Visualization and analysis using REACCH data analysis tools

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An important component of the REACCH technology system is the development of analytical tools that enable researchers, as well as the public, to organize and examine REACCH data in effective and useful ways. Our tool development is focusing on the use of web services to expose, organize, analyze, and present REACCH data in ways that support stakeholder analysis and decision making. Web services allow users to connect to data for analysis and visualization via a web browser without downloading the data to a local computer, thereby making the data more dynamic and accessible to a diversity of users.

IMPACT

These data analysis tools will allow REACCH researchers and educators to effectively use and analyze complicated data sets. Growers and the agricultural industry will have the best information available to make sustainable management decisions in the face of changing climatic conditions.

Our tool development efforts can be divided into four functional areas:

- Web browser-based analytic tools: Building on our data cataloging and meta-tagging model, we are currently developing several map-based applications, including the following:
  - Climatic data viewing, analysis, and download (Figure 1). Using our REACCH climatic data viewer, users can build their own request for particular climate model output, based on a location or time period.
  - Growing degree calculators for the Pacific Northwest. Using our REACCH biotics data viewer, users can determine the average number of growing degree days for a particular crop and location.
  - Soil and topography data viewers, which use an organization of Natural Resources Conservation Service and U.S. Geological Survey data.
- Meteorological and climatic modeling data aggregation: Our REACCH modeling framework team has produced more than 15 terabytes of meteorological and climatic model data outputs. With such large data sets, we have implemented a data aggregation technology that allows anyone to aggregate and download data based on geography, time, or a particular variable (http://thredds.reacchpna.org).
- Use of Interactive Python for researcher data analysis: Interactive Python (IPython) is a web server-based technology that allows users to create "research notebooks" for collaboration around Python-based data interrogation.
- Geospatial analysis using ArcGIS: A key component of our analysis tools enables geographic analysis and visualization (Figure 2). As such, all data that are uploaded to our REACCH Data Library are loaded into our geospatial database, which can then be searched, analyzed, and visualized using ArcGIS Desktop in a variety of ways.

In support of the above, the REACCH Cyberinfrastructure team has developed a series of geospatial short course videos to educate students and other REACCH team members on the use of ArcGIS to examine REACCH data. These short courses also explain how to develop geospatial data models that might incorporate REACCH data.

The tools and data access methods described here are all part of the cyberinfrastructure and data management strategy to help both researchers and broader stakeholders gain access to the valuable data sets being collected and organized by the entire REACCH team (Figure 3).

