

Drought Contingency Planning

Groundwater Sources

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Overview

- Drought Definitions
- Drought Indicators
- Drought Status
- Drought Regulations
- Requirements During a Drought Emergency
- Elements of a Drought Contingency Plan
- Nonessential Water Uses
- Local Water Rationing Plan
- Groundwater Case Study



Understanding Drought Status

- Normal
- Drought Watch
- Drought Warning
- Drought Emergency

DROUGHT WATCH

A DROUGHT WATCH is intended to alert government agencies, public water suppliers, water users and the public regarding the **onset of conditions** indicating the **potential for future drought-related problems**. The focus during this stage is on **increased monitoring**, **awareness** and **preparation for response** if conditions become worse. A request for voluntary water conservation is made. The objective of **voluntary water conservation** measures during a drought watch is to reduce water uses by **5%** in the affected areas.

USGS, PA Water Science Center



DROUGHT WARNING

A DROUGHT WARNING implements coordinated response to imminent drought conditions and potential water supply shortages and initiates concerted voluntary conservation measures to avoid or reduce shortages, relieve stressed sources and forestall the need to impose mandatory water use restrictions. Development of alternate sources is initiated where and as appropriate. The objective of voluntary water conservation measures during a drought warning is to reduce overall water uses by 10-15% in the affected areas.

USGS, PA Water Science Center



DROUGHT EMERGENCY

A DROUGHT EMERGENCY is a concentrated management phase designed to marshal all available resources to respond to actual emergency conditions, to avoid depletion of water sources. ... mandatory restriction[s] are imposed ... to reduce consumptive water use in the affected area by at least 15 percent, and to reduce total use to the extent necessary to preserve public water system supplies, to avoid or mitigate local or area shortages, and to assure equitable sharing of limited supplies. During a drought emergency, public water suppliers are authorized to institute water rationing ...

USGS, PA Water Science Center



Drought Indicators

	Groundwater	Surface Water	Precipitation	Soil Moisture
	USGS Observation Well	USGS stream gage	Deficit of 3-12 months	Palmer Index
Drought Status	<i>(Low Level Percentile)</i>	<i>(Low Flow Percentile)</i>	<i>(Deficit Percentile)</i>	<i>(Range from 6.0 to -6.0)</i>
Normal	100% to 25%	100% to 25%	Multiple criteria	6.0 to -1.99
Watch	10% to 25%	10% to 25%	15% - 25%	-2.0 to -2.99
Warning	5% to 10%	5% to 10%	25% - 35%	-3.0 to -3.99
Emergency	0%-5%	0%-5%	35% - 45%	-4.0 to -6.0

