The Future Climate Analogs Tool in the Climate Toolbox

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Motivation

National parks are often found in extreme or unique climate environments.
Motivation

Future Climate Projections

Future Climate Analogs

Climate impacts in analog locations provide a potential glimpse into the future.
Future Climate Analogs

What future?

2040-2069?, 2070-2099? Greenhouse Gas Emissions?

Tool: select future scenarios from global climate models *

*MACA downscaling of CMIP5 daily outputs for 1950-2099, RCP4.5 and RCP 8.5 (Abatzoglou, 2012)
Future Climate Analogs

What’s the climate of a location?

Temperature    Rain    Snow    Humidity    Winds

Tool: select specific metrics to define climate
Some Clarifying Questions

Future Climate Analogs

What does it mean for two climates to be similar?

The two climates are ‘close’.

Tool: shows distance between two climates
Current Climate Analogs

Where do we find a climate today that resembles the current climate of a location?

Human heat stress
Apr-Oct days with heat index > 90°F

**Nez Perce Visitor Center (Lapwei, ID)**
Current (1971-2000): 31.1 days
Future Climate Analogs

Where do we find a climate today that will resemble the future climate of a location?

Human heat stress
Apr-Oct days with heat index > 90F

**Nez Perce Visitor Center (Lapwei, ID)**
Current (1971-2000): 31.1 days

**Kennewick, WA (Tri-Cities)**
Current (1971-2000): 30.0 days

**Meridian, ID (Treasure Valley)**
Current (1971-2000): 32.8 days
Future Climate Analogs

Where do we find a climate today that will resemble the future climate of a location?

Human heat stress
Apr-Oct days with heat index > 90°F

**Nez Perce Visitor Center (Lapwei, ID)**
Current (1971-2000): 31.1 days
Future (2040-2069): 87.1 days

**Fresno, CA (Central Valley)**
Current (1971-2000): 85.4 days
Future Climate Analogs Tool

Explore projected climate futures through climate analogs for different metrics across National Park locations in the contiguous US.
## Climate Definitions

<table>
<thead>
<tr>
<th>HUMAN COMFORT</th>
<th>WATER</th>
<th>GROWING CONDITIONS</th>
<th>FIRE DANGER/DROUGHT STRESS</th>
<th>ENERGY</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Max temperature of hottest month</td>
<td>• Annual precipitation</td>
<td>• Temperature degrees for</td>
<td>• 3-month mean vapor</td>
<td>• Temperature degrees for</td>
</tr>
<tr>
<td>• Min temperature of coldest month</td>
<td>• Days of high precipitation</td>
<td>◦ cool season growing (T&gt;32F)</td>
<td>pressure deficit</td>
<td>◦ cooling (T&gt;65F)</td>
</tr>
<tr>
<td>• Days of hot nights (Tmin&gt;70F)</td>
<td>(p&gt;0.25”)</td>
<td>◦ warm season growing (T&gt;50F)</td>
<td></td>
<td>◦ heating (T&lt;65F)</td>
</tr>
<tr>
<td>• Days of heat index &gt;90F, 100F, 105F</td>
<td></td>
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</tbody>
</table>
Climate Definitions

Multiple metrics for defining ‘climate’

- **2 VARIABLE TEMPERATURE COMBO**
  - Coldest temperature of coldest month
  - Hottest temperature of hottest month

- **2 VARIABLE WATER COMBO**
  - Annual water deficit

- **4 VARIABLE TEMPERATURE/WATER COMBO**
  - Actual evapotranspiration
Example: 2 vs 4 variable combos

2 Variable Temperature Combination
Lapwei, ID analogs

2 Variable Water Combination
Lapwei, ID analogs
Example: 2 vs 4 variable combos

4 Variable Temperature/Water Combination

Lapwei, ID analogs:

- Tri cities, Columbia River Gorge in Washington
- Medford area in Oregon, Forests in Northern California
- Boise area in Idaho
Applications

Snow cover analogs: current and future
Applications

Fire danger analogs: current and future
Applications

Cooling energy analogs: current and future
Summary

• The Future Analogs Tool allows you to see both current and future climate analogs for 540 National Park locations.

• The tool has many climate definitions for human comfort, water, growing conditions, fire danger/drought stress and energy.

• The tool lets you visualize climate analogs from the contiguous US.

• The tool lets you choose some multiple variable climate definitions to better describe the climate of a place.

• The tool has lots of applications to the understanding human comfort, mountain snow pack, fire danger, cooling energy and more.

  Future Climate Analogs Tool at
  https://climatetoolbox.org/tool/future-climate-analogs