TYPICAL YEAR

Regulatory Division - Savannah District
19 MAY 2020; Released 10 Sept 2020

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TYPICAL YEAR

OVERVIEW

• Definition, Concept, and Application

• Typical Year Tools and Resources
TYPICAL YEAR - DEFINITION

When precipitation and other climatic variables are within the normal periodic range (e.g., seasonally, annually) for the geographic area of the applicable aquatic resource based on a rolling thirty-year period.
TYPICAL YEAR OBSERVATIONS

Typical year is not synonymous with a calendar year.

The intent is to measure the characteristics of a waterbody at times that are not too wet or too dry.

COE has similar experience with this when looking at wetland hydrology, via the WETS tables.

Typical year conditions may not occur during the specified time period. For example is the time period experiencing a drought, this would not be considered typical.
NORMAL PERIODIC RANGE

Compares climatic data for a specified time period to the same date range over a 30 year period.

- Typical year is not necessarily synonymous with a calendar year.

- PMs will generally use the previous three months of data prior to the date associated with the point in time data source (i.e., date of aerial photo, date of site visit).

- Typical year may be assessed by comparing climatic metrics from a time period that is shorter than one year (e.g., 90 days), equal to one year, or longer than one year to climatic metrics from a 30-year record, if justified.
GEOGRAPHIC AREA

- Climatic data should be collected from the appropriate geographic area.
- Watershed boundaries should be a consideration.
- A particular HUC size is not specified since this could preclude the use of the best available data sources.
- Other considerations include:
  - geographic scale of the rainfall or snowpack sources,
  - data availability,
  - topography, and
  - distance of climatic data collection in relation to the aquatic resource location.
ROLLING 30-YEAR PERIOD

• A standardized time frame is necessary to ensure consistent application across the country.

• 30 years accounts for variability without being confounded by a year or two of unusual data.

• National Oceanic & Atmospheric Administration (NOAA) uses a 30-year timeframe for climatic data programs which is based on World Meteorological Organization requirements.

• PMs are familiar with using a rolling 30-year period when assessing hydrology for wetlands via the WETS tables.
DETERMINING TYPICAL YEAR

- Typical year will generally be determined by:
  - Normal precipitation conditions based on the three 30-day periods preceding the observation date.
  - For each period, a weighted condition value is assigned by determining whether the 30-day precipitation total falls within, above, or below the 70th and 30th percentiles for totals from the same date range over the preceding 30 years.
  - A determination of “normal,” “wetter than normal,” or “drier than normal” is made based on the condition value sum.

- Other accurate and reliable measurements of normal precipitation and other climatic conditions may be considered when scientifically warranted.
DETERMINING TYPICAL YEAR - ANTECEDENT PRECIPITATION TOOL (APT)

- Developed by the Corps.

- Assesses rainfall data from the preceding 30 years.

- The APT is automated and provides a consistent methodology.

- Includes information from the Web-based Water-Budget Interactive Modeling Program (WebWIMP) and Palmer Drought Severity Index.

- Uses the recommended parameters contained in the NWPR’s preamble (previous slide).
DETERMINING TYPICAL YEAR

In addition to the information generated by the APT, the following should also be considered:

- the range of climatic variables and data available through remote tools, and
- direct on-site observations.

Use professional judgment and a weight of evidence approach when considering precipitation normalcy along with other available data sources.
DETERMINING TYPICAL YEAR – TYPICAL V. ATYPICAL

- Hydrologic conditions (e.g., surface hydrologic connections, inundation by flooding or flow regime) during atypically wet or dry periods may not accurately represent hydrology during typical year conditions.

- When making a determination during a dry or wet period, it may be necessary to rely on other resources like on remote tools or field-based indicators.

- Consider the weight of the evidence.
  - For example, if flow is observed during an abnormally dry period and not after recent precipitation, more weight may be given to the flow meeting the requirements in the NWPR.
  - In situations where flow is observed on-site during a period of abnormally high precipitation, it might be necessary to rely on remote tools to provide a stronger and more accurate indication of flow conditions.
TYPICAL YEAR APPLICATION

- Provides a predictable framework to appropriately interpret data when determining the jurisdictional status of certain waterbodies.

