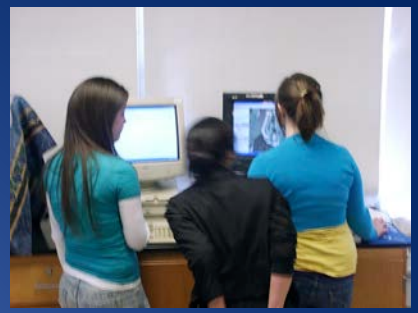


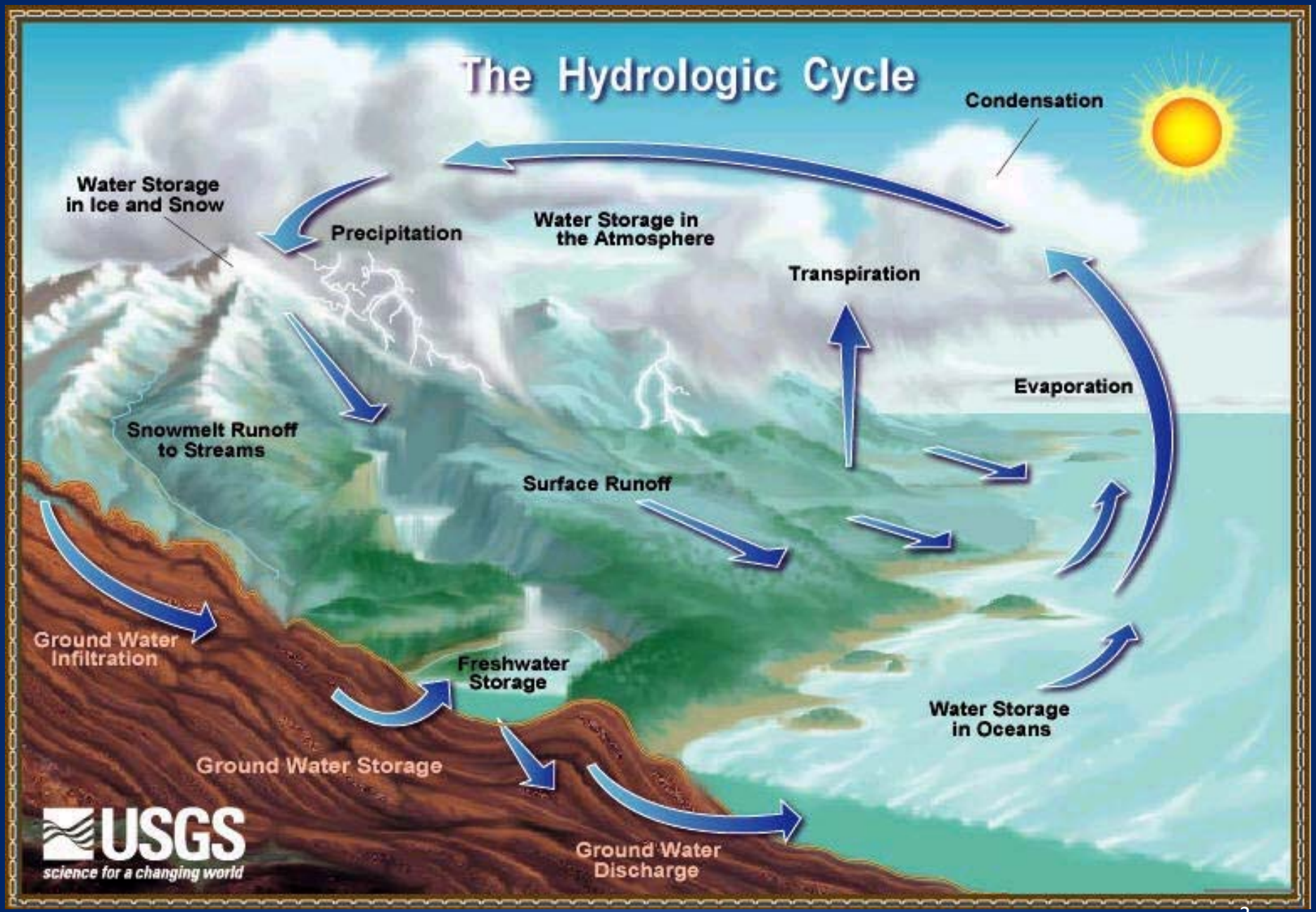
GET WET!

Training Professionals

Teresa E. Thornton, M.S., Ph.D.

1865 THE UNIVERSITY OF MAINE

2012-2013


The Hydrologic Cycle
Condensation
Water Storage in Ice and Snow
Precipitation
Water Storage in the Atmosphere
Transpiration
Evaporation
Snowmelt Runoff to Streams
Surface Runoff
Ground Water Infiltration
Freshwater Storage
Water Storage in Oceans
Ground Water Storage
Ground Water Discharge
USGS
science for a changing world