Low Level Groundwater Indicator

Low Level Percentile



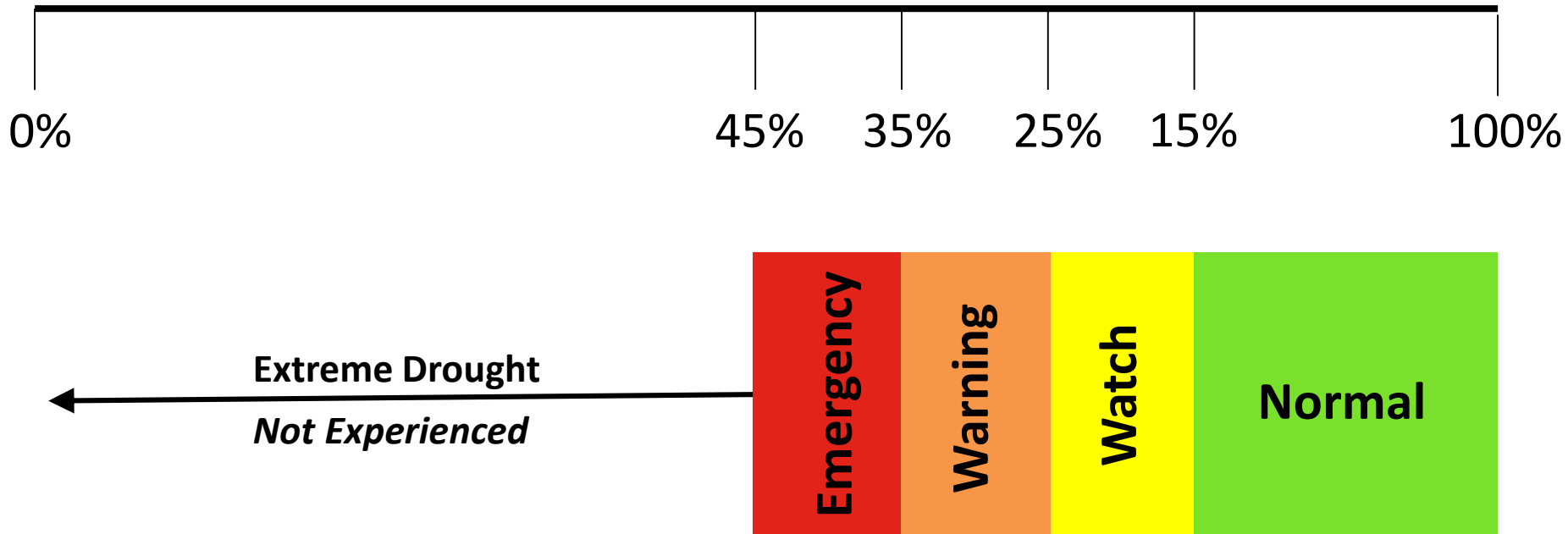
Low Flow Surface Water Indicator

Low Flow Percentile



Precipitation Indicator

Deficit as Percent of Normal*

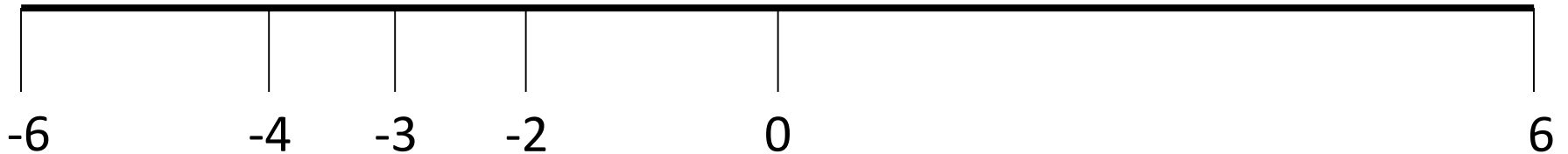


* Dependent on number of months in deficit

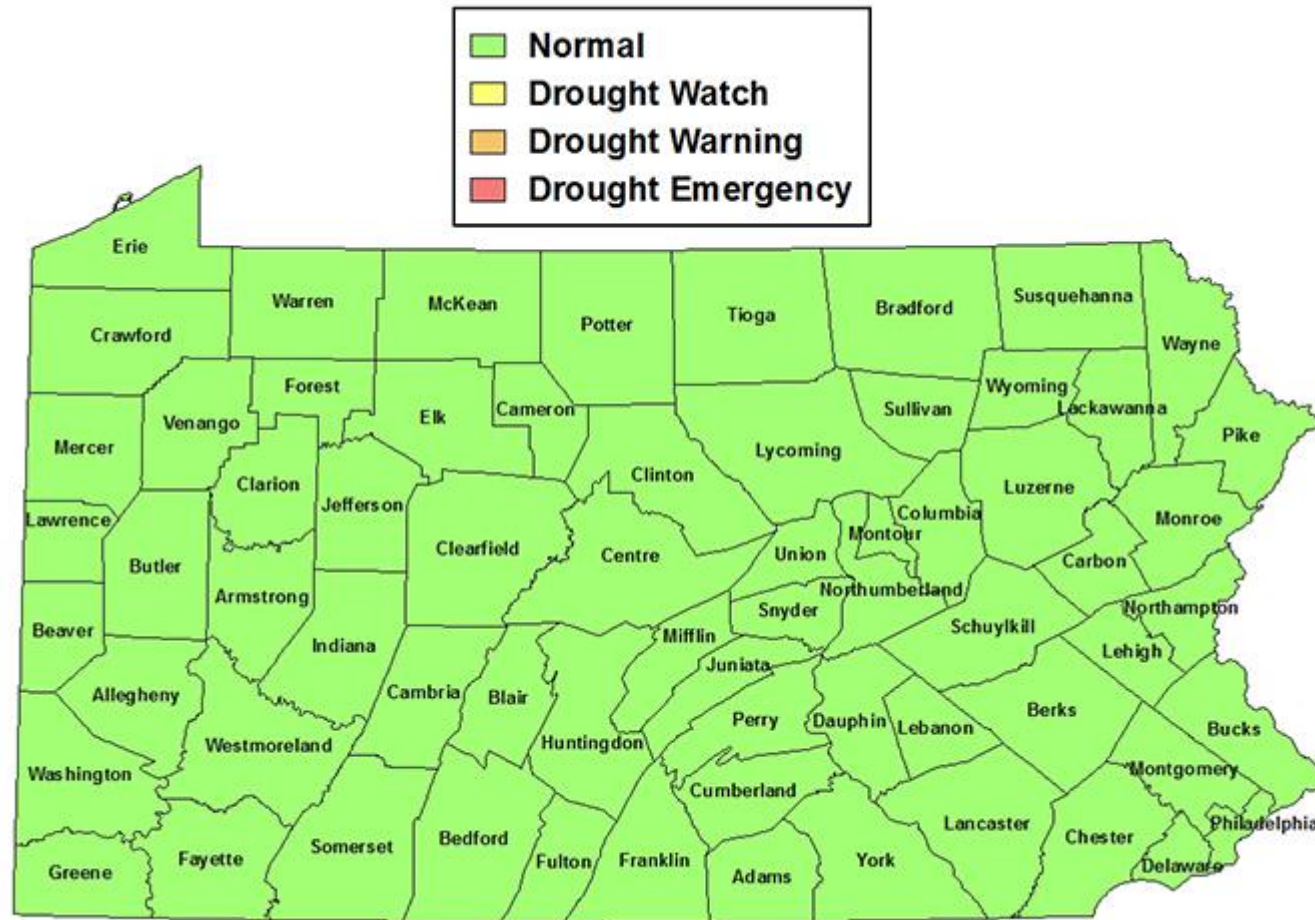


Soil Moisture Indicator

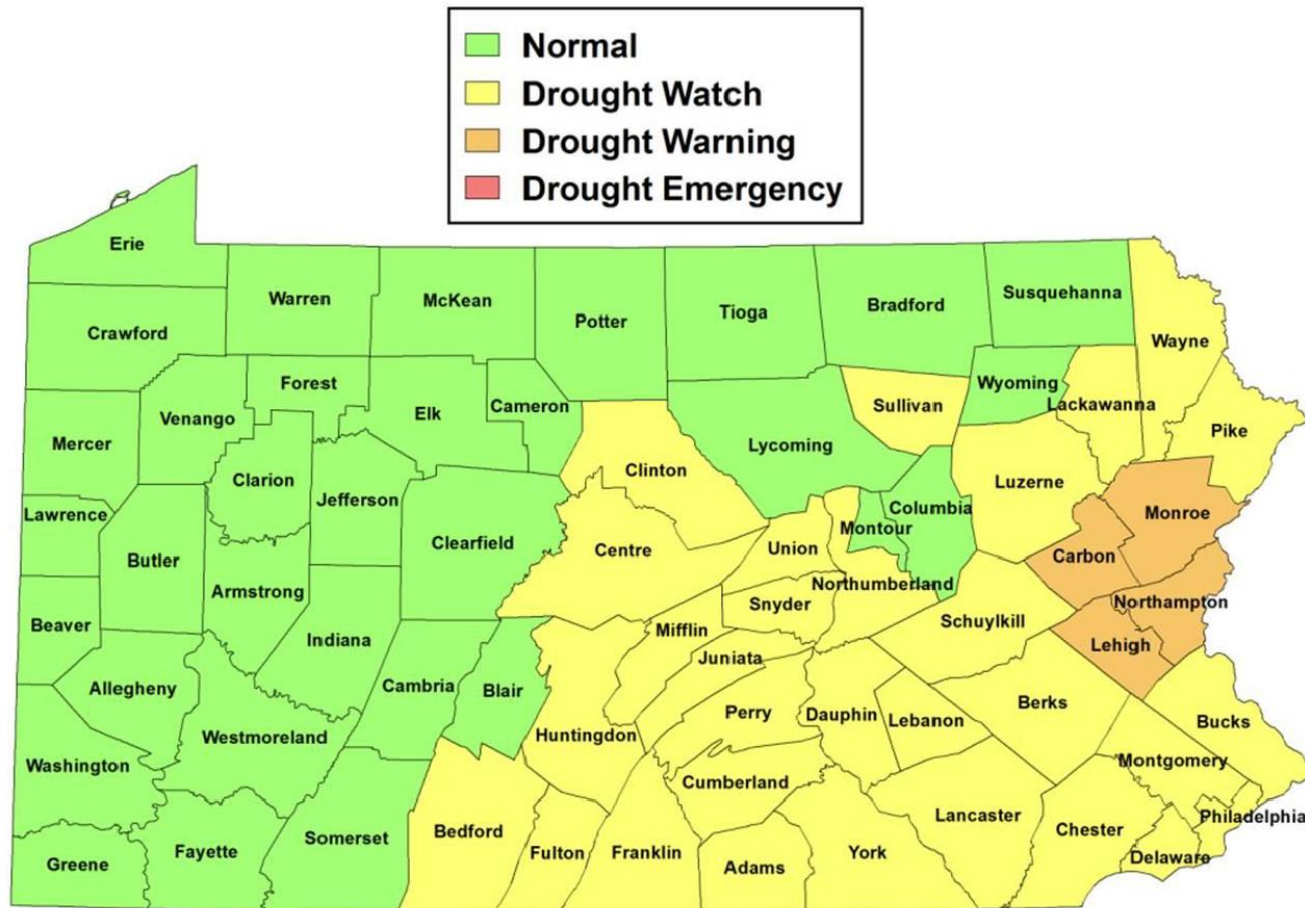
Palmer Index



PA DEP Drought Status – Since 5/16/17



PA DEP Drought Status - 11/16/16 example



Online PA DEP Drought Information

www.dep.pa.gov

Businesses

Water

Division of Planning & Conservation

Drought > Forms



Drought Regulations

Chapter 118

- Reductions of Major Water Use in a Commonwealth Basin Drought Emergency Area

Chapter 119

- Prohibition of Nonessential Water Uses in a Commonwealth Drought Emergency Area

Chapter 120

- Local Water Rationing Plans

Requirements During Drought Emergency

WHY?

- Governor's proclamation of drought emergency

WHO?

- Public water supplier providing service to 50 or more customer connections
- Major commercial and industrial water users

WHAT?

- Develop, adopt and submit drought contingency plan to Commonwealth Coordinator



Elements of a Drought Contingency Plan

- Public water supply contact Information
- Description of the sources
- Monthly average & peak day withdrawal rates
- Monthly average & peak day use rates
- Criteria to identify water shortage problems*
- Drought response plan of action
- Procedure for granting variances / exemptions

Chapter 118

*** GW Case Study**



Nonessential Uses

- Watering grass, athletic fields, outdoor gardens, landscaped areas, trees, and shrubs
- Watering golf courses (except per pre-approved plan)
- Washing paved surfaces
- Fountains, artificial waterfalls, reflecting pools
- Washing and cleaning mobile equipment
- Serving water in restaurants, unless requested
- Fill / top off swimming pools
- Water from a fire hydrant except for firefighting, testing, or necessary flushing
- Use of any water that is not a beneficial use



Local Water Rationing Plan

- **May** be required by Commonwealth Drought Coordinator as part of a drought emergency
- Required 10 days after written notification
- Prepared separately or as a part of the drought contingency plan
- PA DEP template found online
- Submit online via Drought Emergency Application (DEA)