- Applies to some of the requirements for the following categories of waters:
  - (a)(2) - Tributaries;
  - (a)(3) - Lakes and ponds, and impoundments of jurisdictional waters; and
  - (a)(4) - Adjacent wetlands

- May also be applied to determine if a water or feature is not jurisdictional (e.g., an ephemeral stream).
1. To meet the tributary definition, a channel must have perennial or intermittent flow in a typical year.

2. To meet the tributary definition, a channel must contribute surface water flow to a downstream (a)(1) water in a typical year.
   • Does not have to occur every calendar year, just in a typical year.
TYPICAL YEAR APPLICATION – LAKES AND PONDS, AND IMPOUNDMENTS OF JURISDICTIONAL WATERS

1. A lake, pond, or an impoundment of jurisdictional waters is jurisdictional if it contributes surface water flow to a water identified in paragraph (a)(1) in a typical year.
   • Only one flow event is required in a typical year.
   • Does not have to occur every calendar year, just in a typical year.

2. A lake, pond, or an impoundment of a jurisdictional water is also jurisdictional if it is inundated by flooding from a water identified in paragraph (a)(1), (2), or (3) in a typical year.
   • Required inundation frequency is only once in a typical year.
   • Does not have to occur every calendar year, just once in a typical year.
1. Adjacent wetlands include those that are inundated by flooding from a water identified in paragraph (a)(1), (2), or (3) in a typical year.
   - Required inundation frequency is only once in a typical year.

2. Adjacent wetlands include those that are physically separated from a water identified in paragraph (a)(1), (2), or (3) by an artificial structure so long as that structure allows for a direct hydrological surface connection to the water identified in paragraph (a)(1), (2), or (3) in a typical year over/through an artificial feature.
   - Only one flow event is required in a typical year.

NOTE: Abutting wetlands or wetlands separated by a natural barrier do not require a Typical Year analysis.
TYPICAL YEAR RESOURCES

- Definition, Concept, & Application
- Typical Year Tools and Resources
TYPICAL YEAR TOOLS AND RESOURCES

1. Antecedent Rainfall Calculator or Antecedent Precipitation Tool (APT)
4. NOAA National Snow Analysis Map - https://www.nohrsc.noaa.gov/nsa/
5. NRCS Snow Telemetry – https://www.wcc.nrcs.usda.gov
7. NOAA/National Weather Service Meteorological Stations
9. Continuous flow models
10. Hydrologic models
11. Familiar resources (aerials, topographic maps, soil surveys, etc…)
12. Physical and biological field indicators
   *Tools already included into the APT
TYPICAL YEAR TOOLS AND RESOURCES

Antecedent Rainfall Calculator or Antecedent Precipitation Tool (APT)

- Automated and applies a consistent methodology that aligns with the NWPR.
- Incorporates PDSI and Web WIMP to help with climatic information.
- HQ will provide access to and training on the APT prior to the rule effective date.
- EPA will post the APT on a public facing website for the public to use (Timeframe TBD).
TYPICAL YEAR TOOLS AND RESOURCES

Antecedent Rainfall Calculator or Antecedent Precipitation Tool (APT)
Antecedent Precipitation vs Normal Range based on NOAA's Daily Global Historical Climatology Network

<table>
<thead>
<tr>
<th>Weather Station Name</th>
<th>Coordinates</th>
<th>Elevation (ft)</th>
<th>Distance (mi)</th>
<th>Elevation (in)</th>
<th>Weight (in)</th>
<th>Days (Normal)</th>
<th>Days (Antecedent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SACRAMENTO EXECUTIVEAP</td>
<td>38.5669, -121.495</td>
<td>15.092</td>
<td>5.468*</td>
<td>7.962*</td>
<td>0.391*</td>
<td>11345</td>
<td>90</td>
</tr>
<tr>
<td>SACRAMENTO SESE</td>
<td>38.5556, -121.4167</td>
<td>30.058</td>
<td>5.308</td>
<td>22.966</td>
<td>2.553</td>
<td>8</td>
<td>0</td>
</tr>
</tbody>
</table>
Antecedent Precipitation vs Normal Range based on NOAA's Daily Global Historical Climatology Network