Threats to Groundwater

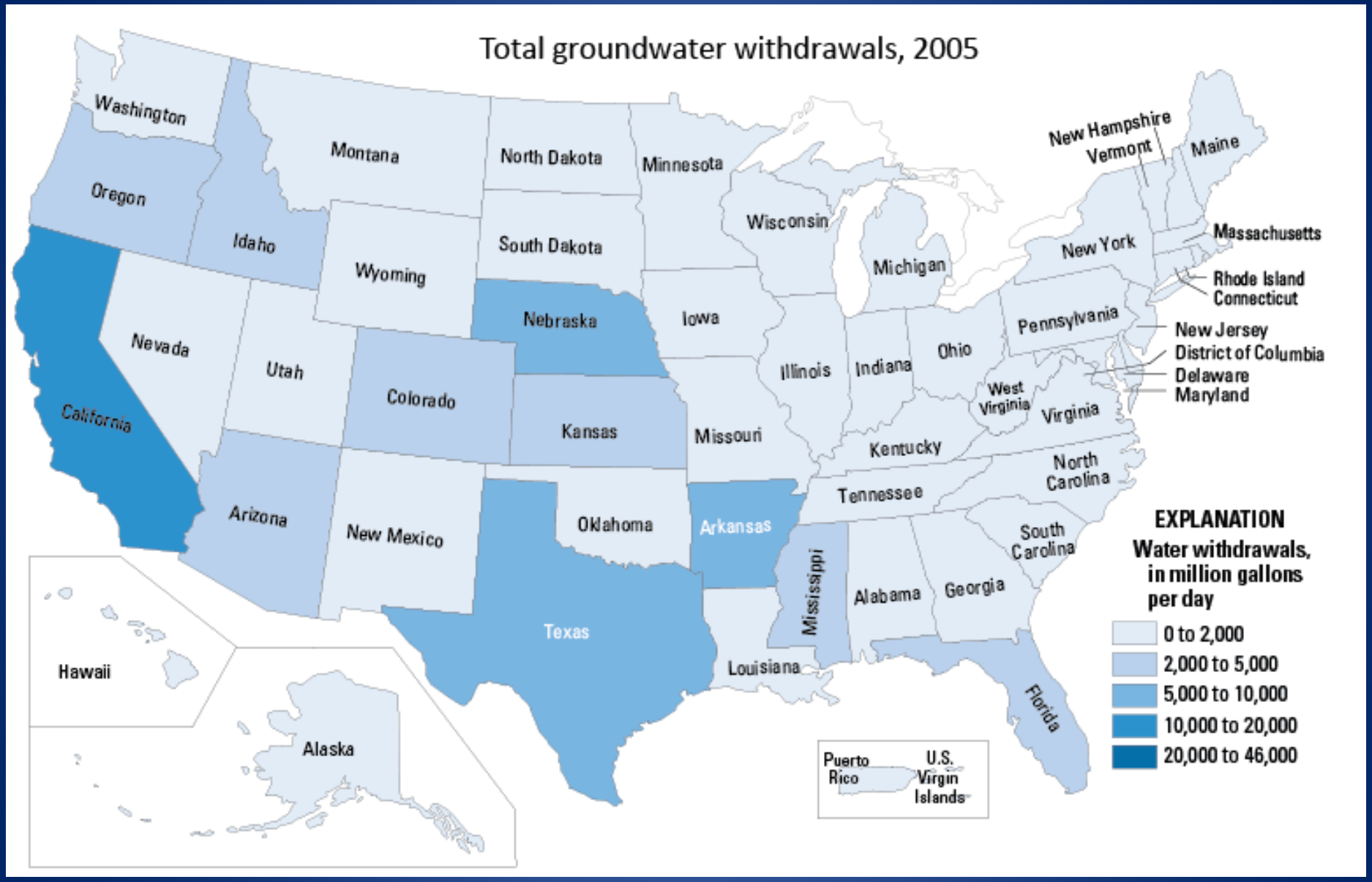
- Increasing development and demand
- Road salt, nitrates, historical contaminants, etc.
- Climate change
  - Precipitation changes
    - Saltwater intrusion in coastal communities
    - Chemically concentrated, scarce groundwater (decreased recharge)
- Natural contaminants

http://spacing.ca/votes/?cat=42

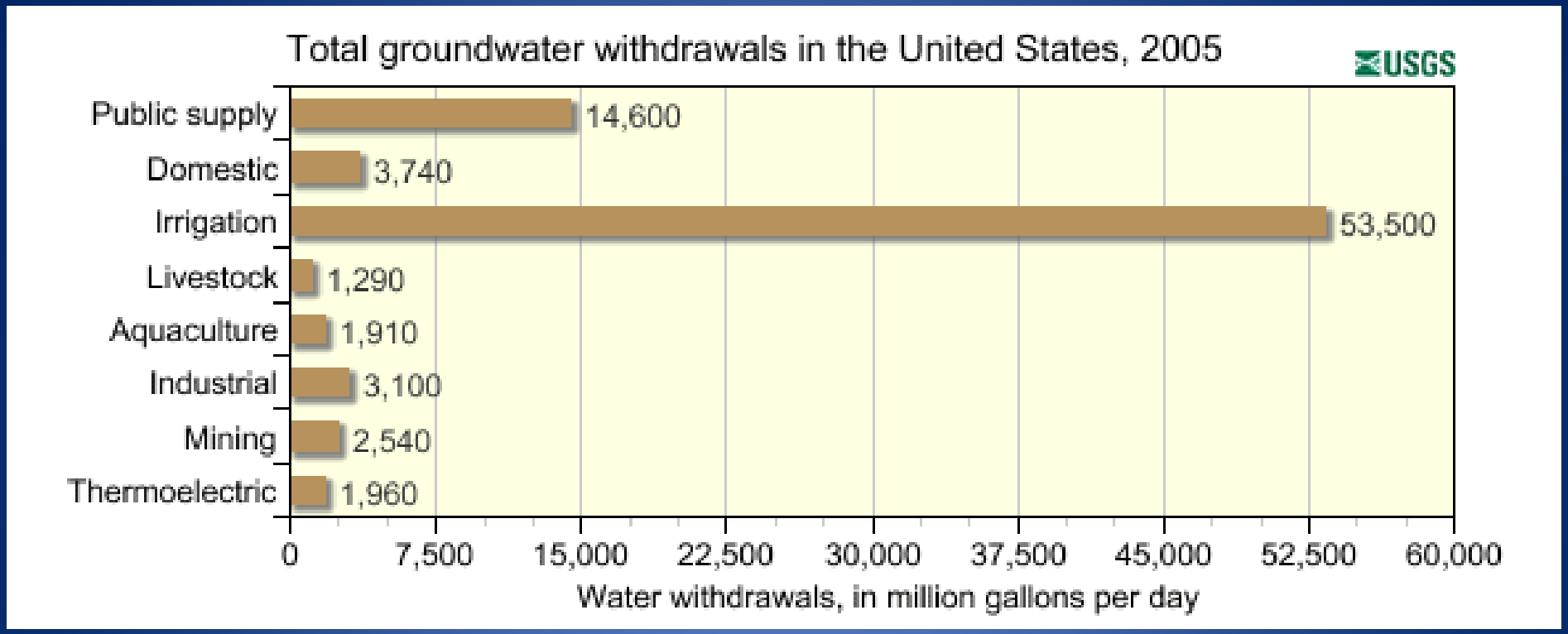
http://facstaff.unca.edu/chennon/images/ocean.jpg