DEPGreenPort
Login

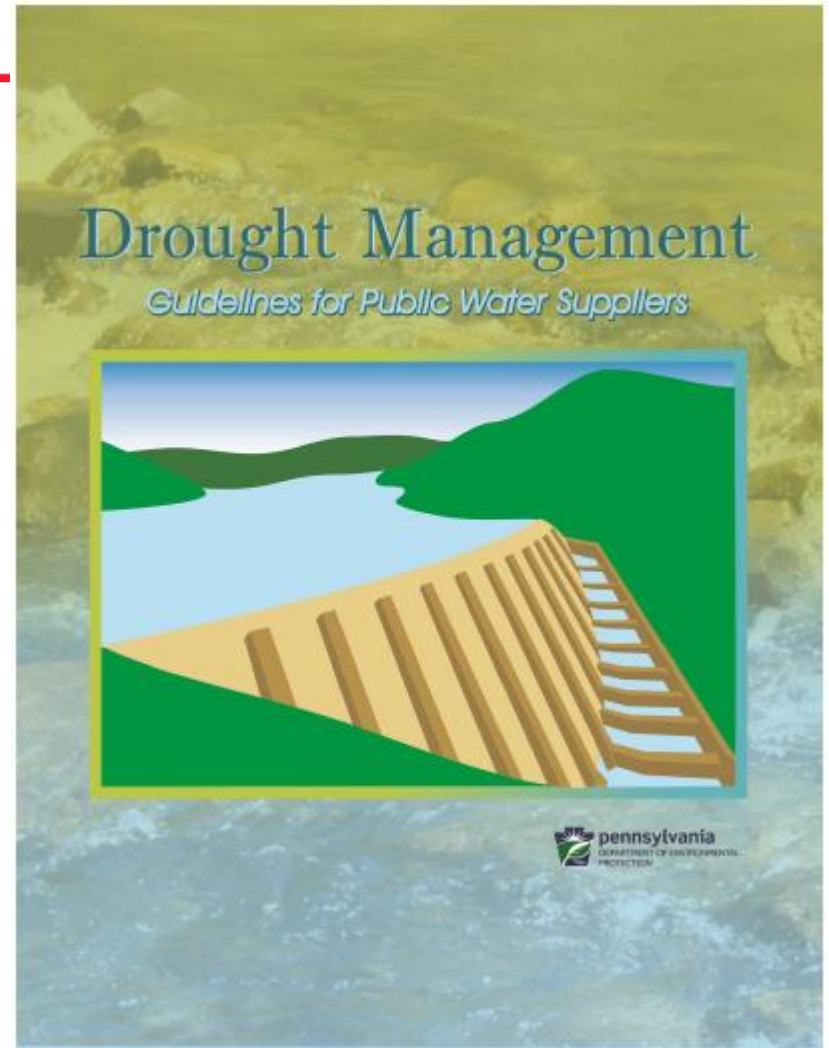
Variance Requests

- Application for Exemption or Variance from Non-Essential Use of Water Restrictions in Drought Emergency Area
- Application for Reduction of Instream Flow Requirement

Case Study

Developing criteria to identify water shortage problems

*PA DEP Guidance:
Drought Management,
Guidelines for Public
Water Suppliers*



Case Study

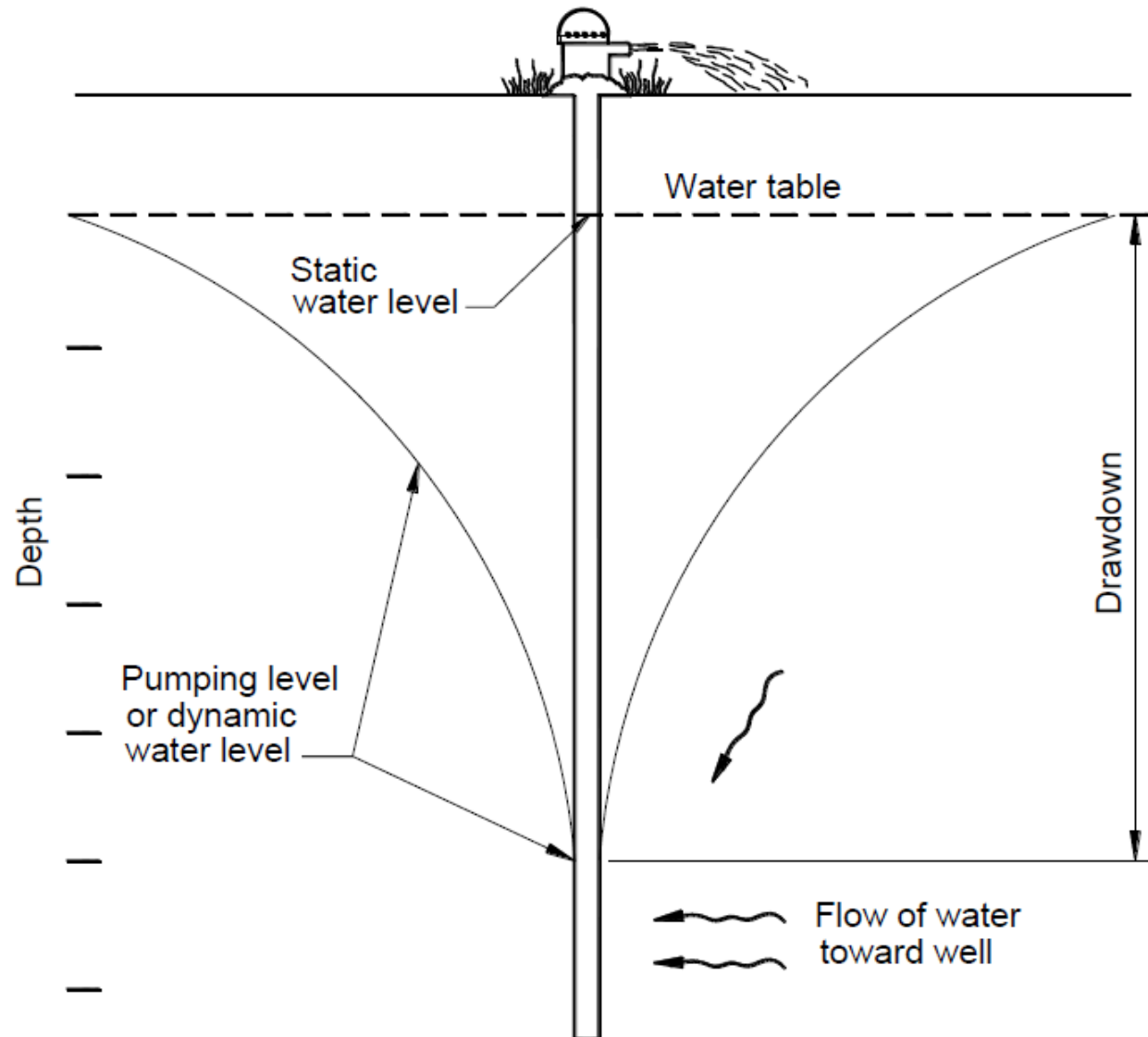
- Methodology: PA DEP, Drought Management, Guidelines for Public Water Suppliers
 - Gather static and pumping water level data
 - Identify normal pumping level
 - Consider geology and well construction
 - Identify critical pumping level