**Rainfall (Inches)**

- Daily Total
- 30-Day Rolling Total
- 30-Year Normal Range

<table>
<thead>
<tr>
<th>Date</th>
<th>Daily Total</th>
<th>30-Day Rolling Total</th>
<th>30-Year Normal Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>2019-01-04</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2019-02-03</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2019-03-05</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Table: Weather Station Data**

<table>
<thead>
<tr>
<th>Weather Station Name</th>
<th>Coordinates</th>
<th>Elevation (ft)</th>
<th>Distance (mi)</th>
<th>Elevation (ft)</th>
<th>Weights Q</th>
<th>Days (Normal)</th>
<th>Days (Antecedent)</th>
</tr>
</thead>
<tbody>
<tr>
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<td>15,062</td>
<td>5.548</td>
<td>7.902</td>
<td>0.351</td>
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<td>90</td>
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<tr>
<td>SACRAMENTO SESE</td>
<td>38.5156, -121.4162</td>
<td>10,958</td>
<td>5.398</td>
<td>22.966</td>
<td>2.503</td>
<td>8</td>
<td>0</td>
</tr>
</tbody>
</table>

**WebWIMP**

- Observation Date: 2019-01-04
- Elevation (ft): 7.14
- Drought Index (IDM): Moderate wetness
- WebWIMP Hydro Balance: Wet Season

**Antecedent Drought Calendar**

- Observation Date: 2019-01-04
- Elevation (ft): 7.14
- Drought Index (IDM): Moderate wetness
- WebWIMP Hydro Balance: Wet Season

- Result: Wet
- Wetness Condition: Wet
- Condition Value: 3
- Month Weight: 3
- Product: Wetter than normal
Antecedent Precipitation vs Normal Range based on NOAA's Daily Global Historical Climatology Network

Current Year – Daily Precipitation Totals (Black Lines)

Current Year – 30 Day Rolling Totals (Blue Lines)

<table>
<thead>
<tr>
<th>Coordinates</th>
<th>Observation Date</th>
<th>Elevation (ft)</th>
<th>Drought Index (POD)</th>
<th>Wet Season</th>
<th>Wetness Condition</th>
<th>Condition Value</th>
<th>Month Weight</th>
<th>Product</th>
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</thead>
<tbody>
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<td>38.5, -121.5</td>
<td>2019-03-05</td>
<td>7.14</td>
<td>Moderate wetness</td>
<td>Wet</td>
<td>Wet</td>
<td>3</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>38.5, -121.5</td>
<td>2019-02-03</td>
<td>1.74</td>
<td>Moderate wetness</td>
<td>Wet</td>
<td>Wet</td>
<td>3</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>38.5, -121.5</td>
<td>2019-01-04</td>
<td>1.74</td>
<td>Moderate wetness</td>
<td>Normal</td>
<td>Normal</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

Weather Station Name | Coordinates | Elevation (ft) | Distance (mi) | Elevation (°) | Weights | Days (Normal) | Days (Antecedent) |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>SACRAMENTO EXECUTIVE</td>
<td>38.5669, -121.495</td>
<td>15.092</td>
<td>0.548*</td>
<td>7.962*</td>
<td>0.251*</td>
<td>11345</td>
<td>90</td>
</tr>
<tr>
<td>SACRAMENTO SESE</td>
<td>38.5556, -121.545</td>
<td>38.058</td>
<td>5.398</td>
<td>22.966</td>
<td>2.553</td>
<td>8</td>
<td>0</td>
</tr>
</tbody>
</table>

Figures adapted using the Antecedent Rainfall Calculator

Written by Ryan C. Davis, Water Management, Sacramento County, CA
Normal Range - (Orange Shaded Area)

Calculated using the 30-Day Rolling Total values from each occurrence of a given date* (Month & Day) over the preceding 30 water years**
- The lower limit of the range is the 30th percentile of those 30 values
- The upper limit of the range is the 70th percentile of those 30 values

