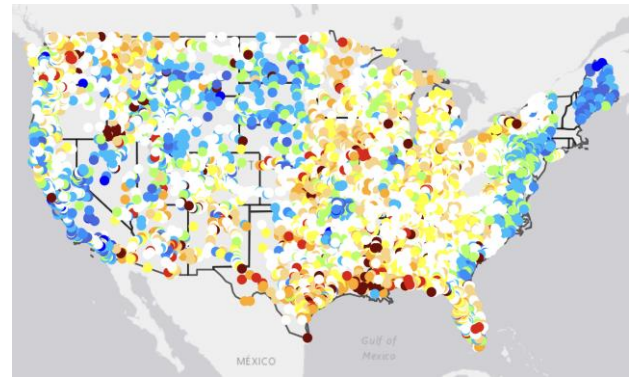
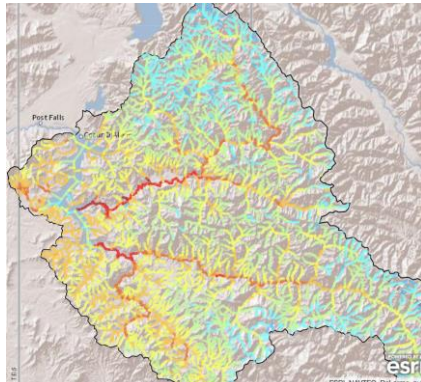
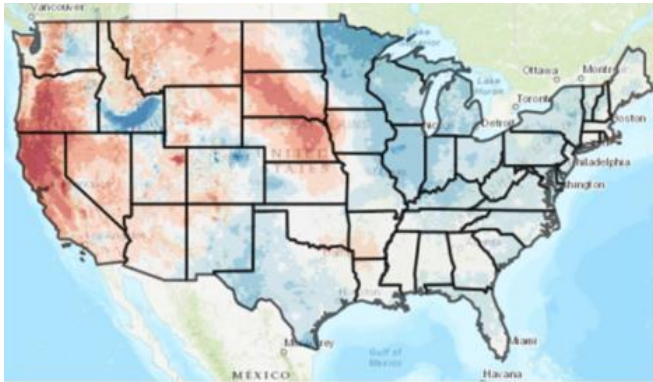


The Climate Toolbox

Katherine Hegewisch, UC Merced



The Climate Toolbox

A collection of web tools for visualizing past and projected climate and hydrology of the contiguous United States of America.



Applications

A collection of tools for addressing questions relating to Agriculture, Climate, Fire Conditions, and Water.



Tools

Climate Mapper
Maps of historical and future climate information across multiple sectors
[Launch Tool](#)

Historical Climate Dashboard
Dashboard of real-time climate for a location
[Launch Tool](#)

Historical Water Watcher
Maps of real-time water monitoring over the contiguous US
[Launch Tool](#)

Historical Climate Tracker
Graphs of historical climate variability for a location
[Launch Tool](#)

Historical Climate Scatter
Compare years for future time periods for a location
[Launch Tool](#)

Historical Climograph
Climographs of monthly average climate for a location
[Launch Tool](#)

Historical Seasonal Progression
Graphs of historical weather and forecasts for a selected location
[Launch Tool](#)

Seasonal Forecast Graphs
Graphs of seasonal climate forecasts for a location
[Launch Tool](#)

Future Time Series
Graphs of future time series projections for a location
[Launch Tool](#)

Future Boxplots
Compare projections for future time periods for a location
[Launch Tool](#)

Future Climate Scatter
Compare model projections for two variables for a location
[Launch Tool](#)

Future Climate Dashboard
Dashboard of future climate projections for a location
[Launch Tool](#)

Future Streamflows
Graphs of future streamflow projections for a stream
[Launch Tool](#)

Future Cold Hardiness Zones
Maps of Future hardiness and crop suitability zones projections
[Launch Tool](#)

Future Crop Suitability
Map of future crop suitability and projections for a location
[Launch Tool](#)

Future Climate Scatter

View a scatterplot of future projections for a location in the contiguous USA.
Location: [Your Current Location \(46.7304° N, 116.9949° W\)](#)

[Documentation](#) [Cite Tool](#) [Take Tour](#)

Make Request -

To update the graph, make all of your selections and then click this button. [MAKE REQUEST](#)

Choose Location -

[CHOOSE LOCATION](#)

Choose Data -

Show changes
Vertical(Y)-Axis:

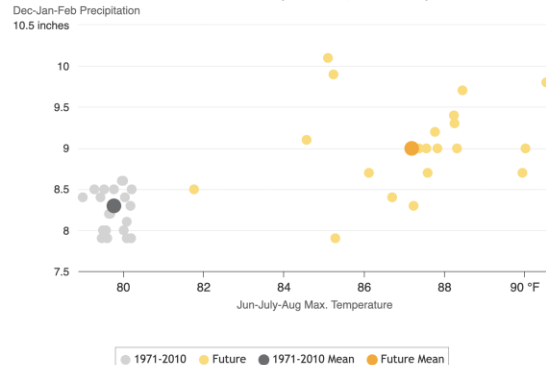
Precipitation
Units: inches
Horizontal(X)-Axis:

Max. Temperature
Units: °F

Choose Analysis -

Change Graph -

Projections for 2040-2069 Higher Emissions (RCP8.5) Future Scenario Your Current Location (46.7304 N, 116.9949 W)



- Interact with the Graph
- Hover over symbols on graph to see values at different model/scenario combinations.
 - Click legend label to remove/add series on graph
 - Drag the legend to any location inside the graph

Poll

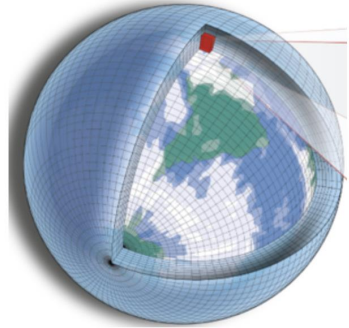
- Who have used the Climate Toolbox for their work?
- Who have looked at the Climate Toolbox since the virtual classroom?

What we did in the Virtual Class

Future Climate Projection Data

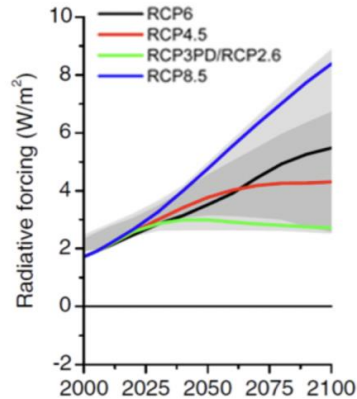
Future Climate Models

The 20 climate model projections utilized are from phase 5 of the Coupled Model Intercomparison Project (CMIP5) from the Intergovernmental Panel on Climate Change (IPCC). These models are run by climate modeling agencies from different countries all over the world and represent the best science for climate modeling.



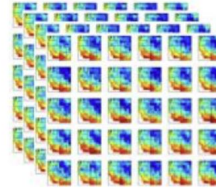
Future Climate Scenarios

The CMIP5 models ran future projections utilizing future scenarios in terms of Representative Concentration Pathways (RCPs). The "High Emissions Scenario (RCP 8.5)" represents a future pathway similar to a business-as-usual continuation of our emissions back in 2010. The "Low Emissions Scenario (RCP 4.5)" considers a curtailment in greenhouse gas emissions through greenhouse gas mitigation efforts.



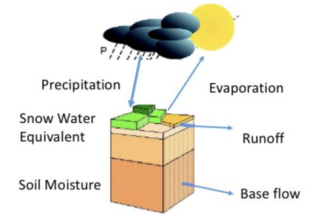
Statistical Downscaling

The CMIP5 model outputs were statistically downscaled using the Multivariate Adaptive Constructed Analogs (MACA) method version 2 with the gridMET training dataset. This method removes biases and increases the resolution of the model outputs.



Derived Metrics

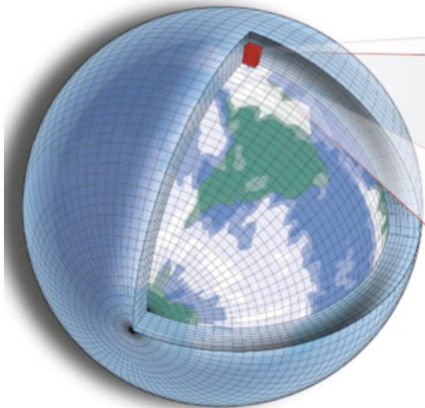
The downscaled CMIP6 data is run through other models or functions to create other metrics of interest to decision makers.



Future Climate Models

Future Climate Models

The 20 climate model projections utilized are from phase 5 of the Coupled Model Intercomparison Project (CMIP5) from the Intergovernmental Panel on Climate Change (IPCC). These models are run by climate modeling agencies from different countries all over the world and represent the best science for climate modeling.



In the tools, you
select a model.

