

# Extreme Weather: Monitor & Protect Your Source

---

---

**“OVER THE LAST 5 YEARS, MAINE ENDURED  
11 WEATHER EVENTS... DECLARED DISASTERS BY  
FEMA...**

**FEDERALLY-DECLARED DISASTERS AVERAGE  
BETWEEN 5 & 6 EVENTS EVERY 5 YEARS”**

(mpbn 2/22/12)

*Maine Water Utilities Association  
Augusta, Maine  
September 12, 2013*

*Matthew Reynolds. P.E, C.G.*

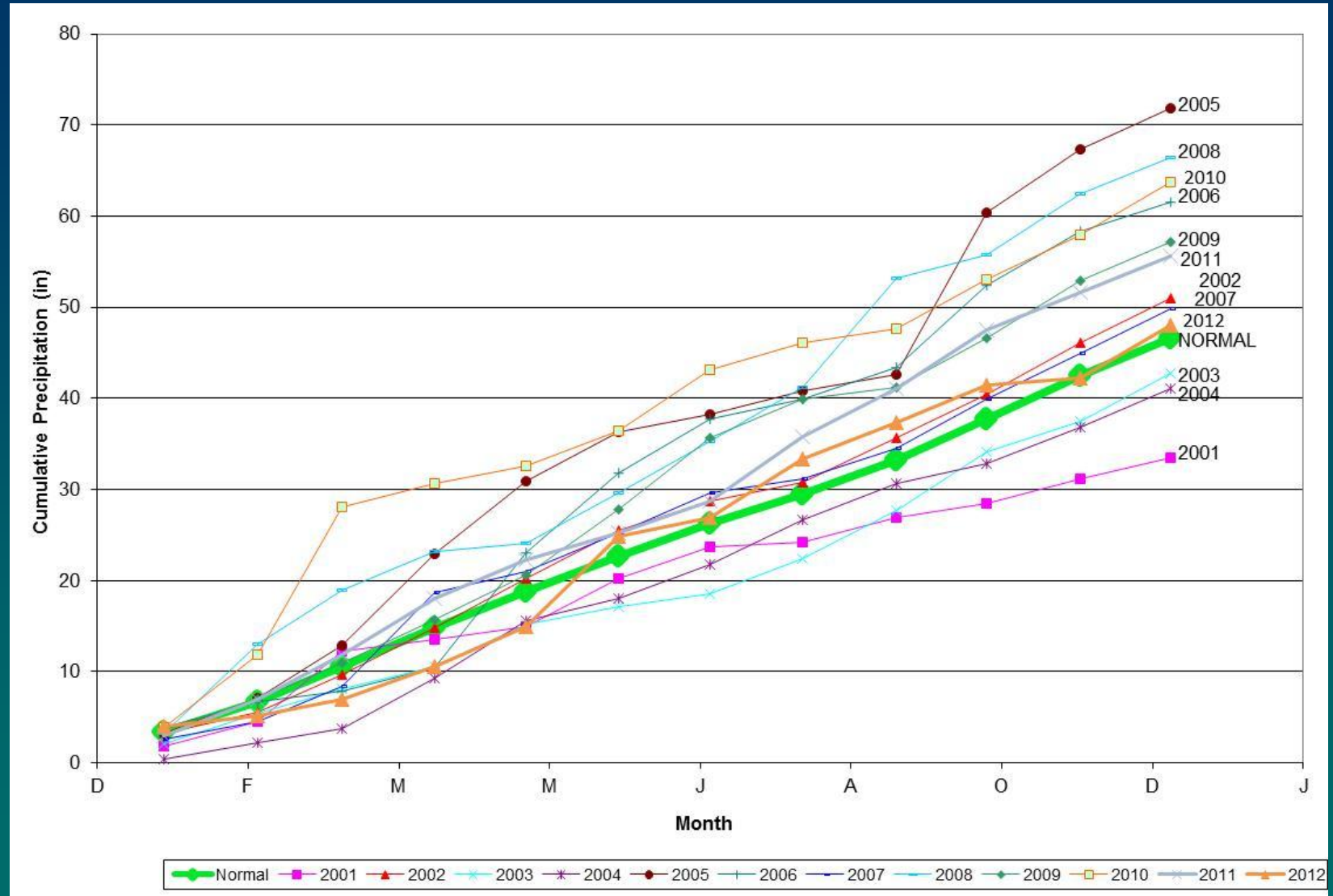


# Overview of Presentation

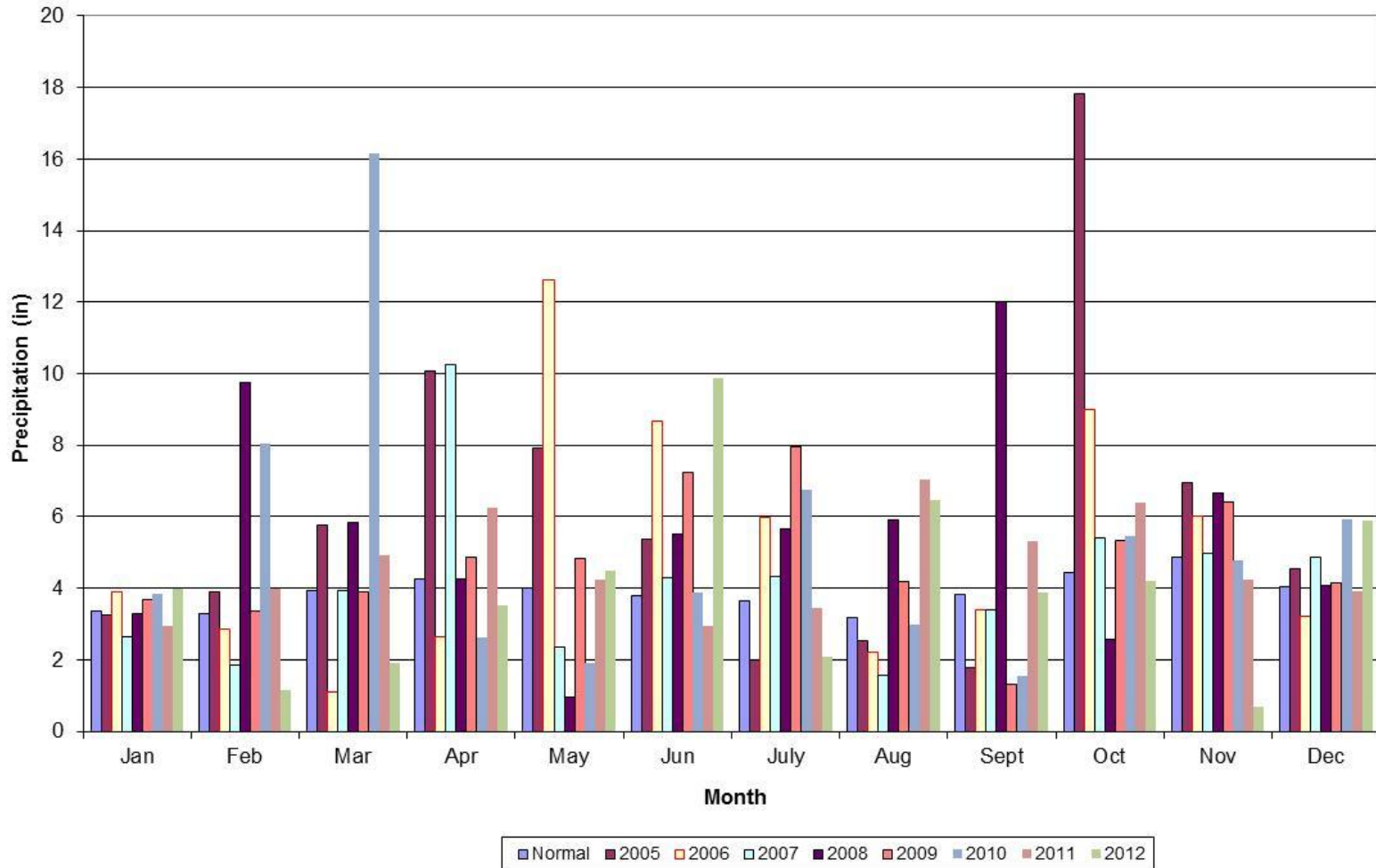
---

1. Weather Context
2. Surface Water Sources
3. Groundwater Sources
4. Awareness & Planning

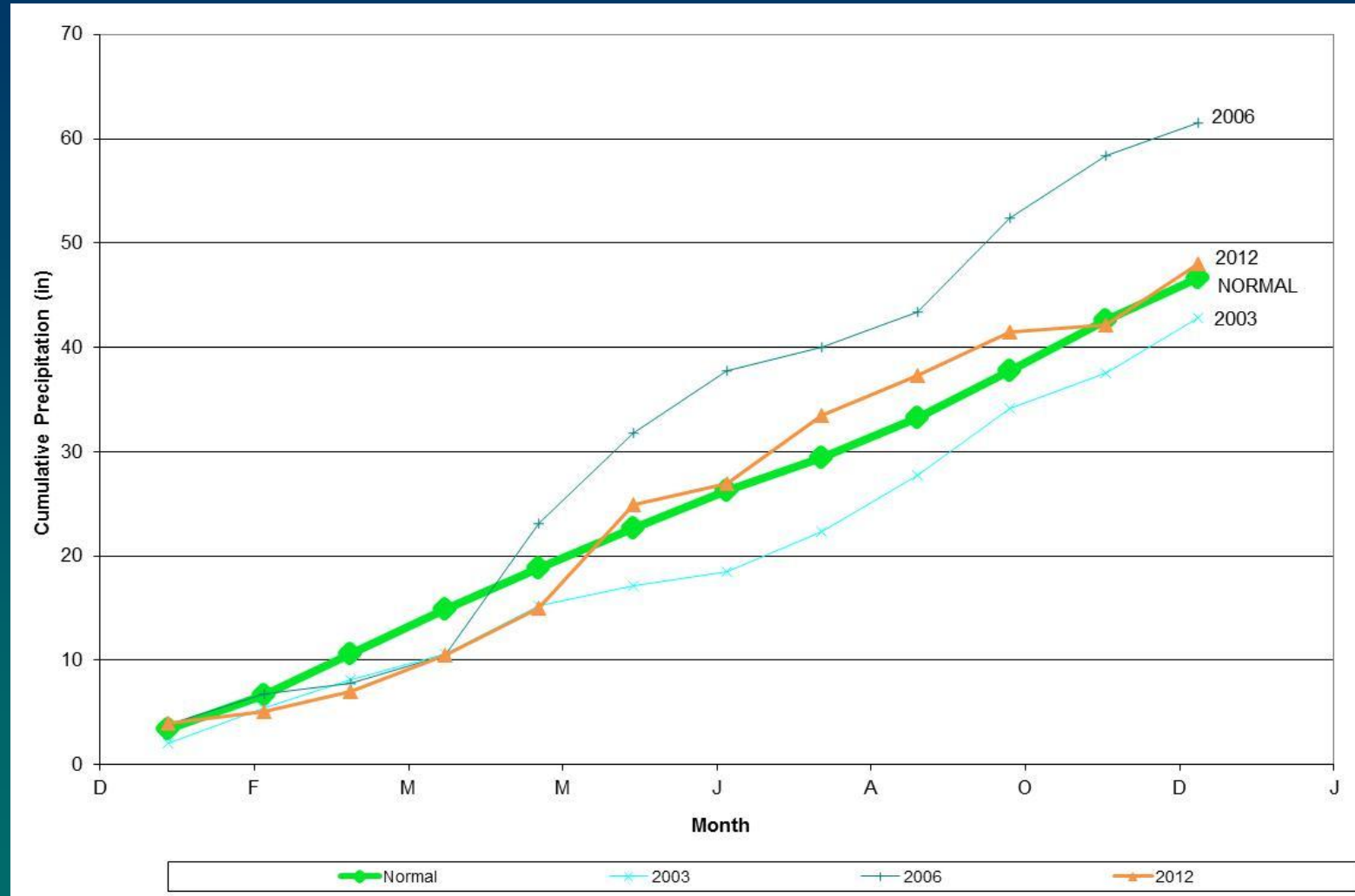