Private Well Water

- More than 15.9 million groundwater wells in the United States (NGWA.ORG)
- Approximately 500,000 new residential wells are constructed annually (NGWA.ORG)
- Limited to no regulations or enforcement for water quality testing
- Little incentive for homeowners to test wells



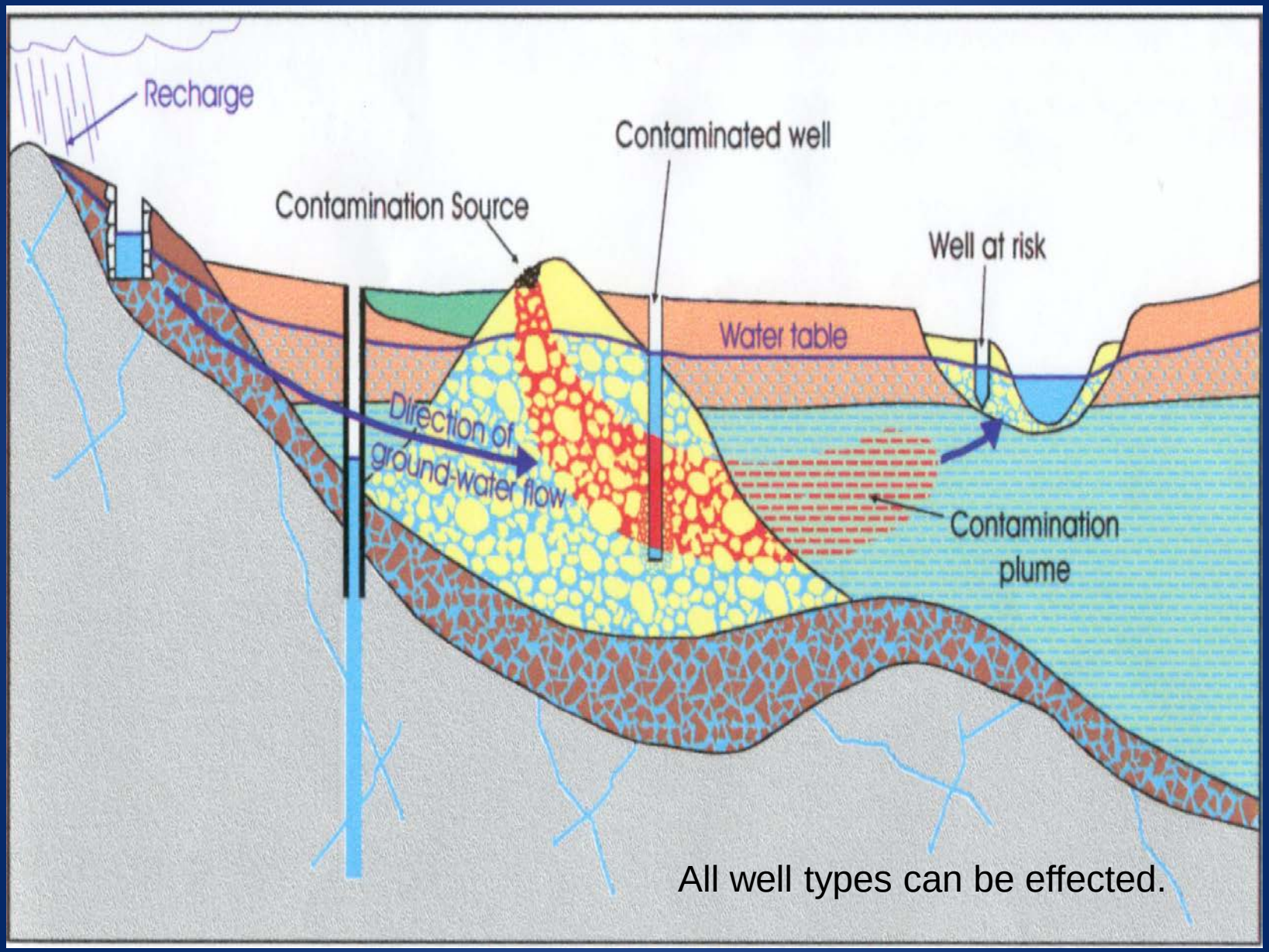
http://ga.water.usgs.gov/edu/wugw.html



http://ga.water.usgs.gov/edu/wugw.html

The largest use for groundwater in the US is agriculture.

CONTAMINATION OF DRINKING WELLS



All well types can be effected.

GET WET!

Groundwater Education Through Water Evaluation and Testing.

PROGRAM GOALS:

- Collect data on groundwater quality (students).
- Build interest in the community (schools).
- Educate public to the need for private well testing
- Establish groundwater monitoring network.
  - -Through random sampling of wells

GET WET!