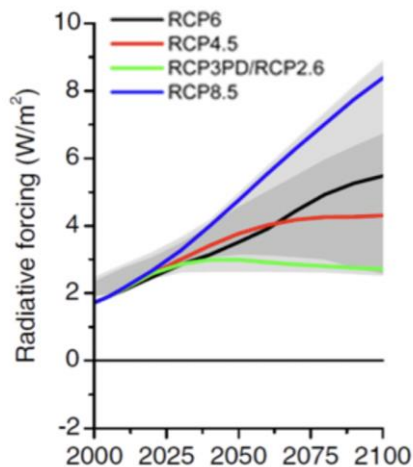
Individual Models

- bcc-csm1-1 (China)
- bcc-csm1-1-m (China)
- BNU-ESM (China)
- CanESM2 (Canada)
- CCSM4 (USA)
- CNRM-CM5 (France)
- CSIRO-Mk3-6-0 (Australia)
- GFDL-ESM2M (USA)
- GFDL-ESM2G (USA)
- HadGEM2-CC365 (United Kingdom)
- HadGEM2-ES365 (United Kingdom)
- inmcm4 (Russia)
- IPSL-CM5A-LR (France)
- IPSL-CM5A-MR (France)
- IPSL-CM5B-LR (France)
- MIROC5 (Japan)
- MIROC-ESM (Japan)
- MIROC-ESM-CHEM (Japan)
- MRI-CGCM3 (Japan)
- NorESM1-M (Norway)

Future Climate Scenarios

Future Climate Scenarios

The CMIP5 models ran future projections utilizing future scenarios in terms of Representative Concentration Pathways (RCPs). The "High Emissions Scenario (RCP 8.5)" represents a future pathway similar to a business-as-usual continuation of our emissions back in 2010. The "Low Emissions Scenario (RCP 4.5)" considers a curtailment in greenhouse gas emissions through greenhouse gas mitigation efforts.



In the tools, you select a future scenario.

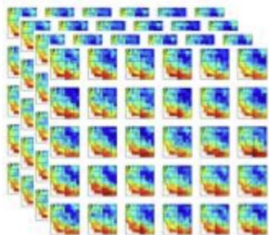
- ✓ RCP 4.5 (Reduced Emissions Scenario)
- RCP 8.5 (Business-as-Usual High Emissions Scenario)

Future Dataset

Future Downscaled Data

Statistical Downscaling


The CMIP5 model outputs were statistically downscaled using the Multivariate Adaptive Constructed Analogs (MACA) method version 2 with the gridMET training dataset. This method removes biases and increases the resolution of the model outputs.



In the tools....
you select a
location.

Data comes from
4-km (2.5 mile)
grid cells

Set Point Location

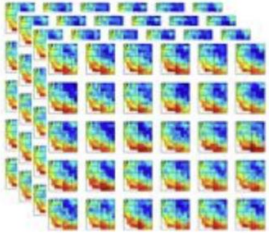
- Choose a point location with one of the options:
 - GeoLocation:** Enter name of a location
 - Click on Map/Drag Marker:** Click a location on the map or drag the marker  to your location.
 - Enter Coordinates:** Enter the coordinates of a point location: North, West
- Click to show grids and grid cell centers of the gridded data. 1/24-deg grid cell
Currently showing grids
- Click the 'SET LOCATION' button to update and return to the tool.

Map -

Future Downscaled Data

Statistical Downscaling

The CMIP5 model outputs were statistically downscaled using the Multivariate Adaptive Constructed Analogs (MACA) method version 2 with the gridMET training dataset. This method removes biases and increases the resolution of the model outputs.



In the tools, you select a variable.

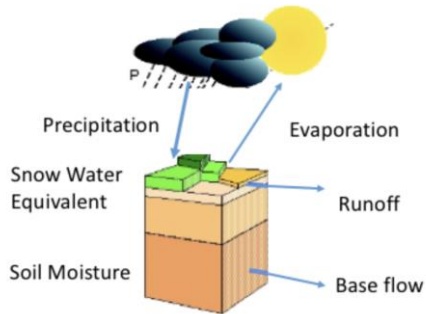
Downscaled variables:

- Min/max daily temperature
- Precipitation
- Min/max daily relative humidity
- Specific humidity
- Downward solar radiation
- Wind speed

Future Derived Metrics

Derived Metrics

The downscaled CMIP6 data is run through other models or functions to create other metrics of interest to decision makers.



In the tools, you select a variable.

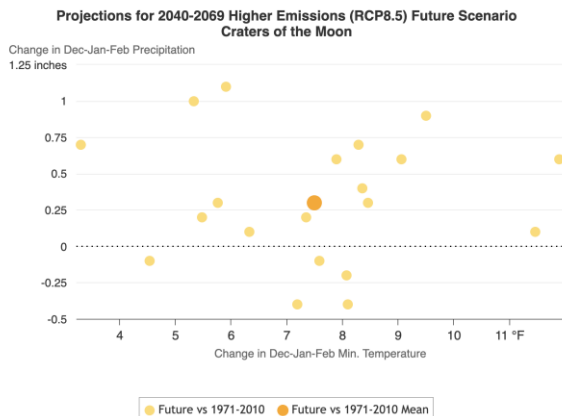
Derived Metrics:

- Snow water equiv., runoff, soil moisture
- Days of heat index > 90F
- Days with max temperature > 86 F
- Coldest night temperature
- Day of first fall freeze, last spring freeze
- Growing degree days (32F, 40, 45, 50F)
- Number of 'high' fire danger days

Scenario Selection

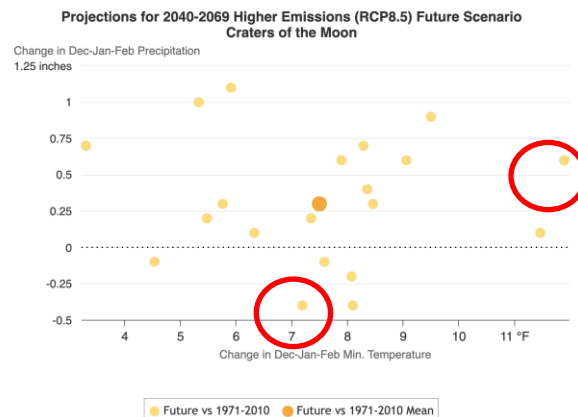
Process of Selecting a Future Scenario

Generate a scatter plot of model/scenario projections



Future Climate Scatter

Identify models/scenarios that represent a particular climate vulnerability



Future Climate Scatter

Explore future metrics for chosen model/scenarios

Results

DOWNLOAD REPORT AS CSV DOWNLOAD REPORT AS PNG

Climate Scenarios

Location: 43.1718°N; 113.4821°W.

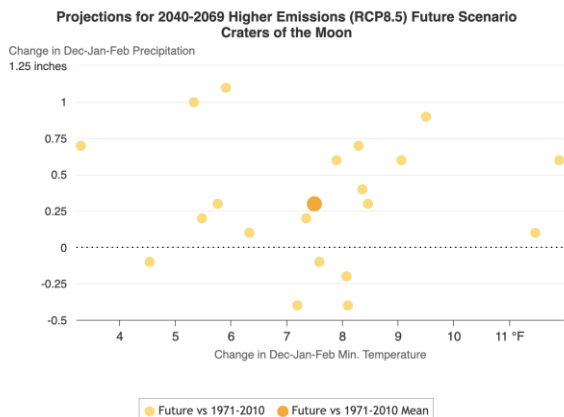
The summary table below describes changes in the future climate by 2020 (2010-2039) relative to the 1971-2000 period under climate scenarios: **Scenario 1** (MIROC-ESM-CHEM.rcp85)

Climate Metric	Scenario 1	Historical Value
Spring Minimum Temperature (°F) (change relative to historical by °F)	38.27 (6.85)	31.42
Winter Precipitation (in) (% change relative to historical)	3.84 (2.13)	3.76
Coldest Winter Day (°F) (relative to historical by °F)	2.19 (12.49)	-10.3
Hottest Summer Day (°F) (relative to historical by °F)	101.97 (4.87)	97.1
Day of First Fall Freeze (days) (relative to historical by days)	Sept. 27 (5)	Sept. 22
Day of Last Spring Freeze (days) (relative to historical by days)	Mar. 30 (-59)	May 28
Length of Growing Season (days) (relative to historical by days)	181 (84.00)	117
Cum. Growing Degree Days Since Jan 1 (32 °F base) (°F) (relative to historical by °F)	7125.37 (1264.94)	5860.43

Future Climate Scenarios

Generating a Scatterplot

Generate a scatter plot
of model/scenario
projections



1. Go to **Future Climate Scatter** tool
2. Select a location
3. Select variables of interest for x,y axes
4. Select Future Scenario (RCP 8.5)
5. Select Future Time Period (2040-2069)
6. Click 'Show Changes' Show changes
7. Click 'Make Request' button to update graph

Generating Scatter Plot

[Documentation](#) [Cite Tool](#) [Take Tour](#)

Future Climate Scatter

View a scatterplot of future projections for a location in the contiguous USA.

Location: Your Current Location (46.7304° N, 116.9949° W)

Make Request -

To update the graph, make all of your selections and then click this button.