Case Study

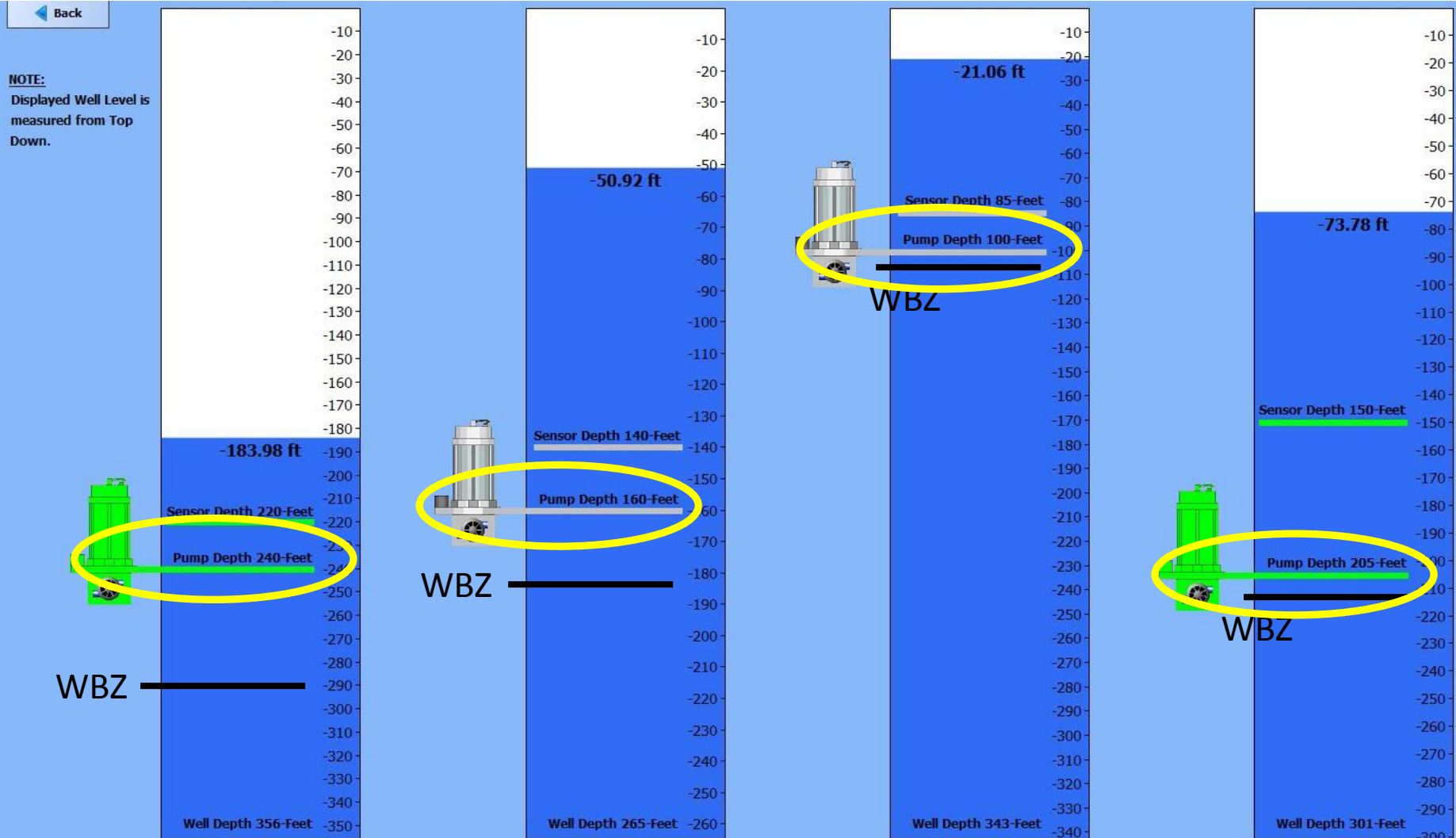
- Water supplier in northern Pennsylvania
- 4 wells
- Depth range: 265 - 356 feet deep
- Static water level range: 14 - 80 feet BTOC
- Contributing geology:
 - Ridgeley Sandstone (calcareous sandstone)
 - Keyser Limestone
 - Tonoloway Limestone

