Appendix B.
- Begin Year and End Year (Single Select DropDown).** Users can drilldown on specific timeframes or they can see the trends for the overall study period from 2008 to 2095. Selecting a shorter timeframe gives the user more detail on specific timeframes of interest. For example, selecting the timeframe between 2010 (Begin Year) and 2020 (End Year) will expand the graphs along the x-axis and will enable the user to see more detail than the time period between 2008 and 2095. However, if the user would like to see the overall trend for the study period, he/she can leave the default values of 2008 (Begin Year) and 2095 (End Year) unchanged.

Viewing the Data

Users can view the data in two ways:

- Hover over the points on the line chart.** Users can hover the mouse over each point on the line chart associated with each climate model to get specific information for the climate model, average value, and scenario as shown below:



- **View the data report below the graph.** All the data that were used to generate the graphs are available below the charts on the reports. This data and graphs can be downloaded to different file formats, including Excel, Word, and PDF. For more information about exporting data to different file formats, see the section Exporting the Reports.

Data Reports

The data report provides users with access to daily simulation results for all general circulation models over all greenhouse gas emission scenarios.

The data report below contains data for the selected Parameter (Basin Evapotranspiration), Greenhouse Gas Emissions (Medium Emissions), Climate Model (Commonwealth Scientific and Industrial Research Org, Version 3.5, and Begin and End Year.

Daily values for Parameter Basin Evapotranspiration (basin_et1), Medium Emissions scenario (SRESb1), and climate model Commonwealth Scientific and Industrial Research Org., V3.5 (CSIRO_MK3_5) for 2008 - 2095

Climate Model	Scenario	Parameter Name	Day	Month	Central Year	Year Range	Average
csiro_mk3_5	sresb1	basin_et1	1	1	2008	2001-2012	0.004
csiro_mk3_5	sresb1	basin_et1	2	1	2008	2001-2012	0.003
csiro_mk3_5	sresb1	basin_et1	3	1	2008	2001-2012	0.002
csiro_mk3_5	sresb1	basin_et1	4	1	2008	2001-2012	0.003
csiro_mk3_5	sresb1	basin_et1	5	1	2008	2001-2012	0.003
csiro_mk3_5	sresb1	basin_et1	6	1	2008	2001-2012	0.002
csiro_mk3_5	sresb1	basin_et1	7	1	2008	2001-2012	0.004
csiro_mk3_5	sresb1	basin_et1	8	1	2008	2001-2012	0.005
csiro_mk3_5	sresb1	basin_et1	9	1	2008	2001-2012	0.005
csiro_mk3_5	sresb1	basin_et1	10	1	2008	2001-2012	0.005
csiro_mk3_5	sresb1	basin_et1	11	1	2008	2001-2012	0.005
csiro_mk3_5	sresb1	basin_et1	12	1	2008	2001-2012	0.006
csiro_mk3_5	sresb1	basin_et1	13	1	2008	2001-2012	0.006
csiro_mk3_5	sresb1	basin_et1	14	1	2008	2001-2012	0.005
csiro_mk3_5	sresb1	basin_et1	15	1	2008	2001-2012	0.007
csiro_mk3_5	sresb1	basin_et1	16	1	2008	2001-2012	0.007

Selecting Line Chart Options

- Parameter (Single Select Dropdown).** The user can select one model parameter from the dropdown list. Model parameters might include segment variables, with simulated streamflow corresponding to 13 USGS-operated streamflow gaging stations, and basin-wide variables such as soil moisture, temperature, or percent snow-covered area. For more detail on the different model parameters, see Appendix C.
- Scenario (Single Select DropDown).** The user can select one Greenhouse Gas Emission Scenario (High, Medium, and Low) from the dropdown box. For more detail on the different scenarios, see Appendix B.
- Climate Model (Single Select DropDown).** The user can select one Climate Model from the dropdown box. For more detail on the different Climate Models, see Appendix A.
- Begin Year and End Year (Single Select DropDown).** Users can drilldown on specific timeframes or they can see the trends for the overall study period from 2008 to 2095. Selecting a shorter timeframe gives the user more detail on specific timeframes of interest. For example, selecting the timeframe between 2010 (Begin Year) and 2020 (End Year) will expand the graphs along the x-axis and will enable the user to see more detail than the time period between 2008 and 2095. However, if the user would like to see the overall trend for the study period, he/she can leave the default values of 2008 (Begin Year) and 2095 (End Year) unchanged.