MAKE REQUEST

Choose Location -

Point Location

CHOOSE LOCATION

Choose Data -

Show changes

Vertical(Y)-Axis:

Dec-Jan-Feb

Precipitation

Units: inches

Horizontal(X)-Axis:

Jun-July-Aug

Max. Temperature

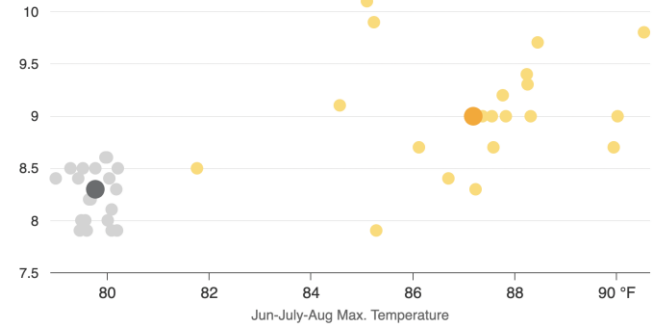
Units: °F

Choose Analysis -

Change Graph -

Projections for 2040-2069 Higher Emissions (RCP8.5) Future Scenario Your Current Location (46.7304 N, 116.9949 W)

Dec-Jan-Feb Precipitation
10.5 inches



● 1971-2010 ● Future ● 1971-2010 Mean ● Future Mean

Interact with the Graph

- Hover over symbols on graph to see values at different model/scenario combinations.
- Click legend label to remove/add series on graph
- Drag the legend to any location inside the graph

Climate Central, Data Source: NCCM2014-MET2014-021 Revised

Choose Location →

Generating Scatter Plot

Documentation Cite Tool Take Tour

Future Climate Scatter

View a scatterplot of future projections for a location in the contiguous USA.
Location: Your Current Location (46.7304° N, 116.9949° W)

Make Request -
To update the graph, make all of your selections and then click this button. [MAKE REQUEST](#)

Choose Location -
 [CHOOSE LOCATION](#)

Choose Data -
 Show changes
Vertical(Y)-Axis:

 Units:

Horizontal(X)-Axis:

 Units:

Choose Analysis -

Change Graph -

Projections for 2040-2069 Higher Emissions (RCP8.5) Future Scenario
Your Current Location (46.7304 N, 116.9949 W)

Data extraction from grid cell

- Point Location
- Area average over polygon
 - Rectangular Area
 - US State Area
 - US County Area
 - US Hydrologic Watershed (HUC8)
- Area average over custom polygon
 - Custom Polygon

90 °F

Jun-July-Aug Max. Temperature

1971-2010 Future 1971-2010 Mean Future Mean

Interact with the Graph

- Hover over symbols on graph to see values at different model/scenario combinations.
- Click legend label to remove/add series on graph
- Drag the legend to any location inside the graph

Choose Location →

Generating Scatter Plot

Choose Location →

Future Climate Scatter

View a scatterplot of future projections for a location in the contiguous USA.
Location: Your Current Location (46.7304° N, 116.9949° W)

Make Request -

To update the graph, make all of your selections and then click this button.

Choose Location -

Choose Data -

Show changes

Vertical(Y)-Axis:

 Units:


Horizontal(X)-Axis:

 Units:


Choose Analysis -

Change Graph -

Set Point Location

- Choose a point location with one of the options:
 - GeoLocation:** Enter name of a location
 - Click on Map/Drag Marker:** Click a location on the map or drag the marker  to your location.
 - Enter Coordinates:** Enter the coordinates of a point location: North, West
- Click to show grids and grid cell centers of the gridded data. 1/24-deg grid cell
- Click the 'SET LOCATION' button to update and return to the tool.

Map -



Keyboard shortcuts | Map data ©2024 Google, INEGI, Terms

Generating Scatter Plot

[Documentation](#) [Cite Tool](#) [Take Tour](#)

Future Climate Scatter

View a scatterplot of future projections for a location in the contiguous USA.

Location: Your Current Location (46.7304° N, 116.9949° W)

Make Request -

To update the graph, make all of your selections and then click this button.

[MAKE REQUEST](#)

Choose Location -

[CHOOSE LOCATION](#)

Choose Data -

Show changes

Vertical(Y)-Axis:

Units:

Horizontal(X)-Axis:

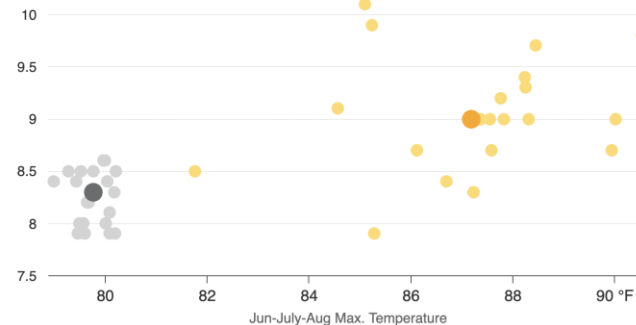
Units:

Choose Analysis -

Change Graph -

Projections for 2040-2069 Higher Emissions (RCP8.5) Future Scenario Your Current Location (46.7304 N, 116.9949 W)

Dec-Jan-Feb Precipitation
10.5 inches



1971-2010 Future 1971-2010 Mean Future Mean

Climate Central, Data Source: NCCM2014 MET D010 (CC BY-NC)

Interact with the Graph

- Hover over symbols on graph to see values at different model/scenario combinations.
- Click legend label to remove/add series on graph
- Drag the legend to any location inside the graph

Choose data
for x,y axes



Generating Scatter Plot

Future Climate Scatter

View a scatterplot of future projections for a location in the contiguous USA.
Location: Your Current Location (46.7304° N, 116.9949° W)

Make Request -
To update the graph, make all of your selections and then click this button. **MAKE REQUEST**

Choose Location -
Point Location **CHOOSE LOCATION**

Choose Data -
 Show changes
Vertical(Y)-Axis:
Dec-Jan-Feb
Precipitation Units: inches
Horizontal(X)-Axis:
Jun-July-Aug
Max. Temperature Units: °F

Choose Analysis -

Change Graph -

Projections for 2040-2069 Higher Emissions (RCP8.5) Future Scenario
Your Current Location (46.7304 N, 116.9949 W)

Dec-Jan-Feb Precipitation
10.5 inches

10
9.5
9
8.5

86 88 90 °F

g Max. Temperature

1-2010 Mean ● Future Mean

scenario combinations.

Dec-Jan-Feb
Mar-Apr-May
✓ Jun-July-Aug
Sept-Oct-Nov
Jan-Dec

Choose a season →

Generating Scatter Plot

Choose a variable



Future Climate Scatter

View a scatterplot of future projections for a location in the contiguous USA.
Location: Your Current Location (46.7304° N, 116.9949° W)

Make Request -
To update the graph, make all of your selections and then click this button. [MAKE REQUEST](#)

Choose Location -
Point Location [CHOOSE LOCATION](#)

Choose Data -
 Show changes
Vertical(Y)-Axis:
Dec-Jan-Feb
Precipitation
Horizontal(X)-Axis:
Jun-July-Aug
Max. Temperature
Units: °F

Choose Analysis -

Change Graph -

Climate Variables

- Mean Temperature
- Max. Temperature**
- Min. Temperature
- Precipitation
- Radiation
- Wind Speed

Climate Indices

- Days with Heat Index $\geq 90^{\circ}\text{F}$
- Days with Heat Index $\geq 100^{\circ}\text{F}$
- Days with Heat Index $\geq 105^{\circ}\text{F}$

Agriculture Variables

- Potential Evapotranspiration
- Coldest Night Temperature
- Hottest Day Temperature
- Days With Max. Temperature Above 86°F
- Days With Min. Temperature Above 32°F
- Day of First Fall Freeze
- Day of Last Spring Freeze
- Length of Growing Season
- Cum. Growing Degree Days Since Jan 1 (32°F base)
- Cum. Growing Degree Days Since Jan 1 (37.4°F base)
- Cum. Growing Degree Days Since Jan 1 (41°F base)

(5) Future Scenario (949 W)

Future Mean

Generating Scatter Plot

[Documentation](#) [Cite Tool](#) [Take Tour](#)

Future Climate Scatter

View a scatterplot of future projections for a location in the contiguous USA.

Location: Your Current Location (46.7304° N, 116.9949° W)

Make Request -

To update the graph, make all of your selections and then click this button.

MAKE REQUEST

Choose Location -

Point Location

CHOOSE LOCATION

Choose Data -

Show changes

Vertical(Y)-Axis:

Dec-Jan-Feb

Precipitation

Units: inches

Horizontal(X)-Axis:

Jun-July-Aug

Max. Temperature

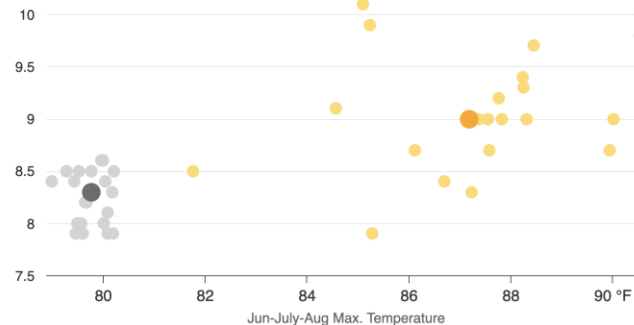
Units: °F

Choose Analysis -

Change Graph -

Projections for 2040-2069 Higher Emissions (RCP8.5) Future Scenario Your Current Location (46.7304 N, 116.9949 W)

Dec-Jan-Feb Precipitation
10.5 inches



Interact with the Graph

- Hover over symbols on graph to see values at different model/scenario combinations.
- Click legend label to remove/add series on graph
- Drag the legend to any location inside the graph

Click 'Show Changes'



Generating Scatter Plot

Open the Analysis Section →

Future Climate Scatter

View a scatterplot of future projections for a location in the contiguous USA.
Location: Your Current Location (46.7304° N, 116.9949° W)

Make Request-

To update the graph, make all of your selections and then click this button. [MAKE REQUEST](#)

Choose Location-

Point Location [CHOOSE LOCATION](#)

Choose Data-

Choose Analysis-

Graph Option:

- Fix future scenario AND future time period
- Fix future scenario
- Fix future time period

Scenario:

Higher Emissions (RCP 8.5)

Time Period:

Mid 21st Century (2040 - 2069)

Display Options:

- Show model means separately on graph

Projections for 2040-2069 Higher Emissions (RCP8.5) Future Scenario Your Current Location (46.7304 N, 116.9949 W)

