Suitability Indices for Tree Islands

- I. Drought Index as a function of
  • cumulative drought days
  • depth of water table below ground

- II. Flood index as a function of
  • cumulative flood days (> 2 ft ponding)

- III. Tree Island Suitability Index
  • Min(DI)*Min(FI)
Cumulative Drought Duration

Defined as number of sequential days with water depths below ground surface

\[ CDD(t) = 0, \quad \text{if } WD(t) > 0; \]

\[ CDD(t) = 1 + CDD(t-1), \quad \text{if } WD(t) < 0. \]

Daily Drought Index on day \( t \), \( DDI(t) \), is then defined as:

\[ DDI(t) = 1 \quad \text{if } WD(t) > 0. \]

\[ DDI(t) = \frac{1.0 - 0.0035 \cdot CDD(t)}{1.0 + 0.010 \cdot e^{-4.6 \cdot WD(t)}} \quad \text{if } WD(t) < 0 \]
Annual Minimum Drought Index

The minimum value of DDI(t) in any year is an indication of the maximum fire risk that tree islands would experience during that year.

And

N-year Mean Annual Minimum Drought Index

\[ \frac{\sum_{i=0}^{N} \text{minDDI}(i)}{N} \]
Continuous Flood Index DFI (t)

Is a function of Cumulative Flood Days

- Incremented if water depth > 2.0 ft
  \[ CFD(t) = CFD(t-1) + 1.0, \]

- Decremented until zero if water depth is < 2.0 ft
  \[ CFD(t) = CFD(t-1) - 0.5 \]

\[ DFI(t) = \frac{1.0}{1.0 + 0.0023 \cdot e^{0.039 \cdot CFD(t)}} \]
Relationship between DFI (t) and CFD(t)

DFI(t) = \frac{1.0}{1.0 + 0.0023 \cdot e^{0.039 \cdot CFD(t)}}
Annual Minimum Flood Index

The minimum value of DFI(t) in any year is an indication of the maximum flood stress that tree islands would experience during that year.

And

N-year Mean Annual Minimum Flood Index

\[ = \sum_{i=0}^{N} \frac{\text{minDFI}(i)}{N} \]
Annual *Tree Island* Suitability Index

Defined as the product of the minimum value of DDI(t) in any year and the minimum value of DFI(t) in the same year,

I.e. $TISI(I) = \min_{i} DDI(i) \times \min_{i} DFI(i)$

N-year Mean Annual *Tree Island* Suitability Index

$$= \sum_{i=0}^{N} \frac{TISI(i)}{N}$$
Indicator Regions and SFWMM grid cells
Applicable for Tree Island Suitability