

# **Everglades Crayfish (*P. alleni*) Model Requirements Document**

## **INPUTS**

The Alleni crayfish model requires a single input layer: water depth.

### **Water Depths**

The water depth's layer will be produced by Everglades Depth Estimation Network (EDEN), which uses a series of water stations that measures water depth throughout the EDEN geographical area. Measurements from these stations are then extrapolated to produce depth approximations between these stations. These daily data are collected into quarter-yearly data, converted into NetCDF format over 400m grids in units of meters and/or centimeters.

## Inputs

Input layer will consist of EDEN Netcdf files that contains fixed 400m grids in the UTM zone 17R projection. Files are to be of a contiguous daily time-steps that contains a “stage” (water levels) variable that contains three dimensions: X, Y and time.

The input layer will also consist of a Digital Elevation Model (DEM) EDEN NetCDF file containing a “dem” variable to represent the ground elevation for the study area. The ground elevation data is subtracted from the stage data to produce the water depths.

## Outputs

The model generate three hydrological indices that are important to Everglades crayfish and subsequently used to generate the model's output.

<b>Output</b>	<b>Inputs</b>	<b>Time Resolution</b>	<b>Type</b>	<b>Optional</b>
Hydroperiod	Water Depths	Time Step	Map	No
Average Past Water Depths	Water Depths	Time Step	Map	No
Local Drying	Water Depths	Time Step	Map	No
HSI	Above outputs	Annual	Map	No

### *Hydroperiod*

The hydroperiod is calculated from daily water depths throughout the yearly hydroperiod (June through May the following year). Yearly maps will be generated for each year that contains the hydroperiod; current year's June to the following year's May (e.g., a 2005 map will display the hydroperiod from June 1, 2005 to May 31, 2006). This map is generated by finding the largest block of contiguous months with depths > -10 cm between this year's June and the following year's May (both inclusive), and applying the function:

$$f_{\text{Hydroperiod}}(h) = \begin{cases} 0 & -50 \geq h \\ 0.01(h+50) & -50 < h \leq -40 \\ .04(h+40)+0.1 & -40 < h \leq -20 \\ .01(h+20)+.9 & -20 < h \leq -10 \\ 1 & -10 < h \leq 0 \\ -.0066(h)+1 & 0 < h \leq 15 \\ -.028(h-15)+.9 & 15 < h \leq 40 \\ -.02(h-40)+.2 & 40 < h \leq 50 \\ 0 & h > 50 \end{cases}$$

### ***Average Past Water Depths***

For every day starting June 1<sup>st</sup> to (the following year's) May 31<sup>st</sup>, average past water depths are calculated by averaging daily water depths over the previous 180 days (including the current day). Similar to the hydroperiod above, an average past water depths yearly map, will display the period of current year June, to the following year's May. The graphed year's map will generated by the applying the function:

$$f_{\text{Graphed Year}}(g) = \begin{cases} 0 & -30 \geq g \\ 0.0333(g+30) & -30 < g \leq 0 \\ 1 & 0 < g \leq 30 \\ -.05(g-30)+1 & 30 < g \leq 50 \\ 0 & g > 50 \end{cases}$$

The average past water depths map will be generated by the function:

$$f_{\text{Average Water Depth}}(A) = \left\lfloor \text{Graphed Year} \div n \right\rfloor$$

Where n represents the number of days between June 1<sup>st</sup> to (next year's) May 31<sup>st</sup>.

### ***Local Drying***

Local drying, like the average past water depths, is calculated from water depth averages albeit, weekly. For each year, for each day from January 1 to July 25, average the depth of the current day and the following six days. The yearly map is generated by applying the function:

$$f_{\text{Average 7-day Depth}}(A) = \begin{cases} 1 & 5 \geq A \\ 0 & A > 5 \end{cases}$$

## ***HSI***

The HSI is a function of the hydroperiod, average past water depth and local drying. The HSI for a given year is the geometric mean of the three hydrological indices for that year. This output is generated for each calendar year that all three indices contains outputs. The yearly maps are generated by the functions:

$$f_{HSI}(hsi) = \left( (Hydroperiod * Average Past Water Depths * Local Drying) \right)^{0.333}$$

## **Optional outputs**

The model provides the option of displaying outputs for average 7-day depths. These are daily outputs that looks at the current day plus the following 6 days to be averaged out.

The 180-day average depths. These are also daily averages that looks at the current day and the previous 179 days to be averaged.

The model also provides the option of viewing the daily depths for all available dates within the model (January 1, 2000 to December 31, 2008).