Dec-Jan-Feb Precipitation
10.5 inches

10
9.5
9
8.5
8
7.5

80 82 84 86 88 90 °F

Jun-July-Aug Max. Temperature

● 1971-2010 ● Future ● 1971-2010 Mean ● Future Mean

[Interact with the Graph](#)

- Hover over symbols on graph to see values at different model/scenario combinations.
- Click legend label to remove/add series on graph
- Drag the legend to any location inside the graph

Generating Scatter Plot

Future Climate Scatter Documentation Cite Tool Take Tour

View a scatterplot of future projections for a location in the contiguous USA.
Location: Your Current Location (46.7304° N, 116.9949° W)

Make Request-

To update the graph, make all of your selections and then click this button. **MAKE REQUEST**

Choose Location-

Point Location **CHOOSE LOCATION**

Choose Data-

Choose Analysis-

Graph Option:

Fix future scenario AND future time period
 Fix future scenario

Scenario:
Higher Emissions (RCP 8.5)

Time Period:
Mid 21st Century (2040 - 2069)

Display Options:
 Show model means separately on graph

**Projections for 2040-2069 Higher Emissions (RCP8.5) Future Scenario
Your Current Location (46.7304 N, 116.9949 W)**

Dec-Jan-Feb Precipitation
10.5 inches

Jun-July-Aug Max. Temperature

Legend: 1971-2010 (grey), Future (yellow), 1971-2010 Mean (dark grey), Future Mean (orange)

Interact with the Graph

- Hover over symbols on graph to see values at different model/scenario combinations.
- Click legend label to remove/add series on graph
- Drag the legend to any location inside the graph

Choose a future scenario

Generating Scatter Plot

Future Climate Scatter Documentation Cite Tool Take Tour

View a scatterplot of future projections for a location in the contiguous USA.
Location: Your Current Location (46.7304° N, 116.9949° W)

Make Request

To update the graph, make all of your selections and then click this button. **MAKE REQUEST**

Choose Location

Point Location **CHOOSE LOCATION**

Choose Data

Choose Analysis

Graph Option:

- Fix future scenario AND future time period
- Fix future scenario
- Fix future time period

Scenario:

Higher Emissions (RCP 8.5)

Time Period:

Mid 21st Century (2040 - 2069)

Display Options:

- Show model means separately on graph

Projections for 2040-2069 Higher Emissions (RCP8.5) Future Scenario
Your Current Location (46.7304 N, 116.9949 W)

Dec-Jan-Feb Precipitation
10.5 inches

Early 21st Century (2010 - 2039)

Mid 21st Century (2040 - 2069)

Late 21st Century (2070 - 2099)

Legend: 1971-2010 (grey), Future (yellow), 1971-2010 Mean (dark grey), Future Mean (orange)

Interact with the Graph

- Hover over symbols on graph to see values at different model/scenario combinations.
- Click legend label to remove/add series on graph
- Drag the legend to any location inside the graph

Choose a future time period



Generating Scatter Plot

Click 'Make Request' button to update graph



Future Climate Scatter

View a scatterplot of future projections for a location in the contiguous USA.
Location: Your Current Location (46.7304° N, 116.9949° W)

Documentation Cite Tool Take Tour

Make Request -

To update the graph, make all of your selections and then click this button.

Choose Location -

Point Location

Choose Data -

Choose Analysis -

Graph Option:

Fix future scenario AND future time period
 Fix future scenario
 Fix future time period

Scenario:

Higher Emissions (RCP 8.5)

Time Period:

Mid 21st Century (2040 - 2069)

Display Options:

Show model means separately on graph

MAKE REQUEST

Projections for 2040-2069 Higher Emissions (RCP8.5) Future Scenario

Your Current Location (46.7304 N, 116.9949 W)

Dec-Jan-Feb Precipitation
10.5 inches

10
9.5
9
8.5
8
7.5

80 82 84 86 88 90 °F

1971-2010 Future 1971-2010 Mean Future Mean

Interact with the Graph

- Hover over symbols on graph to see values at different model/scenario combinations.
- Click legend label to remove/add series on graph
- Drag the legend to any location inside the graph

Generating Scatter Plot

[Documentation](#) [Cite Tool](#) [Take Tour](#)

Future Climate Scatter

View a scatterplot of future projections for a location in the contiguous USA.

Location: Craters of the Moon (43.1718° N, 113.4821° W)

Scatterplot from selections

Make Request -

To update the graph, make all of your selections and then click this button. [MAKE REQUEST](#)

Choose Location -

Point Location

[CHOOSE LOCATION](#)

Choose Data -

Show changes

Vertical(Y)-Axis:

Projected Change

Dec-Jan-Feb

Precipitation

Units: inches

Horizontal(X)-Axis:

Projected Change

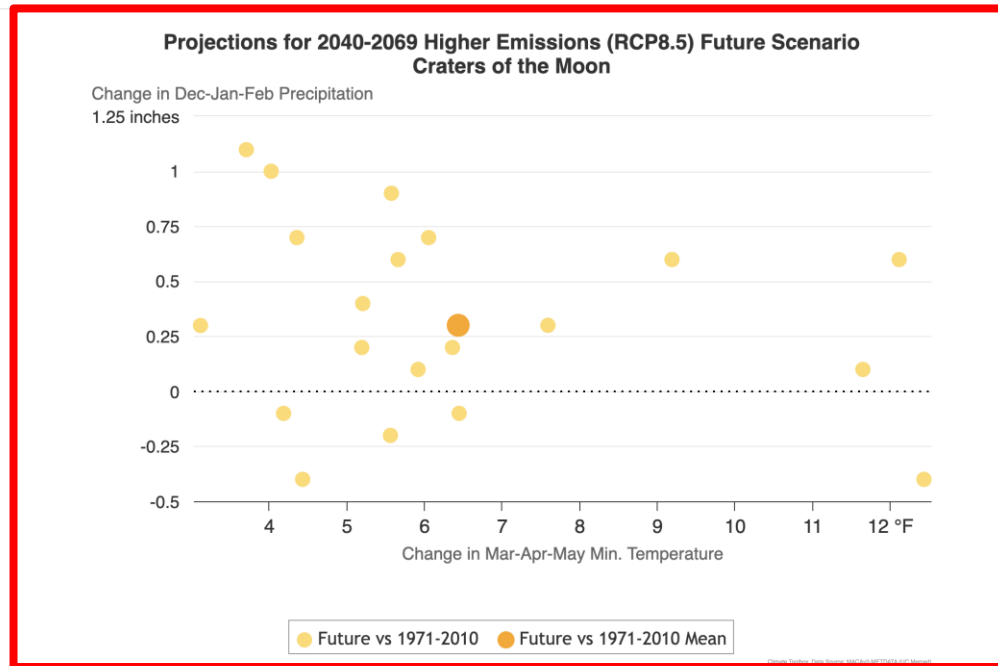
Mar-Apr-May

Min. Temperature

Units: °F

Choose Analysis -

Graph Option:

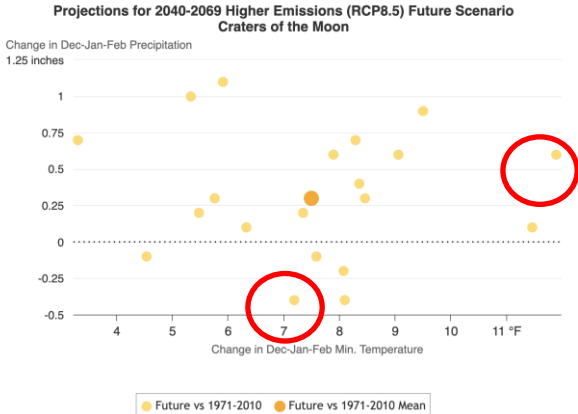


TIP Interact with the Graph

- Hover over symbols on graph to see values at different model/scenario combinations.
- Click legend label to remove/add series on graph
- Drag the legend to any location inside the graph