# Annual Precipitation Since 2001



# Extreme Precipitation



# Precipitation At Both Extremes



# Is This Important to Your Source?

---

- Nearly 10 Years of Above-Normal Precipitation
- Extremely High Precipitation Has Occurred in 8 of 12 Months
- There Have Also Been 2-3 Month Periods of Low Rainfall

How Can This Impact Your Source Quantity?

Can It Influence Your Source Quality?

# Be Proactive & Prepared

---

- **Be Aware of and Keep Track of Climate Predictions**
- **Understand Your Source Watershed's Strengths & Vulnerabilities**
- **Monitor & Manage Your Source**

# Surface Water Sources

---

## Changes to Climate and Weather Patterns:

1. Extreme Precipitation & Runoff Events
2. Decreased Winter Ice (Late Ice-In, Early Ice-Out)



# Surface Water Sources

---

## Extreme Precipitation & Runoff Events:

- **Runoff Carries Sediment with Nutrients (P, N, C)**
  - How Vulnerable is Your Source to Increased Nutrients?
  - What is the Nutrient Load of Sediments in Your Watershed (Geology, Land Use)?
  - Are There Reservoirs of Sediment Building In Your Watershed (Wetlands, Unstable Land, Stormwater Detention Ponds)
  
- **What Infrastructure Controls Sediment in Your Watershed & Who Controls That Infrastructure?**

# Surface Water Sources

---

## Late Ice-In & Early Ice-Out:

- **Changing Ice Patterns Will Change:**
  - Circulation, Mixing & Turnover Patterns of Your Source
  - May Increase the Available Light (Algae Power) at Certain Times
  - Temperature Variations
  
- **What Is the Natural Biological Population (Algae, Fish, etc.) of Your Source & Are They Vulnerable to Changes, Invasion from Other Species, Etc.?**

# Surface Water Sources

---

## UNDERSTAND & MONITOR

- Be Aware Of Evolving Science
- Know Your Watershed & What's Happening (Are Public Works or MDOT Changing Culverts & Drainage?)
- Review & Revise Your Monitoring Program
  - DO, Secchi Disc (Near Real-Time)
  - Lake Turnover Patterns
  - Basic Trophic State
  - Key Algae & Other Species
- Evaluate The Monitoring Data & Track Over Time