Case Study

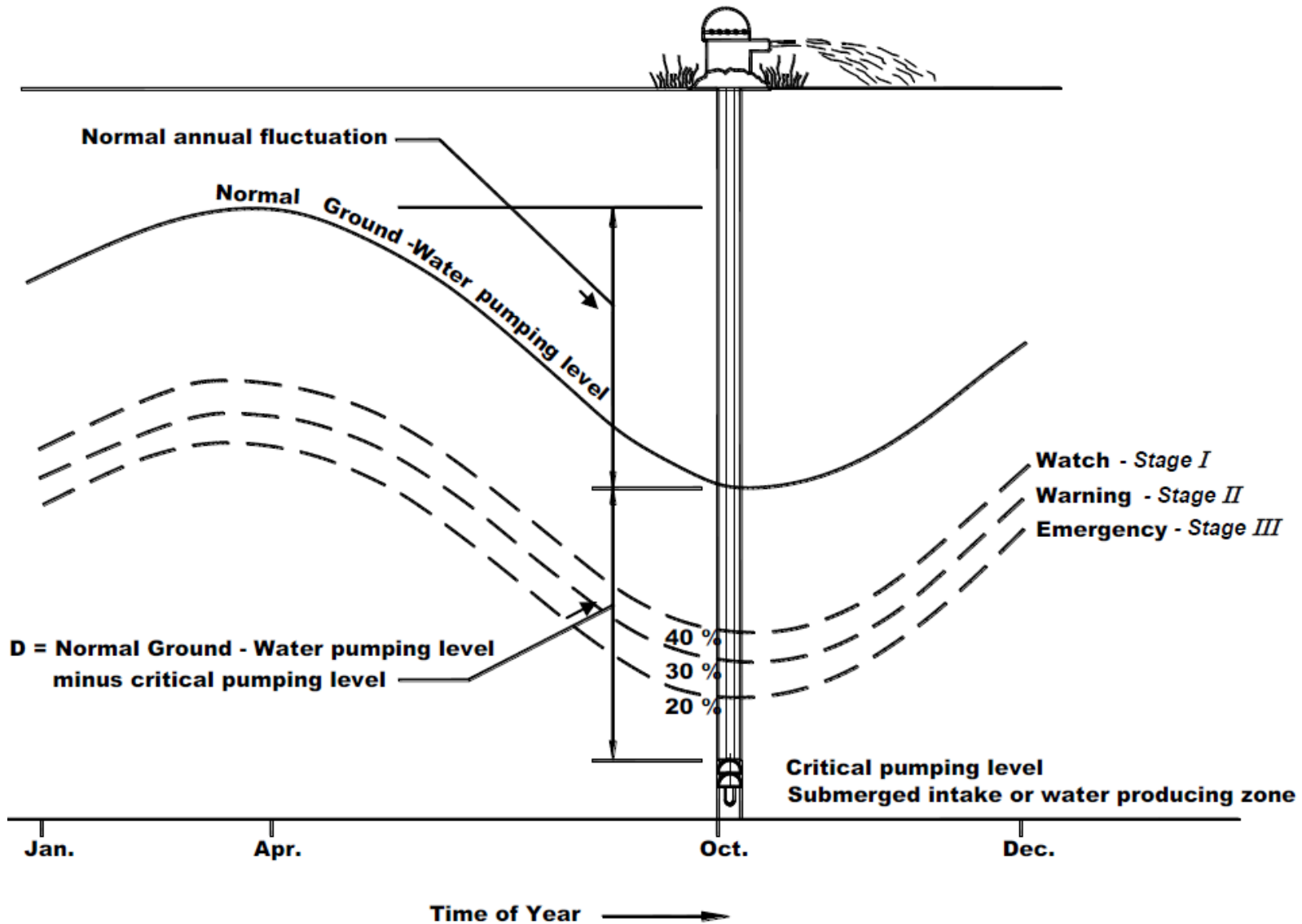


Case Study

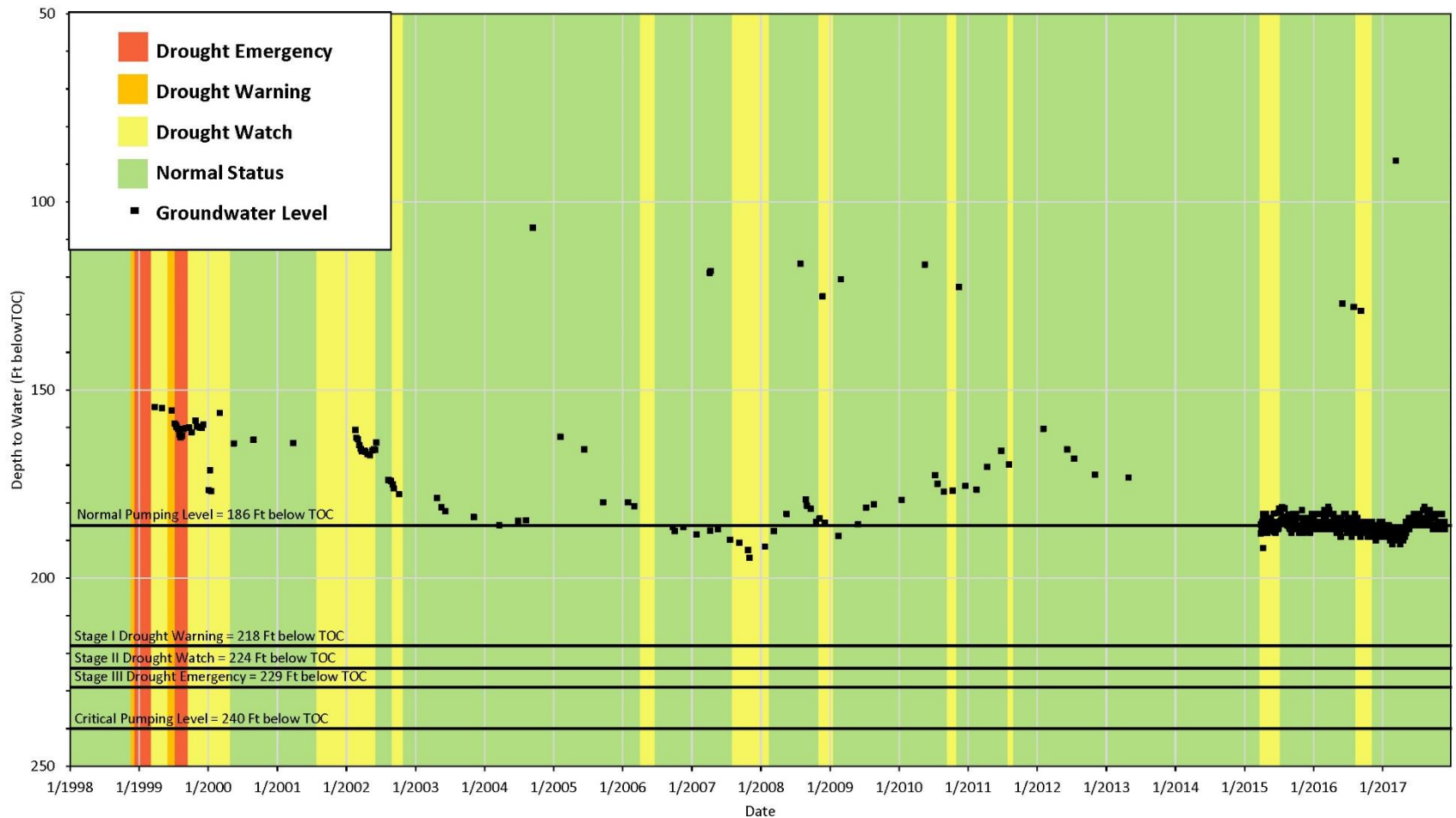
Pump depth was chosen as the critical pumping level for all 4 wells