Identifying Scenario

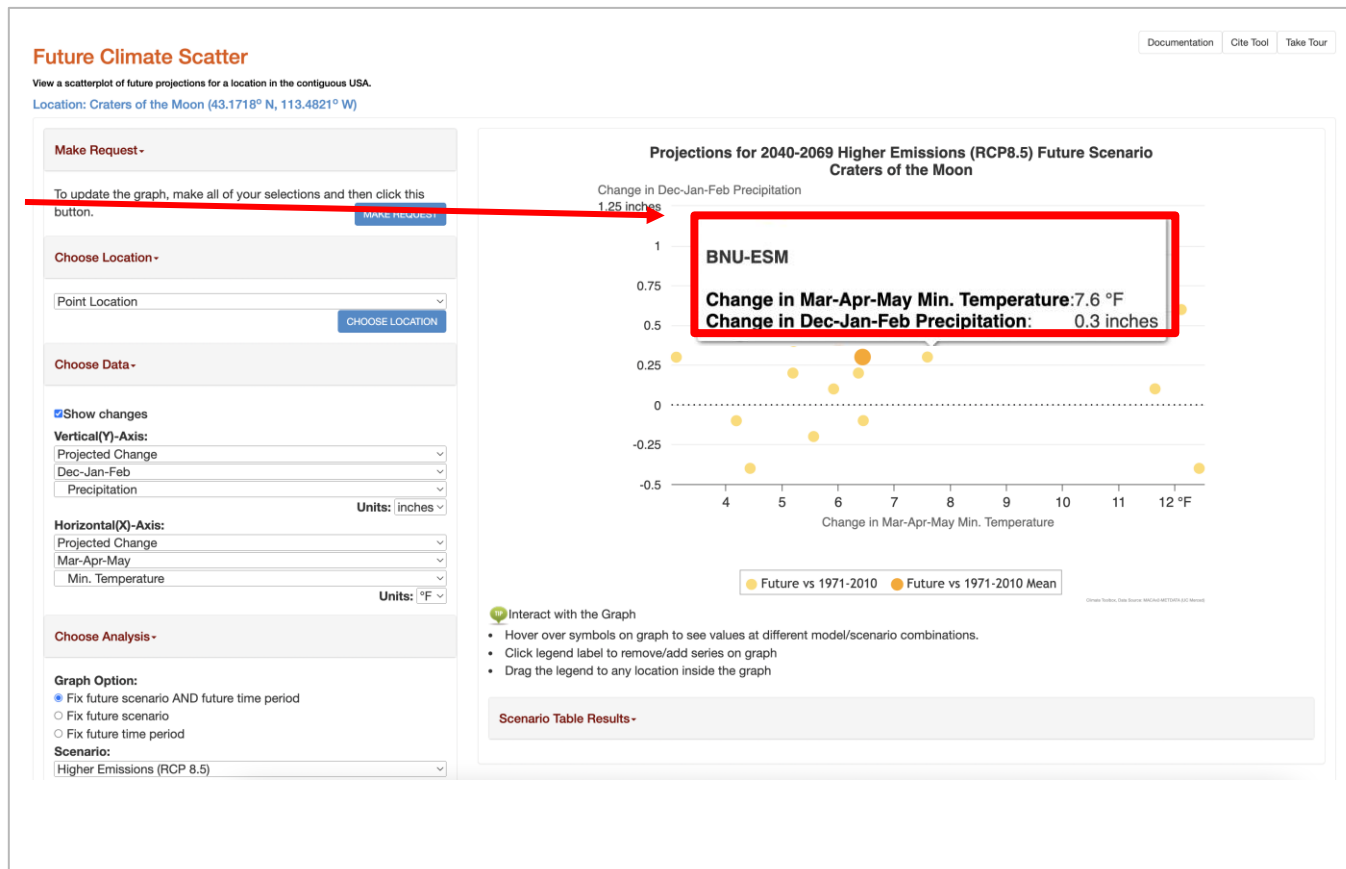
Identify models/scenarios that represent a particular climate vulnerability



1. Go to **Future Climate Scatter** tool
2. Generate Scatter plot
3. Hover over dots on graph to identify model and values
4. Choose a model representing an extreme (i.e. Hot wet, hot dry) of the projection space
5. Track selections in table
 - In 'Scenario Table Results' section, turn tracking button 'On'
 - Click on dots to enter data into table

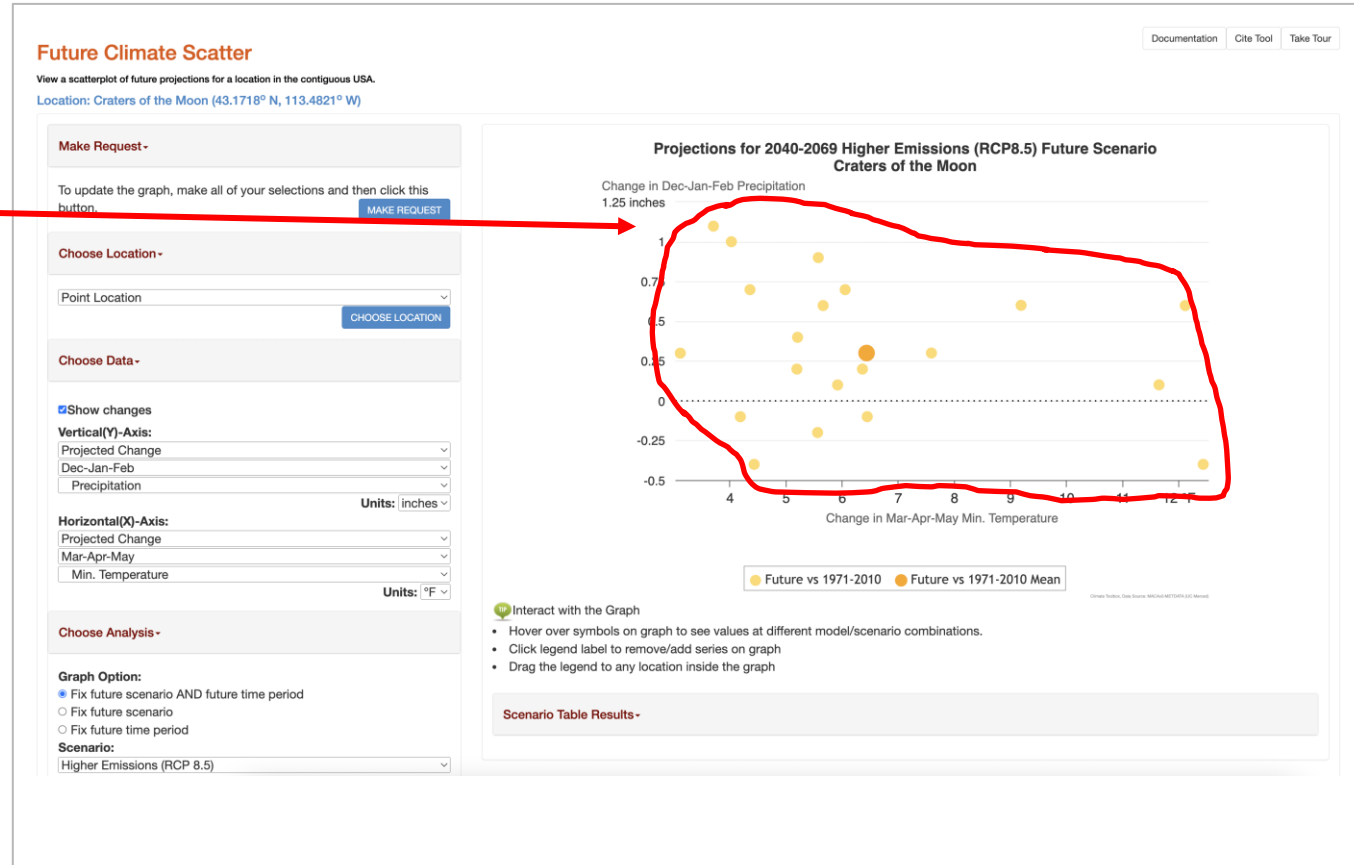
Identifying Scenarios

Hover over dots
to display model
information



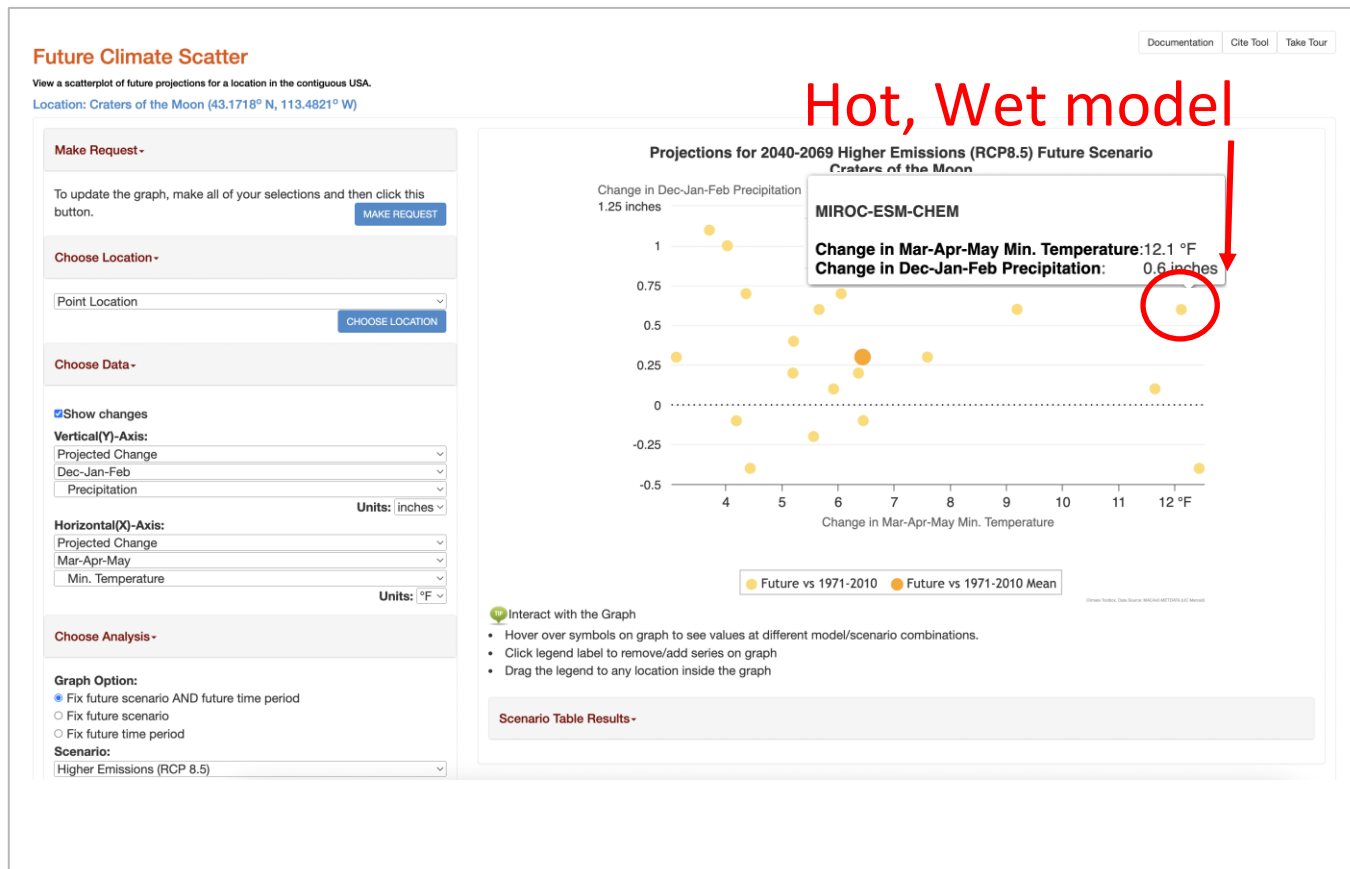
Identifying Scenarios

Projection space
from models



Identifying Scenarios

Choose a model representing an extreme of the projection space



Identifying Scenarios

Future Climate Scatter

View a scatterplot of future projections for a location in the contiguous USA.
Location: Craters of the Moon (43.1718° N, 113.4821° W)