EDUCATIONAL GOALS:

Students:

-Field sampling techniques

-Laboratory skills

-Computer competence in Excel, Word, PowerPoint and a GIS program

-Internet research capabilities

-Mapping abilities

-Water chemistry

-An understanding why conservation and commitment to a healthy environment takes an entire community

GET WET!

The Numbers:

- 8 years old
- 7 states
- 44 towns, 23 schools
- 100+ teachers and pre-service teachers
- 1000's of 5th-12th students
- 100's of Professional and Community Volunteers

GET WET!

- K-12 Students (and indirectly their household members)
- Teachers
- Administrators
- State Employees
- Watershed association representatives & ENGOs
- County or town employees
- Local business owners
- College professors & undergraduate students
- Parents, retirees, and other community members

GET WET! Locations

MAINE

Penobscot Watershed (3 towns)

Androscoggin Watershed (3 towns)

Frenchman Bay Watershed (4 towns)

Nezinscot River Watershed (3 towns)

Acton Watershed

Androscoggin County

Sagadahoc County

NEW HAMPSHIRE

Connecticut River Watershed (4 towns)

Ossipee Watershed (6 towns)

Wakefield Watershed

VERMONT

Connecticut River Watershed (2 towns)

RHODE ISLAND

Scituate Watershed (4 towns)

CONNECTICUT

Pawcatuck Watershed (3 towns)

NEW YORK

WallKill River Watershed (4 towns)

FLORIDA

Okeechobee Watershed (3 towns)

GET WET!

Step 1: Full day training for educators & local citizen volunteers

GET WET!

Step 2: Educate and Train Students

http://www.usawaterquality.org/NewEngland/Focus_Areas/well/

GET WET!

Students pre-visit presentation includes:

- Drinking water sources
- Hydrologic cycle
- Private well types
- How a well can become contaminated
- Potential contamination sources
- Testing parameters
- Student's role in GET WET!
- How to sample well water

GET WET!

Step 3: Field sampling and testing

GET WET!

Parameters Students Test for:

- Chloride
- Nitrates
- Total Metals
- Conductivity
- Hardness ($CaCO_3$)
- pH

GET WET!

A seventh station is set-up in the classroom for Data analysis and mapping

GET WET!

Step 4: A Post visit is scheduled to discuss raw data with students and explain the presentation they will be creating with local professionals

Bottle Identification Number	Chloride (mg/L)	Nitrate (mg/L)	pH	Hardness (mg/L CaCO3)	Total Metals (mg/L)	Conductivity (uS/cm)
49	130	0	7.01	239.4	20	893
87	175	0	6.93	51.2	10	1075
75	45	0	7.05	136.8	20	512
71	135	0	7.1	324.9	10	912
48	45	0	7.1	119.7	10	460
66	665+	0	7.21	17.1	50	**3126**
89	330	0	6.96	34.2	20	1135
61	280	8.8	6.8	85.5	20	400
24		0	7.13	51.2	200	1124
59	145	0	6.86	324.9	10	950
20	95	8.8	6.85	119.7	100	341
3	250	0	6.88	68.4	50	1123.5
6	235	0	7.2	51.3	20	667.5
33	295	22	4.12	222.3	100	1371.5
32	105		6.78	119.7	119.7	427
46	70	0	9.1	34.2	20	192
2	150	0	7.05	239.4	10	869
51	25	0	7.18	205.2	50	501
42	365	0	7	51.3	100	969
16	125	0	7.05	273.6	100	770

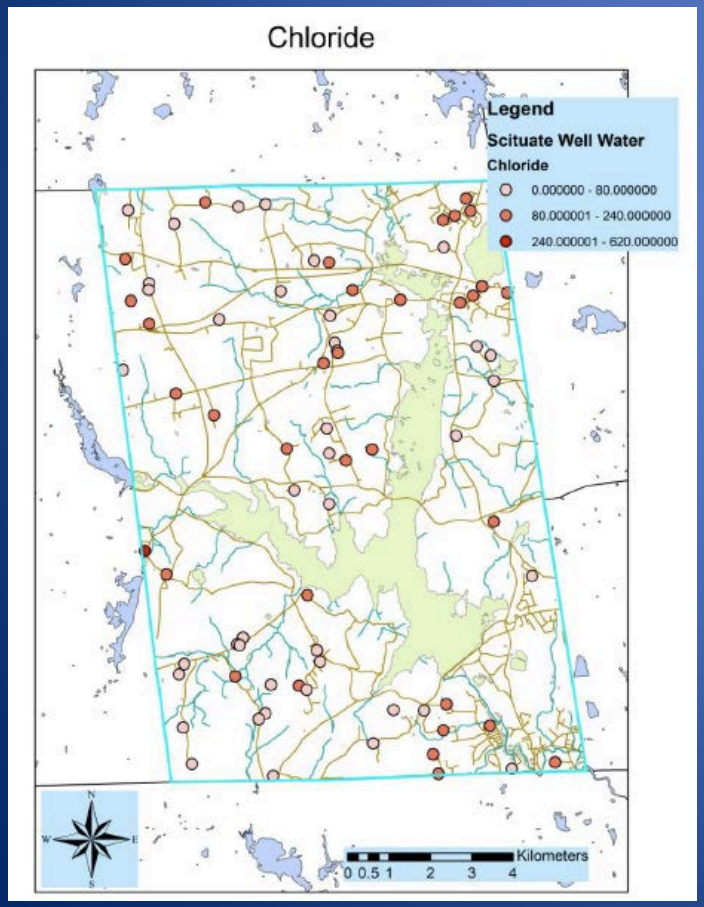
GET WET!

