

# ClimateWNA version history

## ClimateWNA v6.00 (March 20, 2019)

### New features

- A new feature has been added that enables the program directly read digital elevation model (DEM) raster (ASC) files and output climate variables in raster format for mapping. The spatial resolution of the raster files is up to user's preference.
- RCP 2.6 of the included GCMs have been added for being relevant to the Paris agreement, which requires the increase of global temperature being controlled below 2°C.

### Improvements

- Steps visible on high-resolution maps (<100m x 100m) are removed through bilinear interpolaiton of the lapse rates dynamically estimated for each grid of the baseline data across the two neighbouring grids.

## ClimateWNA v5.60 (August 31, 2018)

### Improvements

- Historical monthly data from the Climate Research Unit (CRU ts4.01) for the years 1999-2016 have been replaced by our newly developed dataset with improved accuracy.
- Historical monthly data for the year 2017 has been added using our new data.
- Improvements were made to better handle errors in the input data.

## ClimateWNA v5.51 (May 02, 2018)

### Bugs fixed

- "Divided by zero" error in some occasions for future time-series causing the program to crash.
- Errors in Radiation (RAD) for future time-series.

## ClimateWNA v5.50 (December 2017)

### Updates

- Climate data for historical years and periods updated from CRU ts3.24 to CRU ts4.01. The period extended from 1901-2015 to 1901-2016.

### Bugs fixed

- Some missing values for CRU data (for individual historical years) at some edges of the coverage are fixed.
- PAS\_at for individual years was calculated based on previous year's data. Fixed. This bug does not affect users using normal or decadal climate data.

## **ClimateWNA v5.41 (June 2017)**

### **Bugs fixed**

- GCM climate data missing at some edges.

### **New GCM time series**

- Five individual runs for each of the following two GCMs and two RCPs have been added into the package. The two GCMs include “CanESM2” and “CSIRO-Mk3-6-0”, and the two RCPs are RCP 4.5 and RCP 8.5.

## **ClimateWNA v5.40 (December 2016)**

### **Update**

- Climate data for historical years and periods updated from CRU ts3.23 to CRU ts3.24. The period extended from 1901-2014 to 1901-2015.

## **ClimateWNA v5.30 (May 2016)**

### **New features**

- Monthly future projections for years of 2011-2100 for RCP4.5 and RCP8.5 of six GCMs with a time-series function available;
- Monthly paleoclimate data for three paleo periods for four GCMs and one ensemble;
- Allowing users to add future time series data for additional GCMs into the program at the user end;
- Allowing users to choose multiple GCMs and time periods for a single run;
- Climate data for historical years updated from CRU ts3.22 to CRU ts3.23 and extended to 2014;
- Free from dependence on VB library files.

### **Bugs fixed**

- An error caused due to multiple parts in ID fields of the input file.

## **ClimateWNA v5.21 (July 05, 2015)**

### **Bugs fixed**

- An error in retrieving historical (CRU) data.

## **ClimateWNA v5.20 (June 20, 2015)**

### **Updates**

- Climate data for historical years updated from CRU ts3.21 to CRU ts3.22 and extended to 2013.
- Solar radiation data for the baseline (1961-1990) updated to a new version.

### **Bugs fixed**

- An error caused by handling missing values in historical years.
- Errors in solar radiation data for the baseline (1961-1990)

- An error in incorporating historical solar radiation data.

## ClimateWNA v5.11

### Bugs fixed

- For Single location (the interactive mode), the saved file had missing variables.