Make Request -
To update the graph, make all of your selections and then click this button. **MAKE REQUEST**

Choose Location -
Point Location **CHOOSE LOCATION**

Choose Data -
 Show changes
Vertical(Y)-Axis:
Projected Change
Dec-Jan-Feb
Precipitation Units: inches
Horizontal(X)-Axis:
Projected Change
Mar-Apr-May
Min. Temperature Units: °F

Choose Analysis -
Graph Option:
 Fix future scenario AND future time period
 Fix future scenario
 Fix future time period
Scenario:
Higher Emissions (RCP 8.5)

Projections for 2040-2069 Higher Emissions (RCP8.5) Future Scenario Craters of the Moon

Change in Dec-Jan-Feb Precipitation
1.25 inches

Interact with the Graph

- Hover over symbols on graph to see values at different model/scenario combinations.
- Click legend label to remove/add series on graph
- Drag the legend to any location inside the graph

Scenario Table Results -

ON

SCENARIO	TIME PERIOD	MODEL	X-VALUE Jun-July-Aug Max. Temperature(°F)	Y-VALUE Dec-Jan-Feb Precipitation(inches)
<input type="checkbox"/>	Scenario	Time Period	Model	

Directions:

- Click the ON/OFF button above to enable recording of scenario info from graph.
- Once recording is ON, click on the markers on the graph to add scenario values to a table.
- Turn recording OFF when you are done adding scenarios to the table.
- Select rows of a table to delete and click the DELETE ROW button

Toggle button
To 'On' to start
Recording data to
table

Identifying Scenarios

Click on a dot to record data in table.

Future Climate Scatter

View a scatterplot of future projections for a location in the contiguous USA.
Location: Craters of the Moon (43.1718° N, 113.4821° W)

Make Request -
To update the graph, make all of your selections and then click this button. [MAKE REQUEST](#)

Choose Location -
Point Location [CHOOSE LOCATION](#)

Choose Data -
 Show changes
Vertical(Y)-Axis:
Projected Change
Dec-Jan-Feb
Precipitation Units: inches
Horizontal(X)-Axis:
Projected Change
Mar-Apr-May
Min. Temperature Units: °F

Choose Analysis -
Graph Option:
 Fix future scenario AND future time period
 Fix future scenario
 Fix future time period
Scenario:
Higher Emissions (RCP 8.5)

Projections for 2040-2069 Higher Emissions (RCP8.5) Future Scenario Craters of the Moon

Change in Dec-Jan-Feb Precipitation
1.25 inches

Legend: ● Future vs 1971-2010 ● Future vs 1971-2010 Mean

Interact with the Graph

- Hover over symbols on graph to see values at different model/scenario combinations.
- Click legend label to remove/add series on graph
- Drag the legend to any location inside the graph

Scenario Table Results -

SCENARIO	TIME PERIOD	MODEL	Y-VALUE Projected Change Mar-Apr-May Min. Temperature(°F)	Y-VALUE Projected Change Dec-Jan-Feb Precipitation(inches)	
<input type="checkbox"/>	Scenario	Time Period	Model		
<input type="checkbox"/>	RCP 8.5	2040-2069	MIROC-ESM-CHEM	12.1	0.6

[Delete Row\(s\)](#)

Hot, Wet

Explore Future Metrics

Explore future metrics for chosen model/scenarios

Results

DOWNLOAD REPORT AS CSV DOWNLOAD REPORT AS PNG

Climate Scenarios

Location: 43.1718°N; 113.4821°W.

The summary table below describes changes in the future climate by 2020 (2010-2039) relative to the 1971-2000 period under climate scenarios: **Scenario 1** (MIROC-ESM-CHEM_rcp85)

Climate Metric	Scenario 1	Historical Value
Spring Minimum Temperature (°F) (change relative to historical by °F)	38.27 (8.85)	31.42
Winter Precipitation (in) (% change relative to historical)	3.84 (2.13)	3.76
Coldest Winter Day (°F) (relative to historical by °F)	2.19 (12.49)	-10.3
Hottest Summer Day (°F) (relative to historical by °F)	101.97 (4.87)	97.1
Day of First Fall Freeze (days) (relative to historical by days)	Sept. 27 (5)	Sept. 22
Day of Last Spring Freeze (days) (relative to historical by days)	Mar. 30 (-59)	May 28
Length of Growing Season (days) (relative to historical by days)	181 (64.00)	117
Cum. Growing Degree Days Since Jan 1 (32 °F base) (°F) (relative to historical by °F)	7125.37 (1264.94)	5860.43

1. Go to **Future Climate Scenarios** tool
2. Select Location
3. Enter in future time period
4. Enter in model/scenario
5. Select future metrics of interest
6. Generate a 'Report'

Explore Future Metrics

Select Location

Future Climate Scenarios
Location: Craters of the Moon (43.1718° N, 113.4821° W)

Choose Location -
Point Location

Choose Scenarios -

Future time period
2020 (2010-2039)

Check scenarios and models to add to report.

Scenario 1
Scenario 1
RCP 8.5 (Business-as-Usual High Emissions Scenario)
MIROC-ESM-CHEM (Japan)

Scenario 2
Scenario 2
RCP 4.5 (Reduced Emissions Scenario)
CNRM-CM5 (France)

Scenario 3
Scenario 3
RCP 4.5 (Reduced Emissions Scenario)
GFDL-ESM2M (USA)

Scenario 4
Scenario 4
RCP 4.5 (Reduced Emissions Scenario)
IPSL-CM5A-MR (France)

Scenario 5
Scenario 5
RCP 4.5 (Reduced Emissions Scenario)
CMIP5 20-Model Mean

Choose Seasonal Climate Metrics -

Check metrics to add to report.

Metric #1
Spring (Mar-Apr-May)
Minimum Temperature

Metric #2
Winter (Dec-Jan-Feb)
Precipitation

Metric #3
Winter (Dec-Jan-Feb)
Potential Evapotranspiration (MACA)

Metric #4
Winter (Dec-Jan-Feb)
Maximum Temperature

Metric #5
Winter (Dec-Jan-Feb)
Minimum Temperature

Metric #6
Winter (Dec-Jan-Feb)
Wind Speed

Metric #7
Winter (Dec-Jan-Feb)
Radiation

Metric #8
Winter (Dec-Jan-Feb)
Radiation

Metric #9
Winter (Dec-Jan-Feb)
Radiation

Choose Annual Climate Metrics -

Check metrics to add to report.

Metric #1
Coldest Winter Day

Metric #2
Hottest Summer Day

Metric #3
Day of First Fall Freeze

Metric #4
Day of Last Spring Freeze

Metric #5
Length of Growing Season

Metric #6
Cum. Growing Degree Days Since Jan 1 (32 °F base)

Metric #7
Cum. Growing Degree Days Since Jan 1 (37.4 °F base)

Metric #8
Cum. Growing Degree Days Since Jan 1 (41 °F base)

Metric #9
Cum. Growing Degree Days Since Jan 1 (50 °F base)

Metric #10
Days With Max. Temperature Above 86°F

Metric #11
Days With Max. Temperature Above 86°F

Metric #12
Days With Max. Temperature Above 86°F

Explore Future Metrics

Select Future Time Period

Future Climate Scenarios
Location: Craters of the Moon (43.1718° N, 113.4821° W)

Choose Location -
Point Location

Choose Scenarios -
Future time period
2020 (2010-2039)

Check scenarios and models to add to report.

Scenario 1
Scenario 1
RCP 8.5 (Business-as-Usual High Emissions Scenario)
MIROC-ESM-CHEM (Japan)

Scenario 2
Scenario 2
RCP 4.5 (Reduced Emissions Scenario)
CNRM-CM5 (France)

Scenario 3
Scenario 3
RCP 4.5 (Reduced Emissions Scenario)
GFDL-ESM2M (USA)

Scenario 4
Scenario 4
RCP 4.5 (Reduced Emissions Scenario)
IPSL-CM5A-MR (France)

Scenario 5
Scenario 5
RCP 4.5 (Reduced Emissions Scenario)
CMIP5 20-Model Mean

Choose Seasonal Climate Metrics -
Check metrics to add to report.

Metric #1
Spring (Mar-Apr-May)
Minimum Temperature

Metric #2
2020 (2010-2039)
2050 (2040-2069)
2080 (2070-2099)

Metric #3
Summer (Jun-Jul-Aug)
Maximum Temperature

Metric #4
Winter (Dec-Jan-Feb)
Maximum Temperature

Metric #5
Winter (Dec-Jan-Feb)
Minimum Temperature

Metric #6
Winter (Dec-Jan-Feb)
Wind Speed

Metric #7
Winter (Dec-Jan-Feb)
Radiation

Metric #8
Winter (Dec-Jan-Feb)
Radiation

Metric #9
Winter (Dec-Jan-Feb)
Radiation

Choose Annual Climate Metrics -
Check metrics to add to report.