**Water years (October 1 through September 30) are used to define the 30-year period
Antecedent Precipitation vs Normal Range based on NOAA's Daily Global Historical Climatology Network

Antecedent Condition Calculation

First 30-Day Period - Wetness Condition
- Wet = Observed value above 30-Year Normal Range (70th percentile)
- Normal = Observed value within 30-Year Normal Range (30th & 70th percentiles)
- Dry = Observed value below 30-Year Normal Range (30th percentile)

<table>
<thead>
<tr>
<th>Weather Station Name</th>
<th>Coordinates</th>
<th>Elevation (ft)</th>
<th>Distance (mi)</th>
<th>Δ</th>
<th>Δ (Normal)</th>
<th>Days (Antecedent)</th>
</tr>
</thead>
<tbody>
<tr>
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<td>38.5669, -121.495</td>
<td>5.092</td>
<td>0.548</td>
<td>7.923</td>
<td>0.251</td>
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<tr>
<td>SACRAMENTO SESE</td>
<td>38.5556, -121.4169</td>
<td>38.858</td>
<td>5.798</td>
<td>22.966</td>
<td>2.503</td>
<td>8</td>
</tr>
</tbody>
</table>
Antecedent Condition Calculation

Antecedent Precipitation Condition
- The Condition Value (Numeric portion) is the Sum of the three Product values
- The final Condition is determined as follows:
  - Wetter than Normal = Condition Value greater than 14
  - Normal = Condition Value ranging from 10 to 14
  - Drier than Normal = Condition Value less than 10

Observation Date | 2019-03-05
Elevation (ft)    | 7.14
Drought Index (PDSI) | Moderate wetness
Web/WMD Hydro Balance | Wet Season

Weather Station Name | Coordinates | Elevation (ft) | Distance (mi) | Δ | Δ (Normal) | Days (Antecedent) |
---------------------|-------------|---------------|---------------|---|------------|------------------|
SACRAMENTO EXECUTIVE | 38.5069, -121.495 | 15.682 | 0.546° | 7.993° | 0.261° | 1154 | 90 |
SACRAMENTO SESE      | 38.5556, -121.5169 | 38.8508 | 5.398 | 22.966 | 2.503 | 8 | 0 |
Antecedent Precipitation vs Normal Range based on NOAA's Daily Global Historical Climatology Network

Weather Station Table

<table>
<thead>
<tr>
<th>Weather Station Name</th>
<th>Coordinates</th>
<th>Elevation (ft)</th>
<th>Distance (mi)</th>
<th>Elevation (ft)</th>
<th>Weights Q</th>
<th>Days (Normal)</th>
<th>Days (Antecedent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SACRAMENTO EXECUTIVE</td>
<td>38.5668, -121.455</td>
<td>15.602</td>
<td>0.548</td>
<td>7.962</td>
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<tr>
<td>SACRAMENTO SESE</td>
<td>38.5556, -121.516</td>
<td>10.098</td>
<td>5.398</td>
<td>22.966</td>
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<td>8</td>
<td>6</td>
</tr>
</tbody>
</table>

Weather Station Name: SACRAMENTO EXECUTIVE
Coordinates: 38.5668, -121.455
Elevation (ft): 15.602
Distance (mi): 0.548
Elevation (ft): 7.962
Weights Q: 0.393
Days (Normal): 1134
Days (Antecedent): 90

Weather Station Name: SACRAMENTO SESE
Coordinates: 38.5556, -121.516
Elevation (ft): 10.098
Distance (mi): 5.398
Elevation (ft): 22.966
Weights Q: 2.003
Days (Normal): 8
Days (Antecedent): 6
TYPICAL YEAR TOOLS AND RESOURCES

Antecedent Rainfall Calculator or Antecedent Precipitation Tool (APT)
TYPICAL YEAR TOOLS AND RESOURCES

Antecedent Rainfall Calculator or Antecedent Precipitation Tool (APT)

Antecedent Precipitation vs Normal Range based on NOAA's Daily Global Historical Climatology Network

