

Overview of Website Design and Implementation

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Introduction

This report is intended to be a technical reference for the website that serves data and information produced by the Columbia Basin Climate Change Scenarios Project [<http://www.hydro.washington.edu/2860/>]. Rather than a manual to support new users of the website (which is included as an element of the website itself) this reference is intended to support web programmers and system administrators that may need to install the code on new servers or resolve specific problems with the website that emerge later in response to changes or extensions of the site.

The report primarily describes the structure and organization of the data behind the site, and how the code provides organized access to these resources. Preprocessing scripts for assembling SQLITE data bases and Google maps are also covered.

Web Programming Software

The website is primarily coded in PHP, although as noted above pre-processed links to Google maps created using pre-processed KML files provide clickable maps for selecting streamflow sites, and SQLite software is used for constructing databases and querying databases to provide specific fields presented on the site-specific study pages (e.g. site information tables).

Storage Configuration

The primary code supporting the website is currently archived and served on the University of Washington Hydro web server **dynamo** at:

`/nfs/dynamo/www/data/2860/`

The hydrologic databases are currently stored on a large raid drive (called **/raid7/**) connected to the Hydro system LINUX cluster (**tsunami**) used to run the hydrologic models and post-process the resulting data. The root directory for the study data bases is `/raid7/climate/`. A symbolic link for this directory was created ("**r7climate**") and the file system was made accessible to `http://` and `ftp://` calls from the Hydro system web server. The symbolic link is currently created in:

`/nfs/dynamo/www/data/2860/products/sites/`

Thus data from the study stored on tsunami: /raid7/climate/ can be directly accessed from dynamo via the path:

/www/data/2860/products/sites/r7climate/

These linkages might be accomplished differently if the site were recreated on other servers, but ultimately the directory structure “downstream” of /raid7/climate/ must be reproduced and ideally a symbolic link to the root directory called “r7climate” should be created as above. Having done this the existing PHP code should correctly link to the products and data without modification of the code. Alternately the root pathnames in the PHP files could be manually altered to reflect the new root directory structure.

Primary Web Pages

Several primary web pages, which are very straight-forward applications displaying text and a few figures, are available from the main page. These pages are accessed via buttons on the left sidebar and include:

Introduction for New Users

http://www.hydro.washington.edu/2860/new_users/

Project Report

<http://www.hydro.washington.edu/2860/report/>

The pdf files for each chapter of the report that are linked to this page are archived at: r7climate/study_report/

Climate Scenarios

<http://www.hydro.washington.edu/2860/scenarios/>

Overview of Hydrologic Products and Associated Structure of Databases and PHP Code

Chapter 8 (this report) provides a detailed description of the specific products and services that have been produced by the CBCCSP. In brief, however, there are three basic classes of products available on the website: “Site-Specific Data” (individual figures, information, and data for 297 streamflow sites at the time of this writing), “Primary Data” (primary data files

archived for the entire model domain by downscaling method and scenario and served via ftp links), and “Reservoir Model Inputs” (bias adjusted input data for specific reservoir models organized by scenario and served via ftp links).

Site-Specific Data

Site specific data is organized in the following directory structure:

```
/r7climate/ subbasin_summaries/  
    1001/  
    1002/  
    1003/  
    .  
    .
```

For each site a unique directory corresponding to the four digit ID number of each streamflow site in the data base. These ID numbers are reported in the Excel spreadsheet site database which can be accessed from [<http://www.hydro.washington.edu/2860/products/sites/>]. This site database is stored in the following directory:

```
/r7climate/streamflow_site_database/
```

When the user clicks on the site specific data tab on the left side of the screen, a new page appears which displays a link to the site data base, a pull down menu containing the site names, and links to pre-processed Google maps:

<http://www.hydro.washington.edu/2860/products/sites/>

Selecting a site either from the pull down menu (or alternately by clicking on a symbol in the Google maps) associates the user’s choice of site with an argument string that is the site ID string (and directory name). So for example selecting BOISE RIVER NR BOISE from the PHP code associated with the pull down menu generates the following link:

<http://www.hydro.washington.edu/2860/products/sites/?site=2023>

Using this argument, the PHP code generates a page displaying a set of products for the selected site. All of these products are stored in files that have exactly the same name for each site, which greatly simplifies the PHP coding to generate the pages. Essentially only the ID string changes in the PHP code when generating each site. At the top left of the page, a table of site information is displayed (lat, lon, link to USGS site, etc.). These data fields are extracted from an SQLite data base (see section below) using the ID string as the lookup parameter. A preprocessed map of the streamflow site [map_sm.png] is displayed in the upper right. Clicking on the map displays the larger size [map_lg.png].