Metric #1
Coldest Winter Day

Metric #2
Hottest Summer Day

Metric #3
Day of First Fall Freeze

Metric #4
Day of Last Spring Freeze

Metric #5
Length of Growing Season

Metric #6
Cum. Growing Degree Days Since Jan 1 (32 °F base)

Metric #7
Cum. Growing Degree Days Since Jan 1 (37.4 °F base)

Metric #8
Cum. Growing Degree Days Since Jan 1 (41 °F base)

Metric #9
Cum. Growing Degree Days Since Jan 1 (50 °F base)

Metric #10
Days With Max. Temperature Above 86°F

Metric #11
Days With Max. Temperature Above 86°F

Metric #12
Days With Max. Temperature Above 86°F

Explore Future Metrics

Select Future Scenario

Future Climate Scenarios
Location: Craters of the Moon (43.1718° N, 113.4821° W)

Choose Location -
Point Location

Choose Scenarios -
Future time period
2020 (2010-2039)

Check scenarios and models to add to report.

Scenario 1
Scenario 1
RCP 8.5 (Business-as-Usual High Emissions Scenario)

Scenario 2
Scenario 2
RCP 4.5 (Reduced Emissions Scenario)
CNRM-CM5 (France)

Scenario 3
Scenario 3
RCP 4.5 (Reduced Emissions Scenario)
GFDL-ESM2M (USA)

Scenario 4
Scenario 4
RCP 4.5 (Reduced Emissions Scenario)
IPSL-CM5A-MR (France)

Scenario 5
Scenario 5
RCP 4.5 (Reduced Emissions Scenario)
CMIP5 20-Model Mean

Choose Seasonal Climate Metrics -
Check metrics to add to report.

Metric #1
Spring (Mar-Apr-May)
Minimum Temperature

Metric #2
Winter (Dec-Jan-Feb)
Precipitation

Metric #3
Winter (Dec-Jan-Feb)
Potential Evapotranspiration (MACA)

Metric #4

Metric #6
Winter (Dec-Jan-Feb)
Wind Speed

Metric #7
Winter (Dec-Jan-Feb)
Radiation

Metric #8
Winter (Dec-Jan-Feb)
Radiation

Metric #9
Winter (Dec-Jan-Feb)
Radiation

Choose Annual Climate Metrics -
Check metrics to add to report.

Metric #1
Coldest Winter Day

Metric #2
Hottest Summer Day

Metric #3
Day of First Fall Freeze

Metric #4
Day of Last Spring Freeze

Metric #5

Metric #8
Cum. Growing Degree Days Since Jan 1 (41 °F base)

Metric #9
Cum. Growing Degree Days Since Jan 1 (50 °F base)

Metric #10
Days With Max. Temperature Above 86°F

Metric #11
Days With Max. Temperature Above 86°F

Metric #12
Days With Max. Temperature Above 86°F

RCP 4.5 (Reduced Emissions Scenario)

✓ RCP 8.5 (Business-as-Usual High Emissions Scenario)

Explore Future Metrics

Select Model →

Future Climate Scenarios
Location: Craters of the Moon (43.1718° N, 113.4821° W)

Choose Location -
Point Location **CHOOSE LOCATION**

Choose Scenarios -
Future time period
2020 (2010-2039)

Check scenarios and models to add to report.
 Scenario 1
Scenario 1
RCP 8.5 (Business-as-Usual High Emissions Scenario)
MIROC-ESM-CHEM (Japan)

Scenario 2
Scenario 2
RCP 4.5 (Reduced Emissions Scenario)
CNRM-CM5 (France)

Scenario 3
Scenario 3
RCP 4.5 (Reduced Emissions Scenario)
GFDL-ESM2M (USA)

Scenario 4
Scenario 4
RCP 4.5 (Reduced Emissions Scenario)
IPSL-CM5A-MR (France)

Scenario 5
Scenario 5
RCP 4.5 (Reduced Emissions Scenario)
CMIP5 20-Model Mean

Model Statistics
CMIP5 20-Model Mean

Individual Models
bcc-csm1-1 (China)
bcc-csm1-1-m (China)
BNU-ESM (China)
CanESM2 (Canada)
CCSM4 (USA)
CNRM-CM5 (France)
CSIRO-Mk3-6-0 (Australia)
GFDL-ESM2M (USA)
GFDL-ESM2G (USA)
HadGEM2-CC365 (United Kingdom)
HadGEM2-ES365 (United Kingdom)
inmcm4 (Russia)
IPSL-CM5A-LR (France)
IPSL-CM5A-MR (France)
IPSL-CM5B-LR (France)
MIROC5 (Japan)
MIROC-ESM (Japan)
✓ MIROC-ESM-CHEM (Japan)
MRI-CGCM3 (Japan)
NorESM1-M (Norway)

Metrics -
report.
Days Since Jan 1 (32 °F base)
Days Since Jan 1 (37.4 °F base)
Days Since Jan 1 (41 °F base)
Days Since Jan 1 (50 °F base)
Temperature Above 86°F
Temperature Above 86°F

Winter (Dec-Jan-Feb) **Metric #12**
Radiation Days With Max. Temperature Above 86°F

Explore Future Metrics

Select Seasonal Metrics

- metric
- season

Future Climate Scenarios
Location: Craters of the Moon (43.1718° N, 113.4821° W)

Choose Location -
Point Location
CHOOSE LOCATION

Choose Scenarios -
Future time period
2020 (2010-2039)
Check scenarios and models to add to report.
 Scenario 1
Scenario 1
RCP 8.5 (Business-as-Usual High Emissions Scenario)
MIROC-ESM-CHEM (Japan)
 Scenario 2
Scenario 2
RCP 4.5 (Reduced Emissions Scenario)
CNRM-CM5 (France)
 Scenario 3
Scenario 3
RCP 4.5 (Reduced Emissions Scenario)
GFDL-ESM2M (USA)
 Scenario 4
Scenario 4
RCP 4.5 (Reduced Emissions Scenario)
IPSL-CM5A-MR (France)
 Scenario 5
Scenario 5
RCP 4.5 (Reduced Emissions Scenario)
CMIP5 20-Model Mean

Choose Seasonal Climate Metrics -
Check metrics to add to report.
 Metric #1
Spring (Mar-Apr-May)
Minimum Temperature

Choose Annual Climate Metrics -
Winter (Dec-Jan-Feb)
 Spring (Mar-Apr-May)
Summer (Jun-July-Aug)
Fall (Sept-Oct-Nov)
Annual (Jan-Dec)
st Summer Day
c #3
f First Fall Freeze
c #4
f Last Spring Freeze
c #5
h of Growing Season
c #6
Growing Degree Days Since Jan 1 (32 °F base)
c #7
Growing Degree Days Since Jan 1 (37.4 °F base)
c #8
Growing Degree Days Since Jan 1 (41 °F base)
c #9
Growing Degree Days Since Jan 1 (50 °F base)
c #10
With Max. Temperature Above 86°F
c #11
With Max. Temperature Above 86°F
c #12
With Max. Temperature Above 86°F

Climate Metrics (MACAv2)
Mean Temperature
Maximum Temperature
 Minimum Temperature
Precipitation
Potential Evapotranspiration (MACA)
Radiation
Wind Speed

Hydrology Metrics (MWBM)
Soil Moisture
Snow Water Equivalent
Runoff
Actual Evapotranspiration
Potential Evapotranspiration (MWBM)
Climatic Water Deficit

Fire Danger Metrics (MACAv2)
"High" Fire Danger Days
"Very High" Fire Danger Days
"Extreme" Fire Danger Days
100 Hour Fuel Moisture
Vapor Pressure Deficit

Explore Future Metrics

Select Annual Metrics

Future Climate Scenarios
Location: Craters of the Moon (43.1718° N, 113.4821° W)

Choose Location -
Point Location

Choose Scenarios -
Future time period: 2020 (2010-2039)
Check scenarios and models to add to report.
 Scenario 1
Scenario 1
RCP 8.5 (Business-as-Usual High Emissions Scenario)
MIROC-ESM-CHEM (Japan)
 Scenario 2
Scenario 2
RCP 4.5 (Reduced Emissions Scenario)
CNRM-CM5 (France)
 Scenario 3
Scenario 3
RCP 4.5 (Reduced Emissions Scenario)
GFDL-ESM2M (USA)
 Scenario 4
Scenario 4
RCP 4.5 (Reduced Emissions Scenario)
IPSL-CM5A-MR (France)
 Scenario 5
Scenario 5
RCP 4.5 (Reduced Emissions Scenario)
CMIP5 20-Model Mean

Choose Seasonal Climate Metrics -
Check metrics to add to report.
 Metric #1
Spring (Mar-Apr-May)
Minimum Temperature
 Metric #2
Winter (Dec-Jan-Feb)
Precipitation
 Metric #3
Winter (Dec-Jan-Feb)
Potential Evapotranspiration (MACA)
 Metric #4
Winter (Dec-Jan-Feb)
Maximum Temperature
 Metric #5
Winter (Dec-Jan-Feb)
Minimum Temperature
 Metric #6
Winter (Dec-Jan-Feb)
Wind Speed
 Metric #7
Winter (Dec-Jan-Feb)
Radiation
 Metric #8
Winter (Dec-Jan-Feb)
Radiation
 Metric #9
Winter (Dec-Jan-Feb)
Radiation