<table>
<thead>
<tr>
<th>Coordinates</th>
<th>Observation Date</th>
<th>30 Days Ending</th>
<th>30th Precip (in)</th>
<th>1st Precip (in)</th>
<th>Observed (in)</th>
<th>Wetness Condition</th>
<th>Condition Value</th>
<th>Month Weight</th>
<th>Product</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2020-03-18</td>
<td>1.279446</td>
<td>0.820487</td>
<td>1.307321</td>
<td></td>
<td></td>
<td>1</td>
<td>3</td>
<td>4</td>
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<tr>
<td></td>
<td>2020-05-17</td>
<td>1.545669</td>
<td>2.042213</td>
<td>1.769787</td>
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<td></td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>2020-01-18</td>
<td>1.854786</td>
<td>3.28937</td>
<td>3.449945</td>
<td></td>
<td></td>
<td>3</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>

Result: Normal Conditions

<table>
<thead>
<tr>
<th>Weather Station Name</th>
<th>Coordinates</th>
<th>Elevation (ft)</th>
<th>Distance (mi)</th>
<th>Elevation &amp; Weighted A Days (Normal)</th>
<th>Days (Antecedent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>South Bend Michigan</td>
<td>41.7072, 86.3164</td>
<td>792.386</td>
<td>10.064</td>
<td>23.096</td>
<td>4.731</td>
</tr>
<tr>
<td>Mishawaka 2.5 SE</td>
<td>41.648, 46.5559</td>
<td>734.366</td>
<td>15.555</td>
<td>16.862</td>
<td>6.539</td>
</tr>
<tr>
<td>Lakeville 7 NE</td>
<td>41.5963, 86.1581</td>
<td>854.987</td>
<td>5.312</td>
<td>103.117</td>
<td>2.971</td>
</tr>
</tbody>
</table>
TYPICAL YEAR TOOLS AND RESOURCES
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7. NOAA/National Weather Service Meteorological Stations
9. Continuous flow models
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11. Familiar resources (aerials, topographic maps, soil surveys, etc…)
12. Physical and biological field indicators
   *Tools already included into the APT
TYPICAL YEAR TOOLS AND RESOURCES

Palmer Drought Severity Index (PDSI)

- Data is current, updated monthly.
- Integrates precipitation, soil moisture, and evapotranspiration.
- Sensitive to climatic patterns over a longer time period (e.g., months).

*Included in the APT.
TYPICAL YEAR TOOLS AND RESOURCES

Web WIMP

- Designed to evaluate monthly water balance.

- Provide some reasonable expectation of when a time of year may be a wet or dry period.

- Not Site Specific.

- Based on averages.

*Included in the APT.
TYPICAL YEAR TOOLS AND RESOURCES

NOAA National Snow Analysis Map

- Displays current snow pack conditions graphically on a map.
- Provides information if snow pack is normal, above normal or below normal.
- Provides what the water equivalent of the snow is.
NRCS Snow Telemetry

- Similar to the NOAA National Snow Analysis map.
- Selecting for a date and region you can compare the average for snowpack accumulation.
- Compare the current snow water equivalent to average.
TYPICAL YEAR TOOLS AND RESOURCES

Standardized Precipitation Index

- Can characterize drought or abnormal wetness at different time scales (1 to 36 months).
- Regional patterns of drought or excess wetness can be quickly observed.
- Only analyzes precipitation.
- Not site specific.
TYPICAL YEAR TOOLS AND RESOURCES

NOAA Weather Stations

- One of two ways:
  1. GIS Data Layer
  2. NOAA Website

- Click on the station to display information available.

- Helpful in determining geographic area.

* APT pulls in stations closest to the entered observation point.
QUESTIONS FROM THE FIELD

• Topics for questions include, but are not limited to, the following:
  • Ditches
  • Tributaries
  • Flow Regimes
  • Downstream flow contribution
  • Adjacency
  • Lakes and ponds, and Impoundments
  • Inundation by flooding
  • Typical year
  • Exclusions
  • Compliance/enforcement
  • Compensatory mitigation
  • Uplands