Matching seed to site by climate similarity: Tools to prioritize plant materials development and use

Kyle Doherty
Troy Wood
Bradley Butterfield
Seed Transfer Frameworks

- Which seeds are appropriate where?
- Where should we be collecting to diversify our plant materials?
Seed Zones

Johnson et al 2012

Bower et al 2014
Matching seed to site by climate similarity: Techniques to prioritize plant materials development and use in restoration

Kyle D. Doherty, Bradley J. Butterfield, Troy E. Wood

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Tool #1: Seed Selector
Which seeds to use?

https://seedmapper.shinyapps.io/seed_selector/
App takes ~15 seconds to initialize, please wait.

How would you like to define your area of interest?

Lat/long slider bars

### Latitude Extent

<table>
<thead>
<tr>
<th>15</th>
<th>32</th>
<th>42</th>
<th>60</th>
</tr>
</thead>
</table>

### Longitude Extent

<table>
<thead>
<tr>
<th>-130</th>
<th>-115</th>
<th>-105</th>
<th>-90</th>
</tr>
</thead>
</table>

id  | x    | y    |
----|------|------|
custom id 1 | -107.46667 | 35.88333 |
custom id 2 | -108.64655 | 40.11694 |

Now upload a .csv of your accession data (maximum of 50 accessions) in the format pictured above (id, long, lat):

Choose File  no file selected

**Match Seed to Climate**

**Download Data**

Click above to download underlying rasters and summary data. Note that clicking will open a new tab.
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Latitude Extent

Longitude Extent

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Latitude Extent

| 15 | 32 | 42 | 60 |

Longitude Extent

| -130 | -115 | -105 | -90 |

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<table>
<thead>
<tr>
<th>id</th>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
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<td>35.88333</td>
</tr>
<tr>
<td>custom id 2</td>
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<td>40.11694</td>
</tr>
</tbody>
</table>

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Longitude Extent

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Match Seed to Climate

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How would you like to define your area of interest?

- Lat/long slider bars
- Spatial polygon
- Raster
- Species Distribution Model
App takes ~15 seconds to initialize, please wait.

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- Species Distribution Model

Longitude Extent

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Choose File no file selected

Match Seed to Climate

Download Data

Click above to download underlying rasters and summary data. Note that clicking will open a new tab.
Compress spatial polygon files

Upload to app

four.corners.dbf
four.corners.prj
four.corners.shp
four.corners.shx

four.corners.zip
App takes ~15 seconds to initialize, please wait.

How would you like to define your area of interest?
- Lat/long slider bars

### Latitude Extent
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### Longitude Extent
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- -105
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Match Seed to Climate

Download Data

Click above to download underlying rasters and summary data. Note that clicking will open a new tab.
Our accession data (maximum of 50)

<table>
<thead>
<tr>
<th>id</th>
<th>x</th>
<th>y</th>
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</tr>
<tr>
<td>colorado</td>
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</tr>
<tr>
<td>new mexico</td>
<td>-107.06666</td>
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</tr>
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</table>

Save as .csv
App takes ~15 seconds to initialize, please wait.

How would you like to define your area of interest?
- Lat/long slider bars

**Latitude Extent**

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Choose File: no file selected

[Match Seed to Climate]

[Download Data]

Click above to download underlying rasters and summary data. Note that clicking will open a new tab.
Calculations underway, larger extents take longer. Have a coffee, check email, come back in ~3 to 5 mins.
How would you like to define your area of interest?

Spatial polygon

Upload spatial polygon files (.shp, .shx, .prj, and .dbf) compressed into a .zip format:
Choose File four.corners.zip
Upload complete

Now upload a .csv of your accession data (maximum of 50 accessions) in the format pictured above (id, lon, lat):
Choose File example_s.csv
Upload complete

Match Seed to Climate
Download Data

Click above to download underlying rasters and summary data. Note that clicking will open a new tab.

Climate Similarity

-0.60
-0.65
-0.70
-0.75
-0.80
-0.85
-0.90
-0.95
1.00
<table>
<thead>
<tr>
<th>Accession</th>
<th>cell</th>
<th>x</th>
<th>y</th>
<th>MAT</th>
<th>DiurnalRange</th>
<th>TSeasonality</th>
<th>TWettestQtr</th>
<th>MAP</th>
<th>PSeasonality</th>
<th>PWarmestQtr</th>
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</table>

Showing 1 to 5 of 5 entries
MAT

Diurnal Range

Temperature Seasonality

Temperature Wettest Qtr.
Tool #2: Climate Partitioner

collection / sampling guidance

https://seedmapper.shinyapps.io/climate_partitioning_app/
How would you like to define your area of interest?

- Spatial polygon

Upload spatial polygon files (.shp, .shx, .prj, and .dbf) compressed into a .zip format:

Choose File  four.corners.zip

Upload complete

Specify how many climate partitions you want (1 to 50):

- 10

Partition and Map

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Spatial polygon

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10

Partition and Map

Download Data

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<table>
<thead>
<tr>
<th>Climate Center</th>
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Potential Applications

• Seed banking
• Collection for common garden
• Establishing a common garden array
• Establishing transects
Future Directions

• Incorporating soil variables
• Links to available seed database
• Expansion of extent (currently limited to western US)
• Improving stability and performance
• Manipulation of variable weights
Acknowledgements