Choose Annual Climate Metrics -
Check metrics to add to report.
 Metric #1
Coldest Winter Day
 Metric #2
Days With Max. Temperature Above 86°F

Climate Metrics (MACAv2)
Days with Heat Index $\geq 90^{\circ}\text{F}$
Days with Heat Index $\geq 100^{\circ}\text{F}$
Days with Heat Index $\geq 105^{\circ}\text{F}$
Days With Max. Temperature Above 86°F
 Coldest Winter Day
Hottest Summer Day

Agricultural Metrics (MACAv2)
Day of First Fall Freeze
Day of Last Spring Freeze
Length of Growing Season
Cum. Growing Degree Days Since Jan 1 (32°F base)
Cum. Growing Degree Days Since Jan 1 (37.4°F base)
Cum. Growing Degree Days Since Jan 1 (41°F base)
Cum. Growing Degree Days Since Jan 1 (50°F base)

Explore Future Metrics

Scroll down and
Click 'View
Report' →

Scenario 2
Scenario 2
RCP 4.5 (Reduced Emissions Scenario) ▼
CNRM-CM5 (France) ▼

Scenario 3
Scenario 3
RCP 4.5 (Reduced Emissions Scenario) ▼
GFDL-ESM2M (USA) ▼

Scenario 4
Scenario 4
RCP 4.5 (Reduced Emissions Scenario) ▼
IPSL-CM5A-MR (France) ▼

Scenario 5
Scenario 5
RCP 4.5 (Reduced Emissions Scenario) ▼
CMIP5 20-Model Mean ▼

Add Metadata -

Title of Report:
Climate Scenarios

Download -

[VIEW REPORT](#)

[DOWNLOAD SPATIAL DATA](#)

Winter (Dec-Jan-Feb) ▼
Maximum Temperature ▼

Metric #5
Winter (Dec-Jan-Feb) ▼
Minimum Temperature ▼

Metric #6
Winter (Dec-Jan-Feb) ▼
Wind Speed ▼

Metric #7
Winter (Dec-Jan-Feb) ▼
Radiation ▼

Metric #8
Winter (Dec-Jan-Feb) ▼
Radiation ▼

Metric #9
Winter (Dec-Jan-Feb) ▼
Radiation ▼

Metric #10
Winter (Dec-Jan-Feb) ▼
Radiation ▼

Metric #11
Winter (Dec-Jan-Feb) ▼
Radiation ▼

Metric #12
Winter (Dec-Jan-Feb) ▼
Radiation ▼

Length of Growing Season ▼

Metric #6
Cum. Growing Degree Days Since Jan 1 (32 °F base) ▼

Metric #7
Cum. Growing Degree Days Since Jan 1 (37.4 °F base) ▼

Metric #8
Cum. Growing Degree Days Since Jan 1 (41 °F base) ▼

Metric #9
Cum. Growing Degree Days Since Jan 1 (50 °F base) ▼

Metric #10
Days With Max. Temperature Above 86°F ▼

Metric #11
Days With Max. Temperature Above 86°F ▼

Metric #12
Days With Max. Temperature Above 86°F ▼

Explore Future Metrics

Future metrics for scenario

Future Climate Scenarios

Location: Craters of the Moon (43.1718° N, 113.4821° W)

Choose Location -

Point Location

Choose Scenarios -

Future time period

2020 (2010-2039)

Check scenarios and models to add to report.

Scenario 1

Scenario 1

RCP 8.5 (Business-as-Usual High Emissions Scenario)

MIROC-ESM-CHEM (Japan)

Scenario 2

Scenario 2

RCP 4.5 (Reduced Emissions Scenario)

CNRM-CM5 (France)

Scenario 3

Scenario 3

RCP 4.5 (Reduced Emissions Scenario)

GFDL-ESM2M (USA)

Scenario 4

Scenario 4

RCP 4.5 (Reduced Emissions Scenario)

IPSL-CM5A-MR (France)

Scenario 5

Scenario 5

RCP 4.5 (Reduced Emissions Scenario)

CMIP5 20-Model Mean

Climate Scenarios

Location: 43.1718°N; 113.4821°W.

The summary table below describes changes in the future climate by 2020 (2010-2039) relative to the 1971-2000 period under climate scenarios: **Scenario 1** (MIROC-ESM-CHEM.rcp85)

Climate Metric	Scenario 1	Historical Value
Spring Minimum Temperature (°F) (change relative to historical by °F)	38.27 (6.85)	31.42
Winter Precipitation (in) (% change relative to historical)	3.84 (2.13)	3.76
Coldest Winter Day (°F) (relative to historical by °F)	2.19 (12.49)	-10.3
Hottest Summer Day (°F) (relative to historical by °F)	101.97 (4.87)	97.1
Day of First Fall Freeze (days) (relative to historical by days)	Sept. 27 (5)	Sept. 22
Day of Last Spring Freeze (days) (relative to historical by days)	Mar. 30 (-59)	May 28
Length of Growing Season (days) (relative to historical by days)	181 (64.00)	117
Cum. Growing Degree Days Since Jan 1 (32 °F base) (°F) (relative to historical by °F)	7125.37 (1264.94)	5860.43
Days With Max. Temperature Above 86°F (days) (relative to historical by days)	73.09 (23.62)	49.47

Quantities and projected changes described above are for 43.1718°N; 113.4821°W. Winter is Dec, Jan, Feb; Spring is Mar, Apr, May; Summer is Jun, Jul, Aug and Fall is Sep, Oct, Nov.

Dataset: MACA-METDATA v2 (4-km downscaled climate projections), MWBM forced by MACAv2-METDATA (4-km hydrology projections) and gridMET

Winter (Dec-Jan-Feb)

Radiation

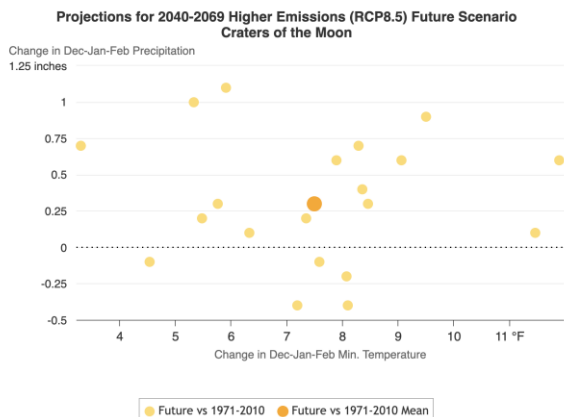
Metric #12

Days With Max. Temperature Above 86°F

Up Next: explore future scenarios
In the activity

Generating a Scatterplot

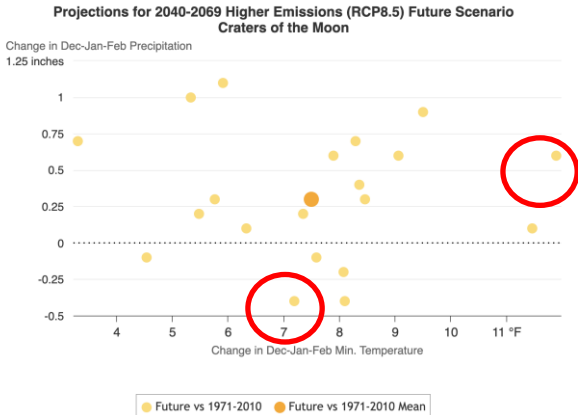
Generate a scatter plot
of model/scenario
projections



1. Go to **Future Climate Scatter** tool
2. Select a location
3. Select variables of interest for x,y axes
4. Select Future Scenario (RCP 8.5)
5. Select Future Time Period (2040-2069)
6. Click 'Show Changes' Show changes
7. Click 'Make Request' button to update graph

Identifying Scenario

Identify models/scenarios that represent a particular climate vulnerability



1. Go to **Future Climate Scatter** tool
2. Generate Scatter plot
3. Hover over dots on graph to identify model and values
4. Choose a model representing an extreme (i.e. Hot wet, hot dry) of the projection space
5. Track selections in table
 - In 'Scenario Table Results' section, turn tracking button 'On'
 - Click on dots to enter data into table

Explore Future Metrics

Explore future metrics for chosen model/scenarios

Results

DOWNLOAD REPORT AS CSV DOWNLOAD REPORT AS PNG

Climate Scenarios

Location: 43.1718°N; 113.4821°W.

The summary table below describes changes in the future climate by 2020 (2010-2039) relative to the 1971-2000 period under climate scenarios: **Scenario 1** (MIROC-ESM-CHEM_rcp85)

Climate Metric	Scenario 1	Historical Value
Spring Minimum Temperature (°F) (change relative to historical by °F)	38.27 (8.85)	31.42
Winter Precipitation (in) (% change relative to historical)	3.84 (2.13)	3.76
Coldest Winter Day (°F) (relative to historical by °F)	2.19 (12.49)	-10.3
Hottest Summer Day (°F) (relative to historical by °F)	101.97 (4.87)	97.1
Day of First Fall Freeze (days) (relative to historical by days)	Sept. 27 (5)	Sept. 22
Day of Last Spring Freeze (days) (relative to historical by days)	Mar. 30 (-59)	May 28
Length of Growing Season (days) (relative to historical by days)	181 (64.00)	117
Cum. Growing Degree Days Since Jan 1 (32 °F base) (°F) (relative to historical by °F)	7125.37 (1264.94)	5860.43

1. Go to **Future Climate Scenarios** tool
2. Enter in future model/scenario/time period
3. Select future metrics of interest
4. Generate a 'Report'