## ClimateWNA v5.10

### New features

1. Database updates
  - a. The baseline dataset of 1961-1990 PRISM normal data (4,000 x 4,000 m) has been updated through resampling the 1971-2000 PRISM normal data (800 x 800 m).
  - b. Historical monthly data from CRU has been updated from the version ts3.1 (1901-2009) to ts3.21 (1901-2012).
  - c. Future climate projections have been updated from IPCC AR4 to IPCC AR5 GCMs.
  - d. Annual projections for the years between 2011 and 2100 from one GCM.
2. New variables added
  - a. Monthly solar radiation data have been added to historical (1948-2010) and the three future periods.
  - b. Relative humidity (RH) has been added. The RH is estimated based on Teten's equation for saturated vapour pressure at a given air temperature.
3. Improvement in downscaling algorithms

The algorithms for elevation adjustment in downscaling monthly climate data have been upgraded from global partial derivative functions to dynamic local regression functions. The new downscaling approach is also applied to monthly precipitation and monthly solar radiation.
4. Fast access to historical and future climate data. Increased size of the data-file sizes slows down the access to these datasets. Improved algorithms have overcome this problem.
5. The accuracy of some derived climate variables has been improved through regional adjustments.

## ClimateWNA v4.85

### New feature

Improved the data access speed for historical years and periods.

### Bugs fixed

An error was identified and fixed in GCM data.

## **ClimateWNA v4.84**

### **Bugs fixed**

Some extremely large values in summer precipitation in some GCM files.

## **ClimateWNA v4.83**

### **Bugs fixed**

Error in finding GCM files when directly choosing GCM period in the Multi-location option.

## **ClimateWNA v4.82**

### **Bugs fixed**

Negative values in historical years.

## **ClimateWNA v4.81**

### **Bugs fixed**

The TimeSeries did not pop up the period selection input box.

## **ClimateWNA v4.80**

### **New features**

1. Historical monthly data from CRU has been updated from the version ts3.1 (1901-2009) to ts3.21 (1901-2012).
2. Future climate projections have been updated from IPCC AR4 to IPCC AR5 GCMs.
3. Time series of annual projections for the years between 2011 and 2100 for three RCPs from one GCM (CanESM2).

## **ClimateWNA v4.72**

### **Bugs fixed**

1. Some unreadable values in historical years 2010 and 2011 and decade 2001-2010, and normal 1981-2010.
2. Errors in reading annual climate data after the year 1999.
3. Return only "0" values in time series if elevation is -9999.

## **ClimateWNA v4.71**

### **New features**

1. Anomaly data for historical years 2010 and 2011 have been added.
2. The anomaly means for the normal period of 1981-2010 and the decadal period of 2001-2010 have also been added.

3. For monthly variable option, in addition to selecting all 144 monthly variables, an option has been added for selecting only primary monthly climate variables, which include monthly minimum, maximum and average temperatures, and monthly precipitation.

## ClimateWNA v4.70

### New features

4. Derived monthly variables added, including DD<0°C (DD\_0), DD>5°C (DD5), DD<18°C (DD\_18), DD>18°C (DD18), NFFD, PAS, Eref, and CMD.
5. A new derived annual variable, “Extreme maximum temperature (EXT) over a normal period (30 years)” has been added. For an individual year, EXT is estimated for its corresponding normal period where the individual year is centered. This also applies to EMT (extreme minimum temperature).
6. Options have been added to allow the selection of a different set of climate variables for the “Time Series”.
7. Seven additional climate change scenarios (20 in total) have been included in the package. A CSV file containing coordinates for GCM files is included for users to develop their own GCM files.
8. Climate data for historical years and periods (decades and normals) from Climate Research Unit (CRU) have been updated from CRUTS2.1 to CRU TS3.1 that covers the period of 1901-2009.

### Changes

1. The estimate of extreme minimum temperature (EMT) for an individual year has been changed to its corresponding normal period where the individual year is centered.
2. The symbols of degree-days (DDs) for multiple location outputs have been changed as follows for easy import to ArcGIS and R.  
DD\_0 = DD<0; DD5 = DD>5; DD\_18 = DD<18; DD18 = DD>18.
3. The interface has been changed to display all the variables.

## ClimateWNA v4.62

A bug for handling missing values in elevation fixed for time series option.

A bug for repeated runs for time series fixed.

## ClimateWNA v4.61

Top 10 AR4 scenarios recommended by Dave and Trevor added  
AR3 scenarios removed.