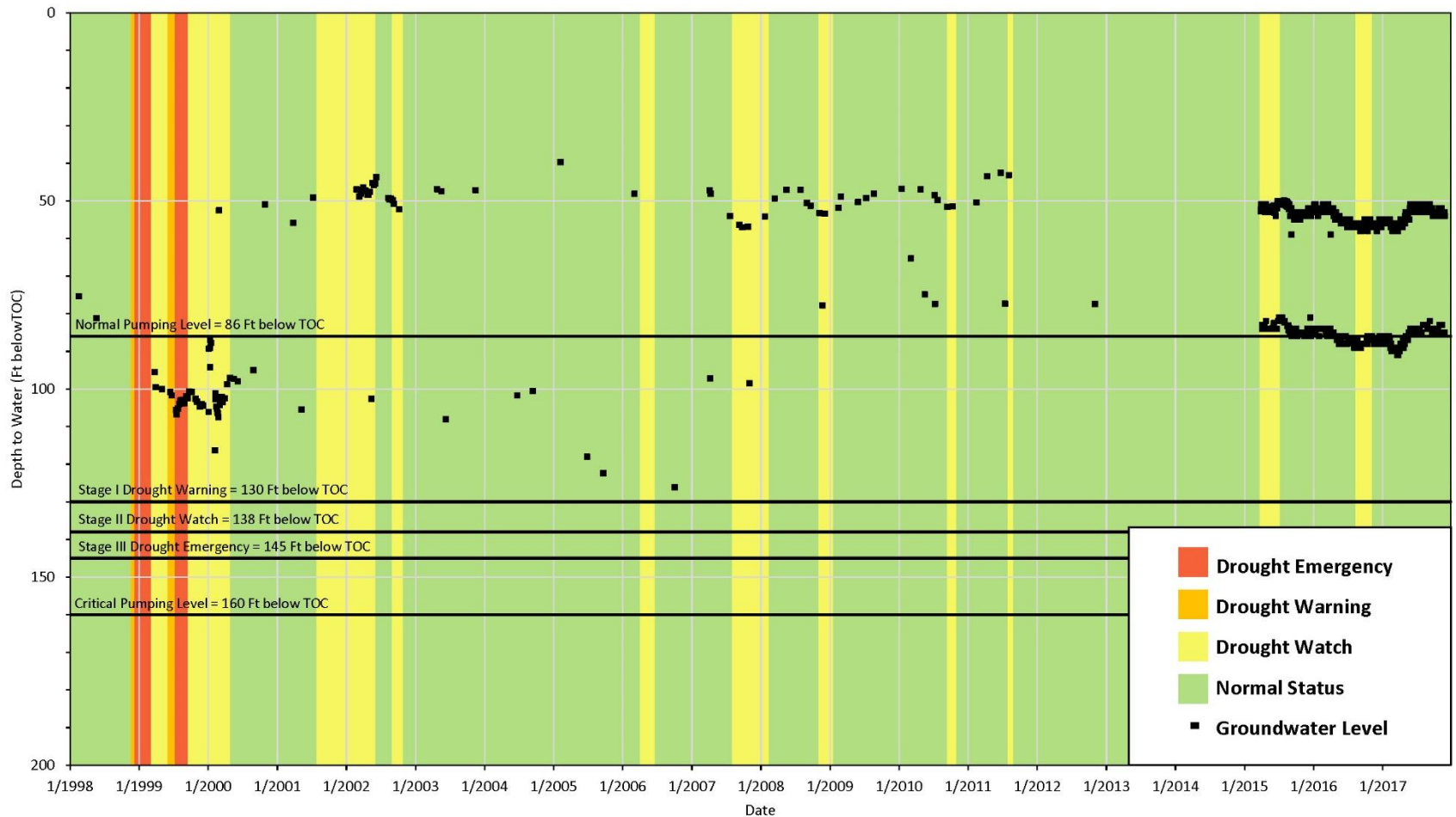
Case Study



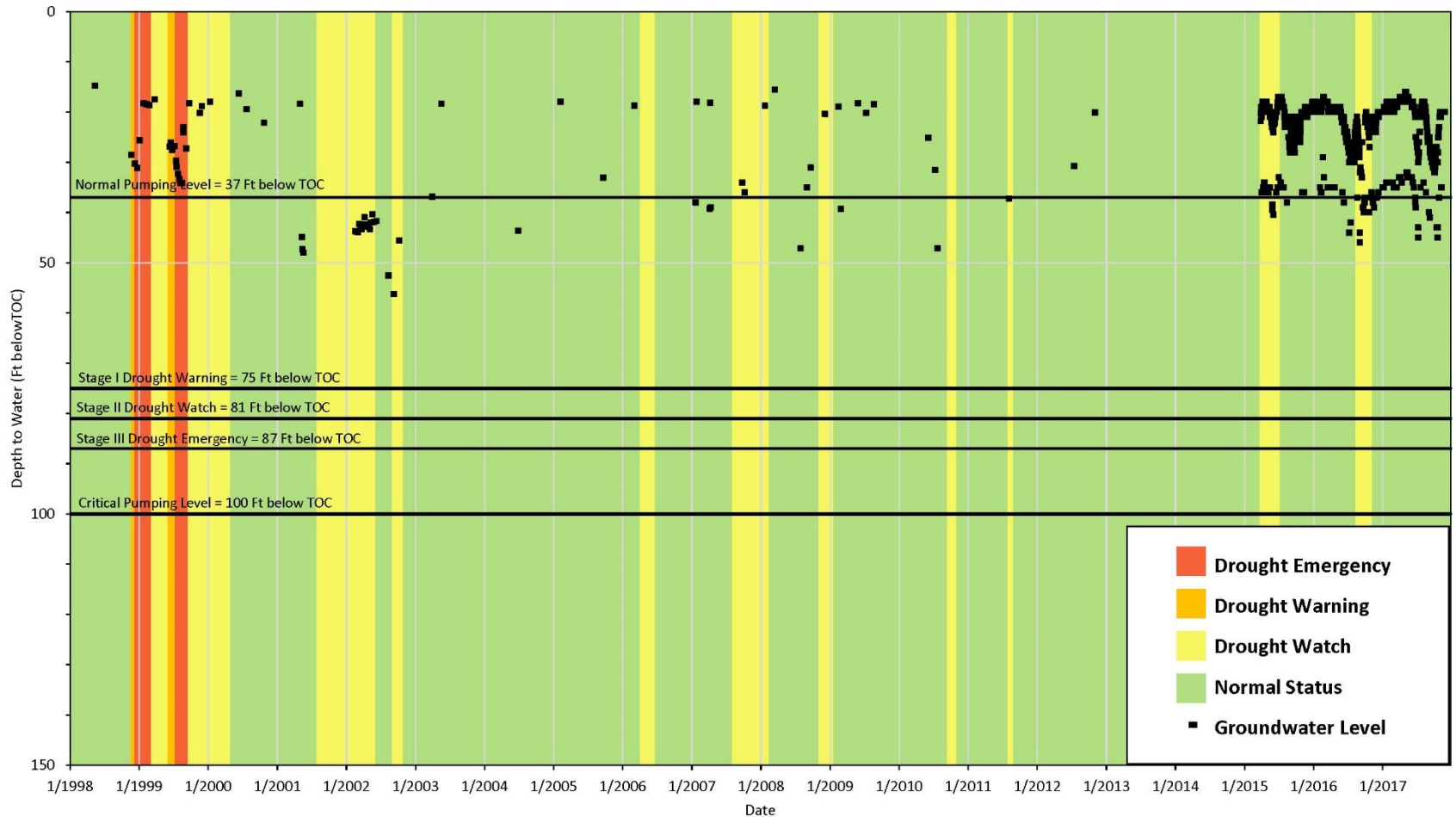
Case Study



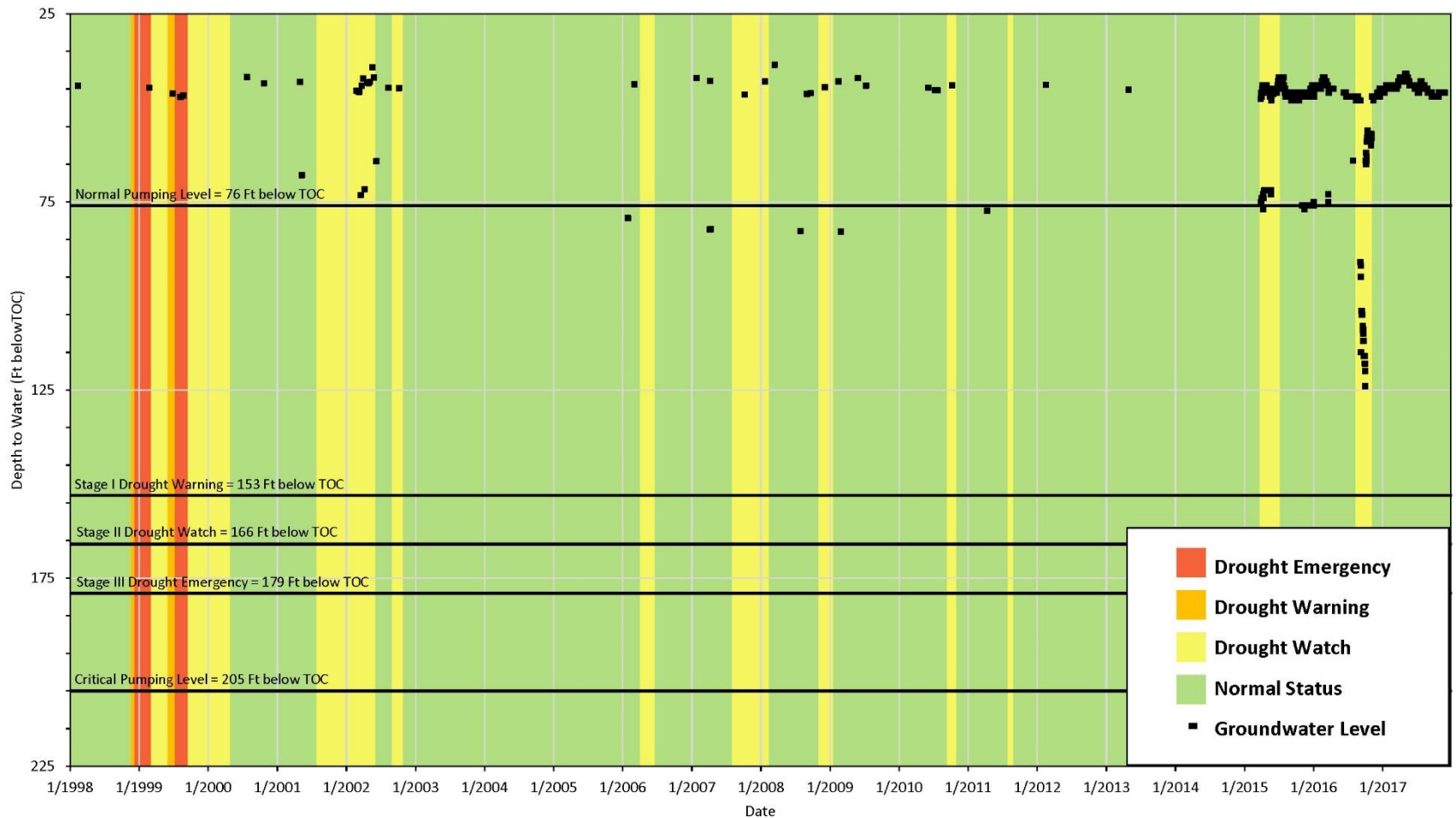
Case Study



Case Study



Case Study



Alternative – Triggers based on Capacity

STAGE I

$$\text{Present Capacity} = \frac{\text{Peak Day Water Use} \times 100}{\text{Normal Capacity}} = \text{___\% of Normal Capacity}$$

STAGE II

$$\text{Present Capacity} = \frac{\text{Average Daily Water Use} - 10\% \times 100}{\text{Normal Capacity}} = \text{___\% of Normal Capacity}$$

STAGE III

$$\text{Present Capacity} = \frac{\text{Average Daily Water Use} - 20\% \times 100}{\text{Normal Capacity}} = \text{___\% of Normal Capacity}$$



Questions?

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