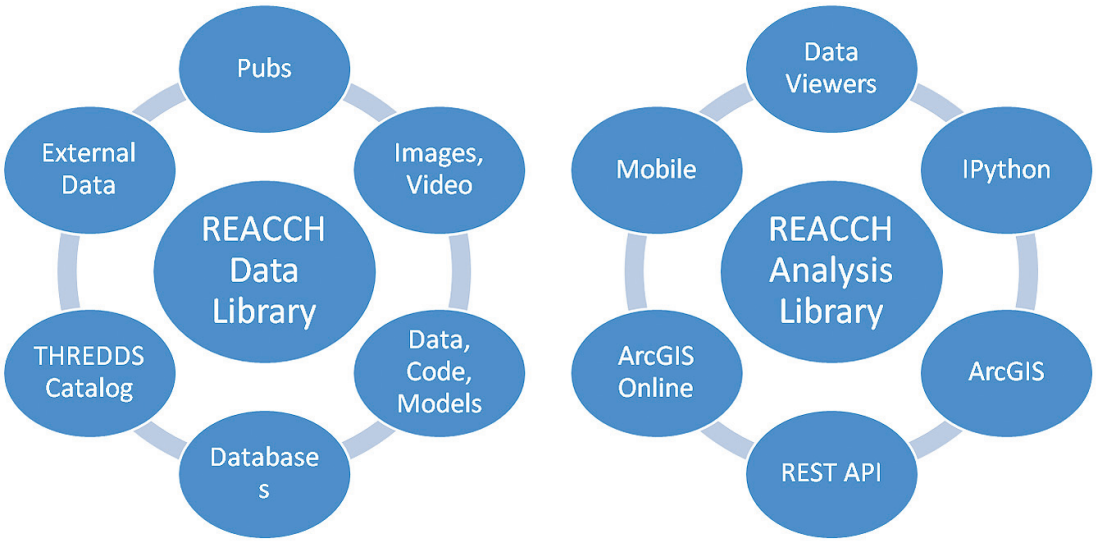

Figure 1. *Flow diagram of REACCH Data Library and Analysis Library.*

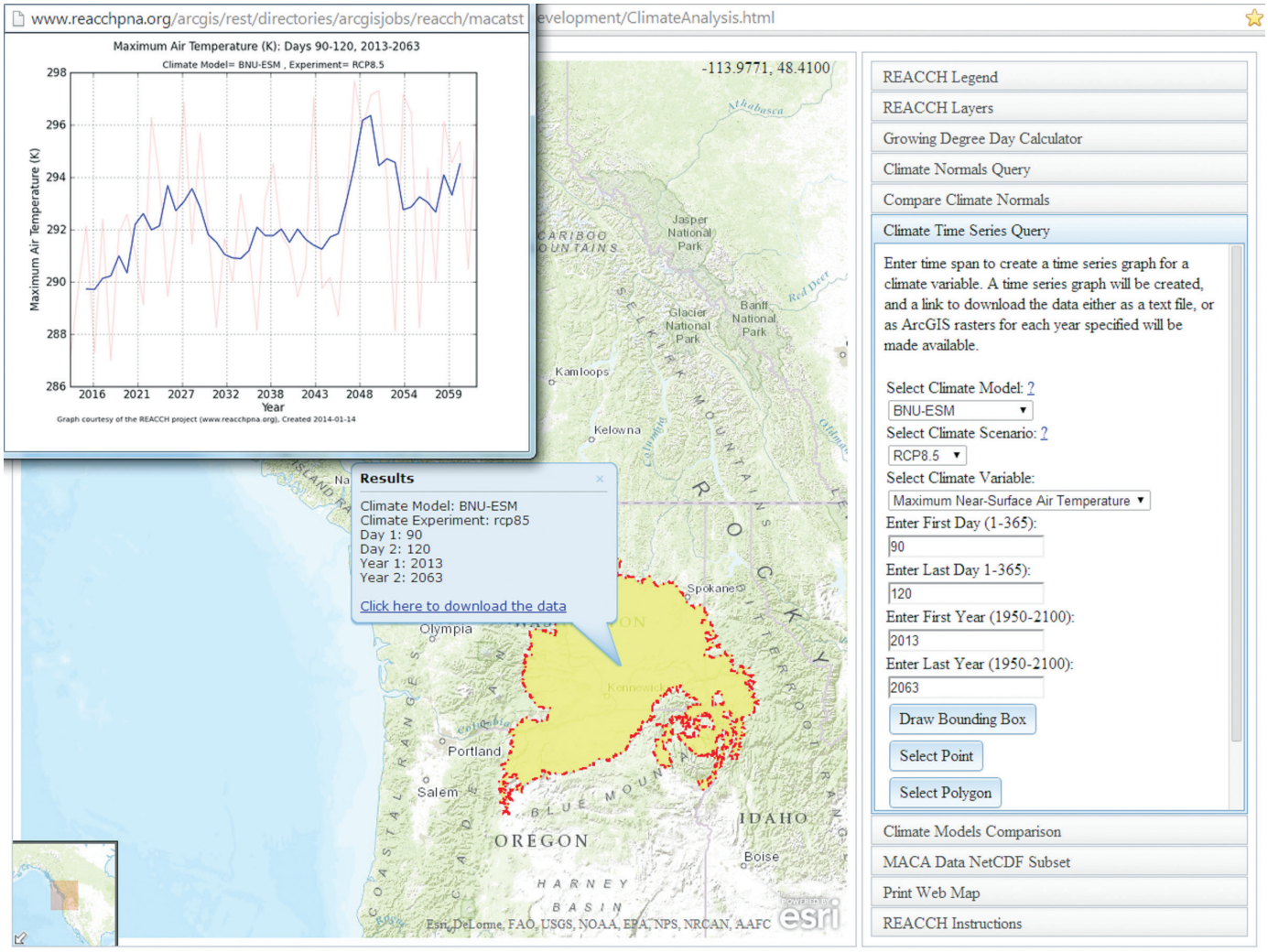

Figure 2. *Example of a web-based geographic analysis using REACCH