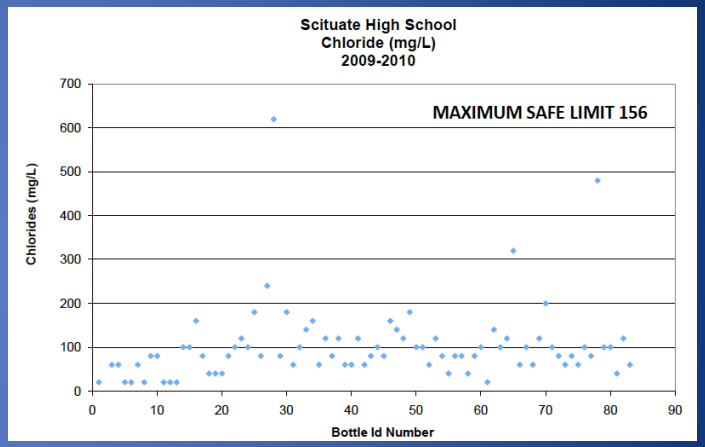
Parameters of Community PowerPoint Presentation:

- Land-use issues
- Local geology
- Groundwater inputs
- Specific local water concerns
- Results in graph form and mapped in a GIS program
- Parameters we did NOT test

GET WET!

Data analysis and mapping





Statistical Results of Chloride
(mg/L)

mean	102
median	80
mode	80
standard deviation	88
range	20-480
MAX SAFE LIMIT	156

GET WET!

Step 5: Students analyze results and create PowerPoint presentation with local professionals

GET WET!

Step 6: Presentation at an evening public meeting

Date, time, and location determined by teacher

http://livingindryden.org/2005/03/

University of Maine
Senator George J. Mitchell Center

Get Wet! - Resources for Teachers & Facilitators

Maine Water Institute Director John Peckenham with students from Lamoine Middle School

Curricula | Lesson Plans | Standards | Forms | Presentations | GET WET! Home

Curricula

- Part I: What is an aquifer (PDF)

Lesson Plans

- Lesson One: What is an Aquifer (PDF)
- Lesson Two: Nitrates (NO_3^{-2}) (PDF)
- Lesson Three: pH (Alkalinity) (PDF)
- Lesson Four: Chloride (Cl^-) (PDF)
- Lesson Five: Conductivity (PDF)
- Lesson Six: Turbidity & Clarity (surface water only) (PDF)
- Lesson Seven: Dissolved Oxygen ~D.O. (PDF)
- Lesson Eight: Sampling and Lab Procedures for Water Chemistry (PDF)
- Lesson Nine: GIS and Map Interpolation (PDF)
- Lesson Ten: Excel and Quantification (PDF)

Senator George J. Mitchell Center Home
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- Workshop – Creati Effective Poster
- Old Town Science Students Raising Dragonflies as Part UMaine Research c Mercury Contamin
- New Report by SSI Finds Maine More Ethnically Diverse

Read More News

Upcoming Events

- Fri, Mar 1:Confere Students as Catalys Large Landscape

Forms

Pre-Visit Forms

- GET WET! Intro Letter to Parents
- EPA quick reference of noticeable problems (PDF)
- Pre-visit sampling procedure form (PDF)
- Pre-visit Survey Sheet (PDF)

Other forms

- Get Wet! Drinking Water Survey Sheet (PDF)
- Classroom Sampling Sheet (PDF)
- Get Wet! Program Evaluation (PDF)
- Get Wet! Classroom Set-up (PDF)
- Get Wet! Station Set-up
- Get Wet! Excel Set-up Sheet (Excel)
- Get Wet! Photo Permission (PDF)

Classroom signs

- Chloride (PDF)
- Conductivity (PDF)
- Hardness (PDF)
- Nitrates (PDF)
- pH (PDF)
- Total Iron (PDF)

Testing Directions

- Chloride Test (PDF)
- Conductivity Test (PDF)
- Hardness Test (PDF)
- Iron Test (PDF)
- Nitrate Test (PDF)
- pH Test (PDF)

Presentations

- Pre-visit Presentation (PDF)
- Post-Visit Presentation (PDF)
- Where do we get drinking water? (PDF)

Download full Curricula Guide (PDF)

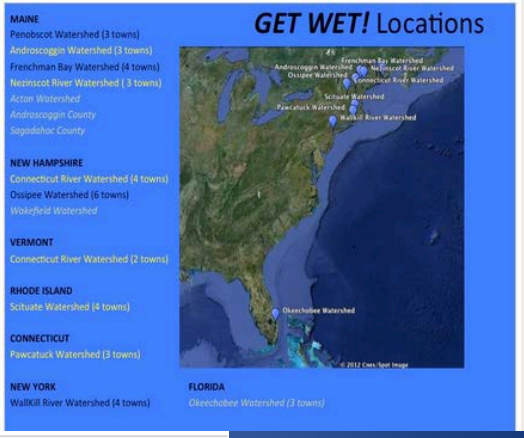
GET WET! program contacts:

John Peckenham, GET WET! Co-founder – 207-581-3254
Teresa Thornton, GET WET! Co-founder and Executive Director – 207-266-3682

- About Get Wet!
- State Programs

Get Wet! - State Programs

- GET WET! Connecticut
- GET WET! Maine
- GET WET! New Hampshire
- Get Wet! New York
- GET WET! Rhode Island
- GET WET! Vermont



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Read More News

Upcoming Events

- Fri, Mar 1:Conference on Students as Catalysts for Large Landscape Conservation
- Thu, Mar 14:2013 Expanding Your Horizons Conference

- Activities and curriculum
- Forms and other state's presentations

Any Questions?

HOW DO WE VALIDATE

GET WET!

Quality Assurance/Quality Control

- 10% of the bottles are returned to a local college or university to have the water tested in the lab.