Below these products, the files containing streamflow tables are displayed. These are simple links to text files, which have the same names for each site. All sites have raw streamflow products; only some have bias corrected products. If there are no bias corrected products available, a message “There are no files available” is displayed below the appropriate heading.

Below these products is an ftp link which displays the entire contents of the directory via an ftp portal. This is intended, for example, to provide access to users who want to download the entire contents of the directory (all files for one site) at once.

A group of summary products is displayed in the remainder of the page. The PHP code generates this display by searching for filenames with the .png extension. If the file exists, the extension is stripped off to form a string, and this string is then used to create file names for the data files and product description that are associated with each of these images. For example the file

combinedflow_monthly_tot_hd.png

is associated with the files below, links to which are displayed beside the corresponding plot.

1. [combinedflow_monthly_tot_hd_A1B_2010-2039.dat](#)
2. [combinedflow_monthly_tot_hd_A1B_2030-2059.dat](#)
3. [combinedflow_monthly_tot_hd_A1B_2070-2099.dat](#)
4. [combinedflow_monthly_tot_hd_B1_2010-2039.dat](#)
5. [combinedflow_monthly_tot_hd_B1_2030-2059.dat](#)
6. [combinedflow_monthly_tot_hd_B1_2070-2099.dat](#)
7. [combinedflow_monthly_tot_hd.product-description.txt](#)

The primary advantage to this system is that as long as the naming convention is followed, new products can be added without making any changes to the PHP code, and they will be displayed correctly in alphabetical order. Similarly a new streamflow site can be seamlessly added to the list, so long as the same set of files is loaded into a unique directory name, and the SQLite data base is updated accordingly.

SQLite Database

SQLite [<http://www.sqlite.org/>] is an open-source, secure, SQL compliant database management application that can both generate and query SQL compliant databases. To create the SQLite database, the excel spreadsheet site data base is saved as a comma delimited file, which is then imported to SQLite. Using functions in SQLITE a binary database is created. Calls to SQLite in the PHP code query the resulting database to extract fields from the database, which are then displayed on the pages, as described above. The database is archived on the Hydro web server:

`/nfs/dynamo/www/data/2860/products/sites/`

Google Maps and Associated KML Files

Free services provided by Google Maps [http://maps.google.com/maps?f=s&utm_campaign=en&utm_source=en-ha-na-us-bk-gm&utm_medium=ha&utm_term=google%20maps] are used to generate clickable topographic maps showing the streamflow sites. Clicking on the marker icons provides a link to the site specific products page. The C-shell script and database to generate the needed kml files for these applications is archived at:

`/r7climate/kml_files/`

After establishing an account with Google and accessing the Google Maps site, click on “My Maps”, create a new map with public access permissions, and click the “import” link. You will be prompted to upload a kml file. After the map is created a link will be displayed for the map. The links to each map are then pasted into the main PHP file for the site specific data.

Primary Data

Primary study data are accessed from the following page:

http://www.hydro.washington.edu/2860/products/primary_data/

This page provides ftp links to directories organized by historical run or future downscaling approach:

http://www.hydro.washington.edu/2860/products/sites/r7climate/hb2860_historic_run/

http://www.hydro.washington.edu/2860/products/sites/r7climate/hb2860_delta_method_runs/

http://www.hydro.washington.edu/2860/products/sites/r7climate/hb2860_hybrid_delta_runs/

http://www.hydro.washington.edu/2860/products/sites/r7climate/hb2860_transient_runs/

Subdirectories organized by scenario name provide access to primary data products which are described in detail Chapter 8 of this report.

Reservoir Model Input Data

Access to bias corrected reservoir model input data is provided at:

http://www.hydro.washington.edu/2860/products/reservoir_model/

Similar to the Primary Data page this page provides access to directories via ftp, which are organized by:

Reservoir Model

Downscaling Method

Scenario

At the time of this writing only products for the GENESYS model are available, however additional products for other models will follow this same directory structure and naming convention and will appear without modification of the site or PHP code.