tools—examining maximum April–June air temperature changes for the REACCH study area (1970–2000).*

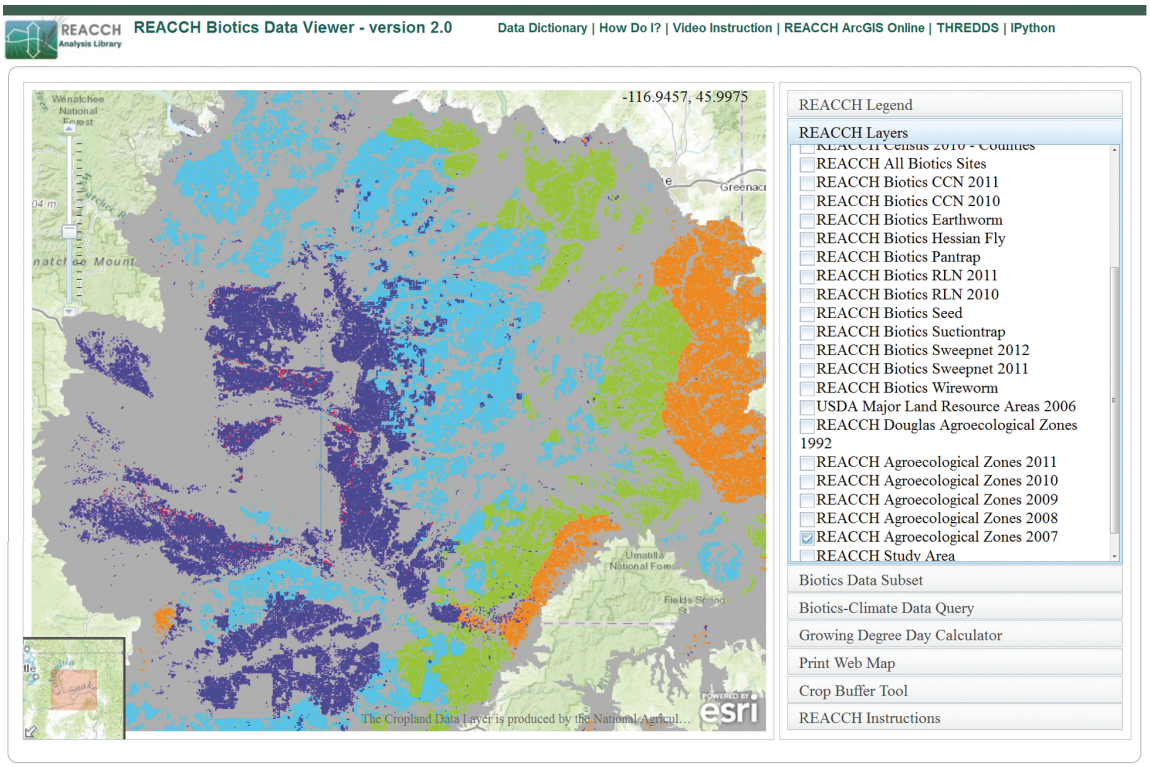

Figure 3. *REACCH Climate Viewer with agroecozones (AEZ) for the Pacific Northwest study area.*