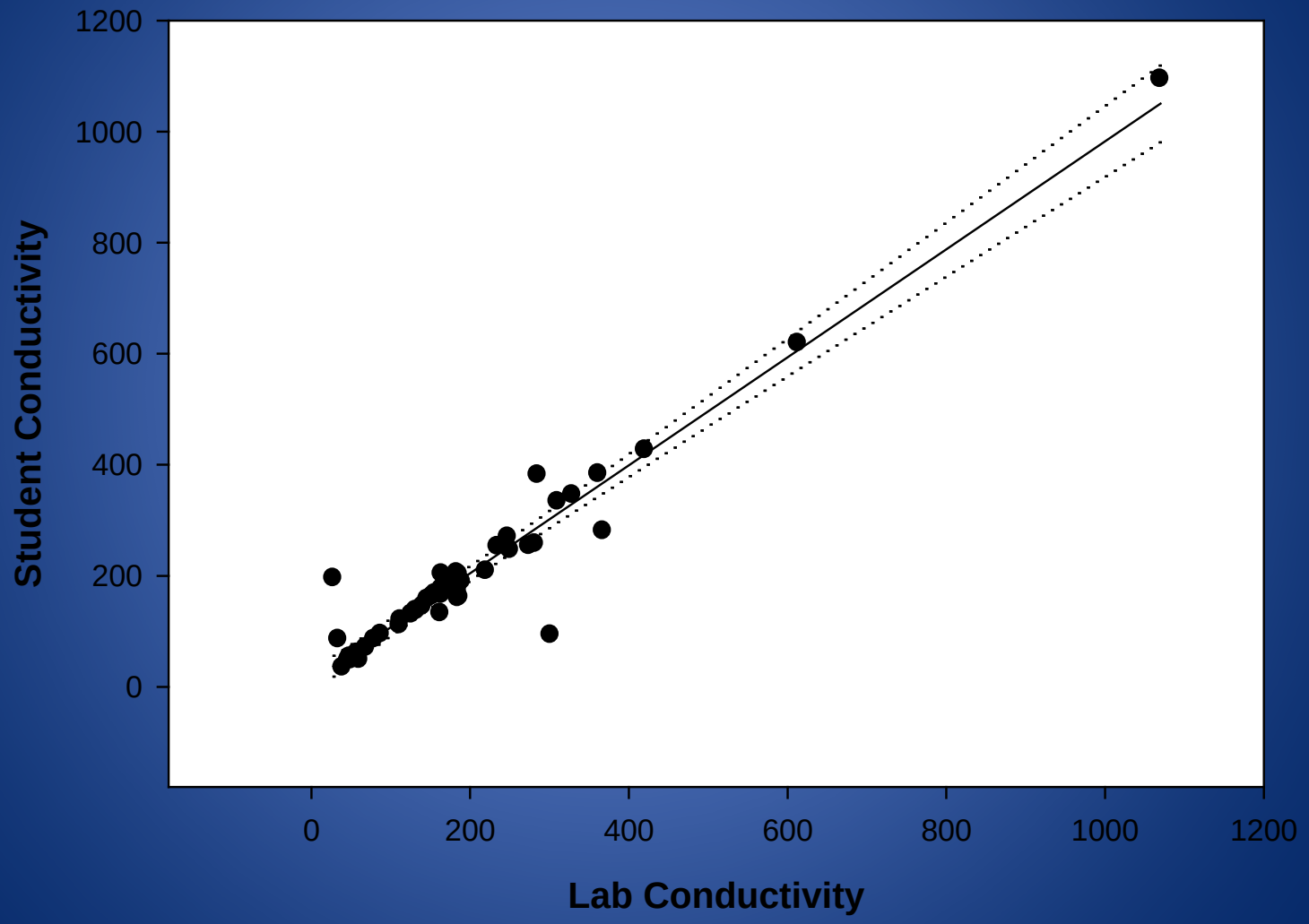
- At UMaine, John Peckenham is responsible for this. If you require his assistance in this matter please call