# Groundwater Sources

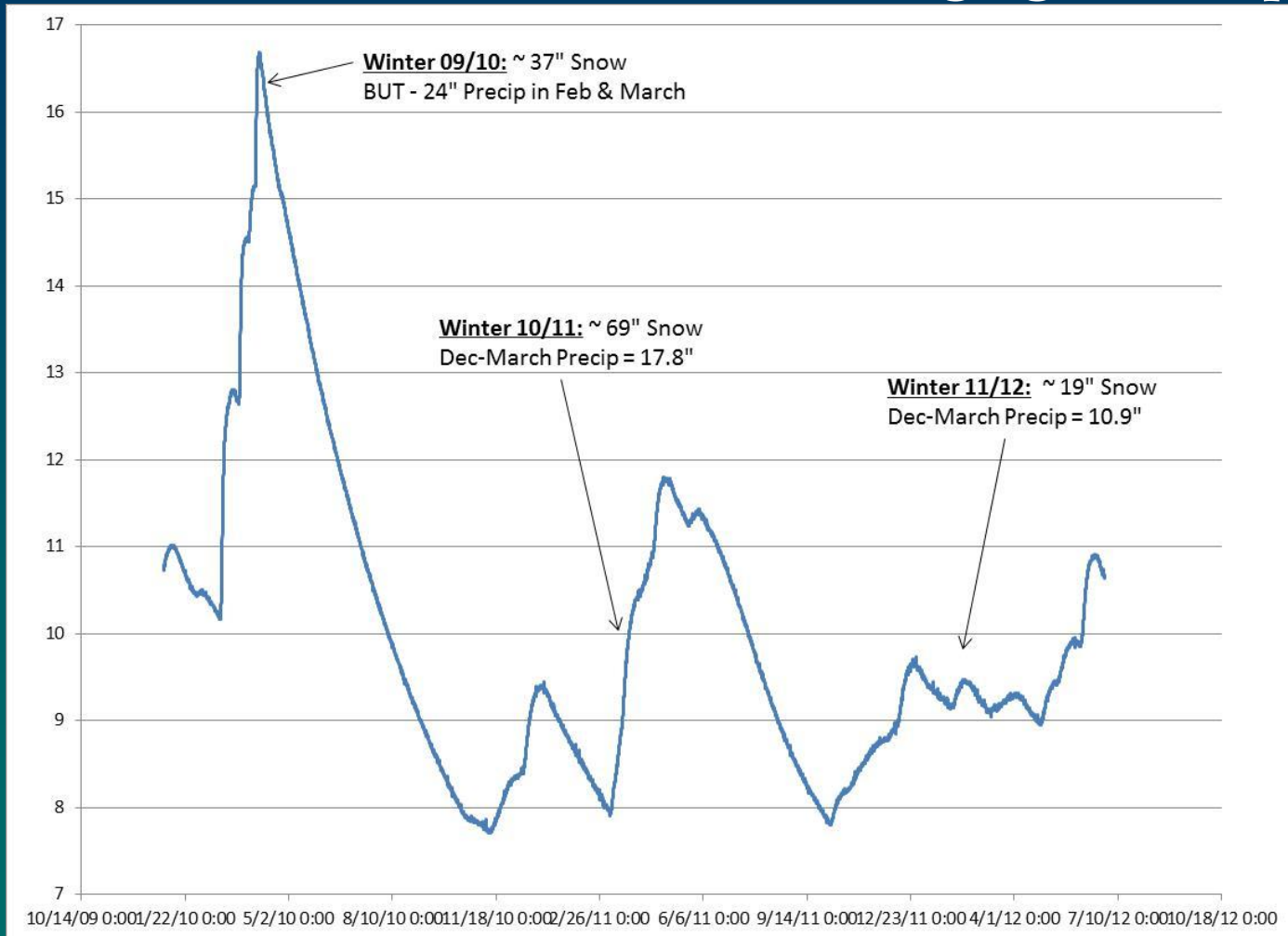
---

## Changes to Climate and Weather Patterns:

1. Decreased Snow Pack & Spring Snow Melt
2. Extreme Precipitation & Recharge Events

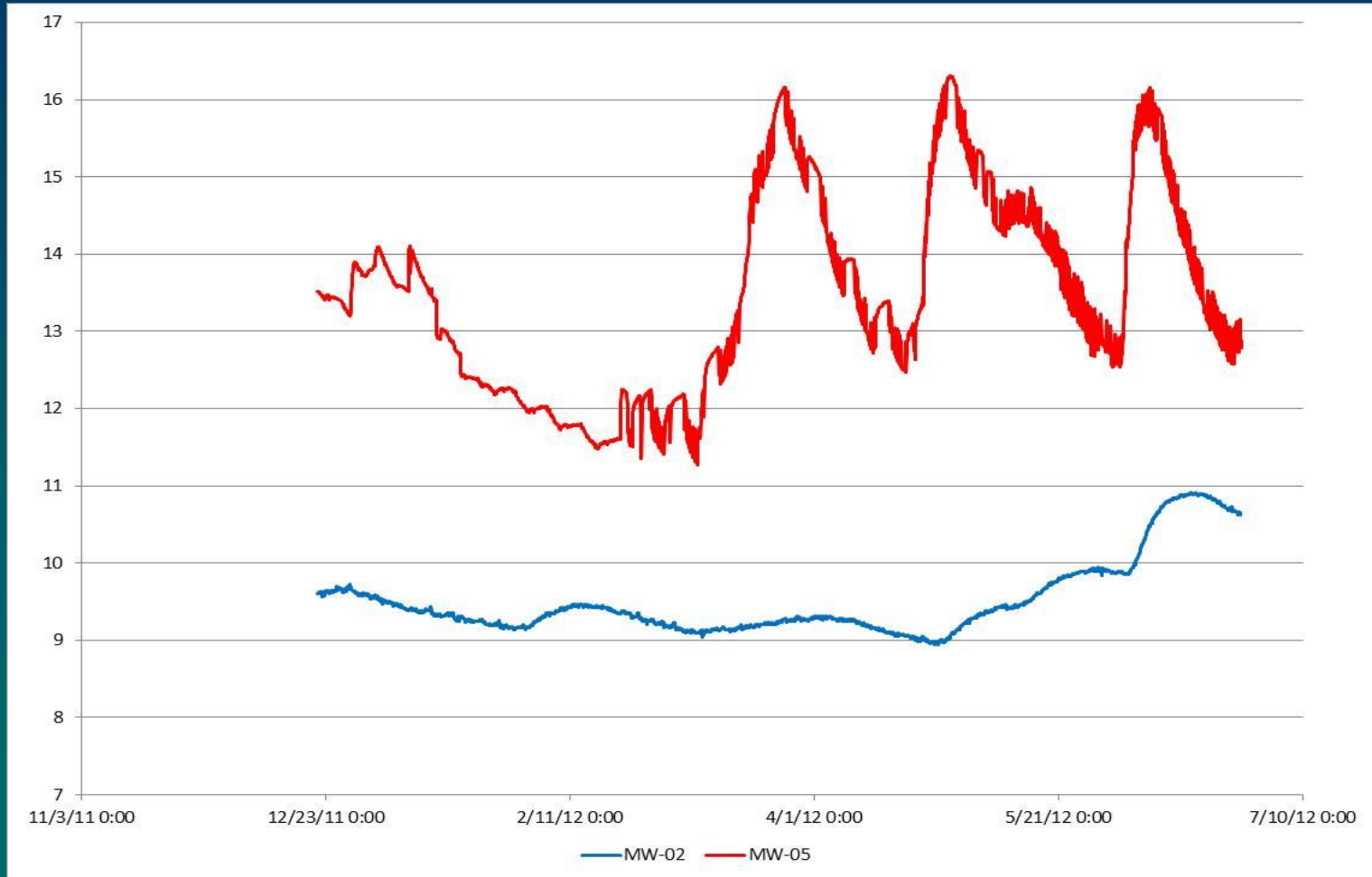
# Groundwater Sources

## What's The Role of Snow Pack Recharging Your Aquifer?



# Groundwater Sources

## How Does Your Aquifer Respond to Recharge?



# Groundwater Sources

## Extreme Precipitation & Runoff Events:

- **Extreme Precipitation Increases Runoff**
  - How Vulnerable is Your Aquifer to Runoff From Development (Parking Lots, Unstable Oil Tanks, Surface Water, etc.)?
  - Are There Areas Where High Water Table Will Increase Leaching (e.g., Failed Septic Systems)?
  - Can Winter Thaws Effect Road Salt Impacts?
- **What Infrastructure Controls Runoff in Your Watershed & Who Controls That Infrastructure?**

# Groundwater Sources

---

## UNDERSTAND & MONITOR

- Be Aware Of Evolving Science
- Understand the Dynamics of Your Aquifer
- Know What's Happening In Your Watershed (Public Works, MDOT, LID Projects)
- Review & Revise Your Monitoring Program
  - Water Level Trends in Your Aquifer
  - Water Quality Upgradient In Your Aquifer
  - Evaluate The Monitoring Data & Track Over Time



# Closing Thoughts

---

- Consider The What If What-Ifs (Extreme is Happening)
- If You Don't Understand & Monitor, It's Hard to Protect Your Source
- Is Your Infrastructure Stable & Secure?
- What Is Your Utility Doing to Reduce Energy Consumption & Be Part of the Solution?