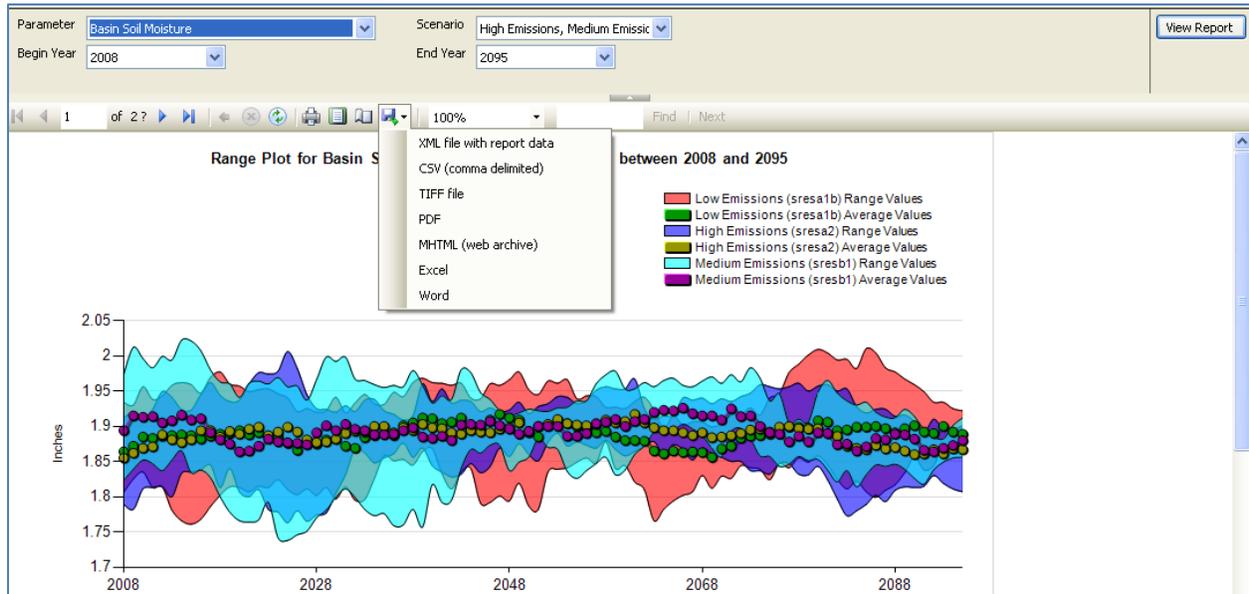
Exporting the Reports

All reports can be easily exported to the following formats:

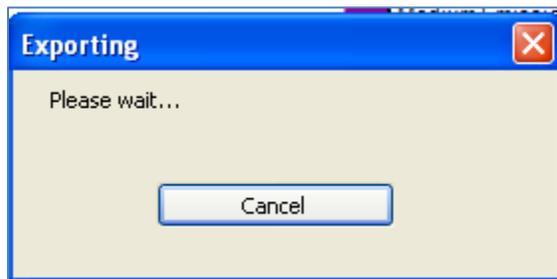
- XML
- CSV

- TIFF
- PDF
- MTHML
- Word
- Excel

To export a report, click on the disk icon as shown in the following screen shot:



A message box will appear indicating that the report is in the process of being exported to the file format selected by the user. For large amounts of data, this might take a few seconds.



The user will then be instructed to navigate to the place on his/her file system where the file is to be saved.

Appendix A: General Circulation Models

Climate Model	Description	Location
BCCR_BCM2_0	Bjerknes Centre for Climate Research	Norway
CSIRO_MK3_0	Commonwealth Scientific and Industrial Research Org., V3.0	Australia
CSIRO_MK3_5	Commonwealth Scientific and Industrial Research Org., V3.5	Australia
INMCM3_0	Institute for Numerical Mathematics	Russia
MIROC3_2_MEDRES	National Institute for Environmental Studies	Japan

Appendix B: Greenhouse Gas Emission Scenarios

Model Scenario	Emission Level	Description
SRESa2	High	Heterogeneous world, high population growth, slow economic growth
SRESa1b	Medium	Population peaks mid-century, rapid economic growth, rapid introduction of efficient technologies
SRESb1	Low	Convergent world, low population growth, rapid changes in economic structure

Appendix C: Model Parameters

Model Parameter	Description	Type of Location	Station ID	Units
basin_cfs1	Basin Surfacewater Outflow	Basin		Cubic Ft/Sec
basin_et1	Basin Evapotranspiration	Basin		Inches
basin_gwin1	Basin Inflow to Groundwater Reservoir	Basin		Inches
basin_ppt1	Basin Average Precipitation	Basin		Inches
basin_pweqv1	Basin Snowpack Water Equivalent	Basin		Inches
basin_snowcov1	Basin Percent Snow Covered Area	Basin		Percentage

Model Parameter	Description	Type of Location	Station ID	Units
basin_soil_moist1	Basin Soil Moisture	Basin		Inches
basin_storage1	Basin Storage	Basin		Inches
basin_tmax1	Basin Maximum Air Temperature	Basin		Degees Fahrenheit
basin_tmin1	Basin Minimum Air Temperature	Basin		Degees Fahrenheit
segment_cfs10	Lost River near Mazama	Gauge	12447370	Cubic Ft/Sec
segment_cfs20	Early Winters Creek near Mazama	Gauge	12447382	Cubic Ft/Sec
segment_cfs148	Methow River above Goat Creek near Mazama	Gauge	12447383	Cubic Ft/Sec
segment_cfs35	Wolf Creek below diversion, near Winthrop	Gauge	12447387	Cubic Ft/Sec
segment_cfs41	Andrews Creek near Mazama	Gauge	12447390	Cubic Ft/Sec
segment_cfs80	Chewuch River below Boulder Creek	Gauge	12447500	Cubic Ft/Sec
segment_cfs88	Chewuch River at Winthrop	Gauge	12448000	Cubic Ft/Sec
segment_cfs162	Methow River at Winthrop	Gauge	12448500	Cubic Ft/Sec
segment_cfs100	Twisp River above Newby Creek, near Twisp	Gauge	12448990	Cubic Ft/Sec
segment_cfs111	Twisp River near Twisp	Gauge	12448998	Cubic Ft/Sec
segment_cfs172	Methow River near Twisp	Gauge	12449500	Cubic Ft/Sec
segment_cfs124	Beaver Creek near mouth, near Twisp	Gauge	12449710	Cubic Ft/Sec
segment_cfs204	Methow River near Pateros	Gauge	12449950	Cubic Ft/Sec