207-581-3254

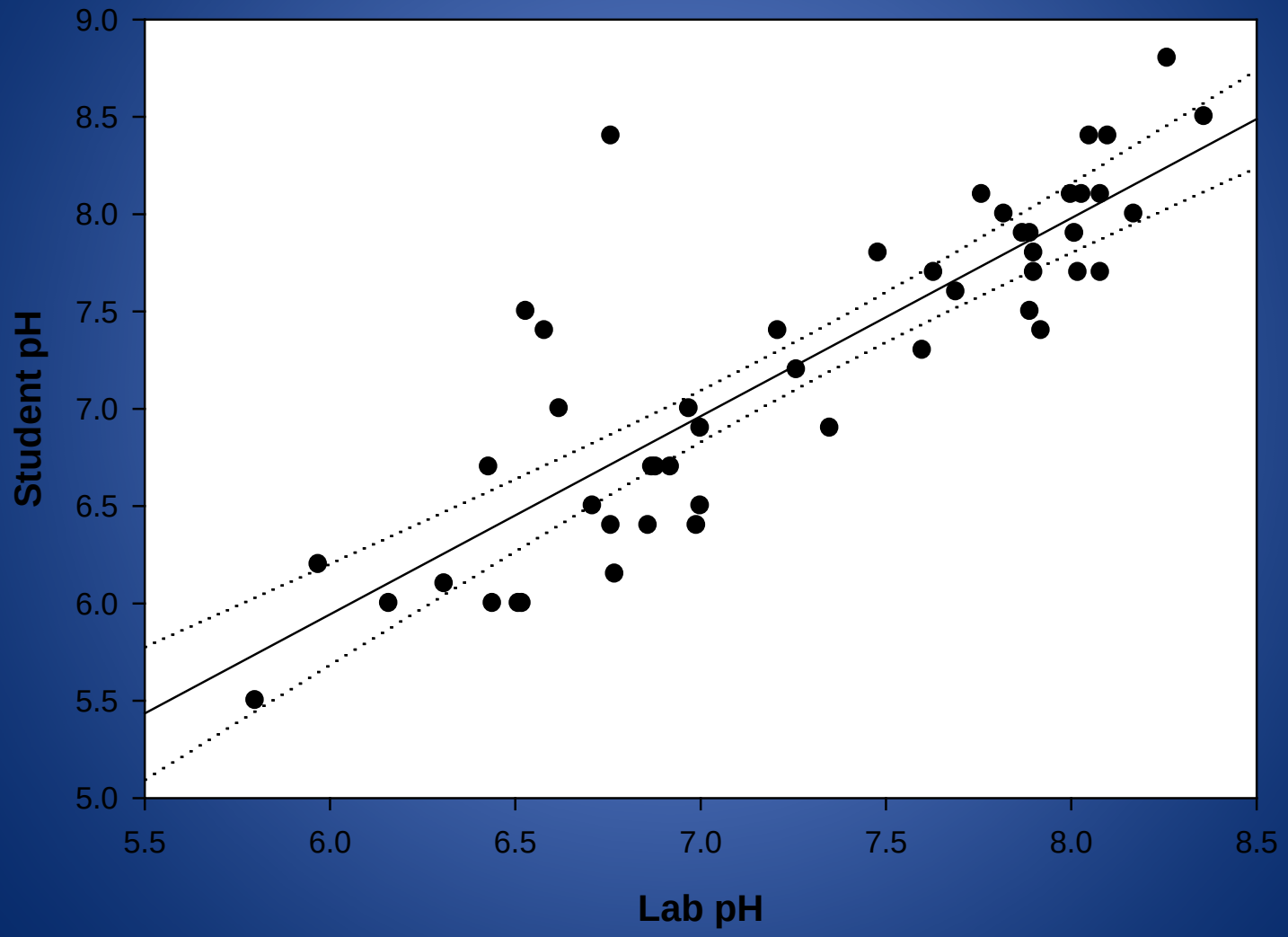
Director, Maine Water Resources Research Institute

Associate Director and Senior Research Scientist,
Senator George J. Mitchell Center for Environmental & Watershed Research