## **ClimateWNA v4.60**

Annual climate data update:

- 2007-2009 annual data added with full coverage (data for Alaska added)

- 2003-2006 annual data replaced by the new dataset with full coverage

A bug was fixed in "Time Series" option. The bug caused the program to freeze when a location with "No data values" was encountered .

"ClimateWNA v4.522\_npb.exe" has also been updated to v4.60 for those who use managed computers without installation privileges.

## **ClimateWNA v4.522**

A bug in estimating EMT was indentified and fixed .

An additional EXE file named "ClimateWNA v4.522\_npb.exe" is included for those who use managed computers without installation privileges.

## **ClimateWNA v4.521**

A bug in estimating NFFD was indentified and fixed .

## **ClimateWNA v4.52**

New features:

- Derived variables calibrated and improved based on observations from weather stations in western North America.

- Add all CGCM3 scenario means over five individual runs

## **ClimateWNA v4.51**

New features:

Derived variables validated and improved  
Add CGCM3 means over five runs

## **ClimateWNA v4.34**

New features:

Eref: Hargreaves annual reference evaporation  
CMD: Hargreaves annual climatic moisture deficit

Removed:

DD5\_100

Bugs fixed

AR4 GCM data do not cover to the edges of the land.

## **ClimateWNA v4.33**

Bugs identified and fixed:

Nodata values interrupt process  
Elevation adjustment generates some weird values in the north (>lat=60°)

## **ClimateWNA v4.32**

New features:

GCM data added with compression.  
GCM AR4 (12 scenarios) added  
Historical data for recent years (2003-2006) added

## **ClimateWNA v4.31**

New features:

Historical data (1901-2002) added with compression.

## **ClimateWNA v4.30**

New features:

Coverage expanded to include entire West North America (lat. 24.5 - 80° N; long. -100 - 179° W).

## **ClimateWNA v4.21**

New features:

Historical data are compressed by eliminating nodata (-9999) data points.

## **ClimateWNA v4.20**

New features:

PRISM data compressed by eliminating nodata (-9999) data points. Storage requirement has been reduced to half.

## **ClimateWNA v4.10**

New features:

1. Range expansion: Integrated the coverage of ClimateBC, ClimatePP and ClimateUS01. Elevation adjustment is carried out separately for "BC and PP" and US. The joint was tested and found no steps at 100m resolution.
2. The resolution of input historical averages for decade and normal periods changed from 1° to 0.5°.
3. More normal periods for historical data.
4. Calculations of winter and related variables improved. For individual year historical climate variables, both target and previous years' data are used to calculate winter seasonal variables and one annual variable "precipitation as snow (PAS)", which is the sum between August in previous year and July in the target year.
5. Time series function added. This function allow users to obtain climate variables for multiple location and for multiple years.
6. More option added for selecting output variables . Users now can choose all the 83 variables at once.
7. The Output format for interactive mode (for single location) improved. The new format makes it easier for users to put the output into spreadsheet file (space delimited).



# ClimateBC version history

## Version 3.21

The following bugs have been fixed:

- An error was identified for the degree input option at the interface. Fixed
- Blank rows at the end of an input file cause the program to generate error message. Fixed

## Version 3.2

The resolution of the historical climate data (1901-2002) was restored from 1° to the original resolution (0.5°) of the datasets generated by [Mitchell and Jones \(2005\)](#) to improve the prediction precisions.

## Version 3.1

Historical climate data (1901-2002) ( [Mitchell and Jones 2005](#)) were integrated into the model. The historical data were upsampled from the resolution of 0.5° to 1° using Anuspline to match the resolution of downscaled GCM datasets.

More GCMs were added.

## Version 2.3

Some bugs were identified and fixed.

## Version 2.0

The downscaling of the PRISM data was achieved through the combination of bilinear interpolation and elevational adjustments.

Monthly, seasonal and derived climate variables were included.

Three GCMs were integrated.

## **Version 1.0**

The downscaling of the PRISM data was achieved through elevational adjustments.

Eight annual climate variables were included.