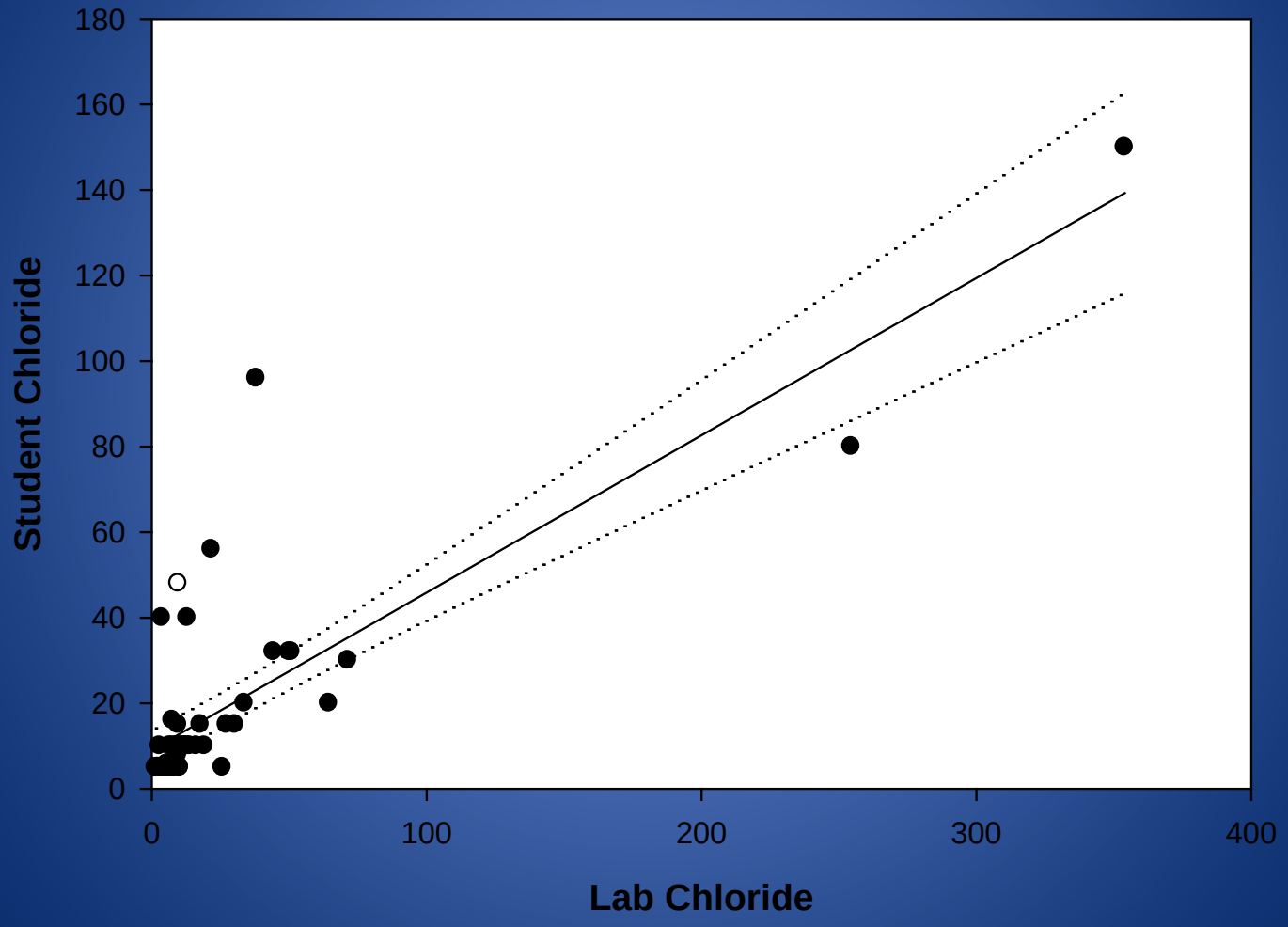
Conductivity Comparison



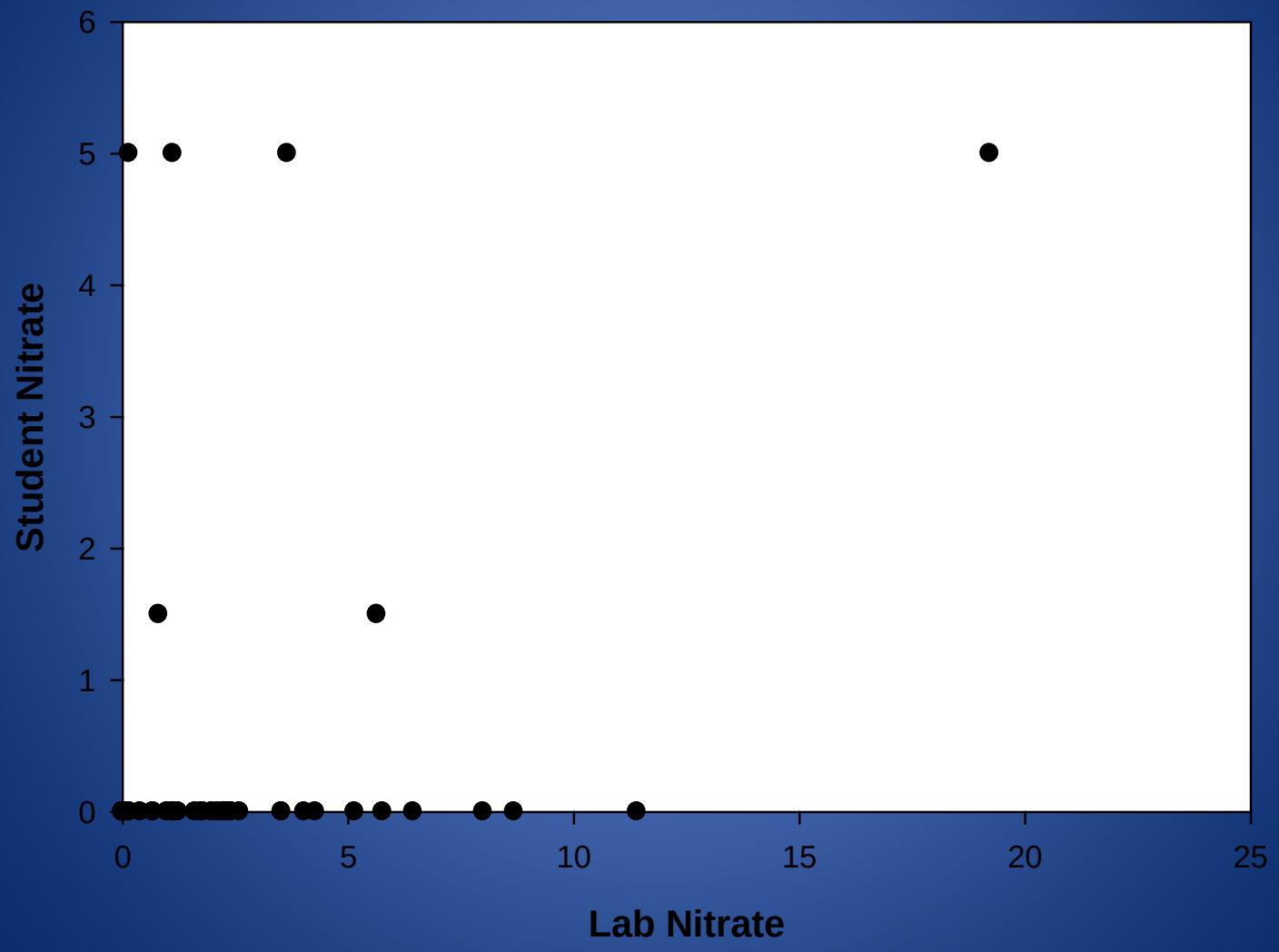
pH Comparison



Chloride Comparison



Nitrate Comparison



- Because of these kinds of initial results, new tests have been chosen to increase the validity of student data.

- Each year tests were under scrutiny until proper QA/QC results were verified.

Furthermore, research has been published that with greater than ***5 consecutive years of QA/QC validation of student-generated data*** patterns are formed and results are considered reliable.

Further reading:

*Peckenham, J. M., **Thornton, T.,** and Peckenham, P. 2012. "Validation of Student Generated Data for Assessment of Groundwater Quality." Journal of Science Education and Technology. Vol. 21 No. 2: 287-*

Any Questions?

Do you need a break?

Introductions

- Name
- Position and area of knowledge
- How do you fit into the GET WET! program?
- Is it preferable to assist in the classroom during testing or research?
- Is it possible to give a presentation to the students regarding your expertise?

Folder Contents

- Agenda
- Intellectual Property Sharing Agreement
  (All results published must refer to the ***GET WET!*** program as the source of data collection)
- Copy of PowerPoint
- GET WET! FLYER
- Contact Sheets
- Program Coordination Information

Folder (cont.)

- Calendars
- Classroom Set-up
- Station Set-up
- Sampling Procedures
- Survey Sheet for Parents
- Classroom Sampling Sheet

BREAK

15 Minutes

Begin Testing with Kits

Go through all of the testing stations so you are comfortable with the process

For further assistance please contact:

Teresa E. Thornton, M.S., Ph.D.

207-266-3682