Texas Stream Team Train the Trainer Training

- Presented by City of Dallas, Stormwater Management

Starting a training

- Introduce yourself

Training

- Have them sign in
- Try an ice breaker
- Introduce them to the Texas Stream Team Program
- Stream team is a network that connects citizens, industries, river authorities, councils of government, water districts, municipalities, state and federal agencies, students, teachers, and private groups
- Two types of trainings: Core and Advanced

Texas Stream Team

- Since 1991 Stream team program is made up of a Volunteer Citizen Monitoring Network for Water Quality.

- A non-profit environmental education organization focused on watershed education and Nonpoint Source (NPS) pollution prevention.

- This is a joint partnership with Texas Commission on Environmental Quality, U.S. EPA Region VI, Texas State University-San Marcos, and numerous partners including the City of Dallas

Stream Team Monitors

Citizen Monitors fulfill a niche as:

- - "natural resource witnesses"
- - "the eyes and ears on the water"

- There are almost 200,000 stream miles in Texas and 23 river basins.

- Citizen Water Quality data becomes Quality assured data , which augments and verifies professionally collected data
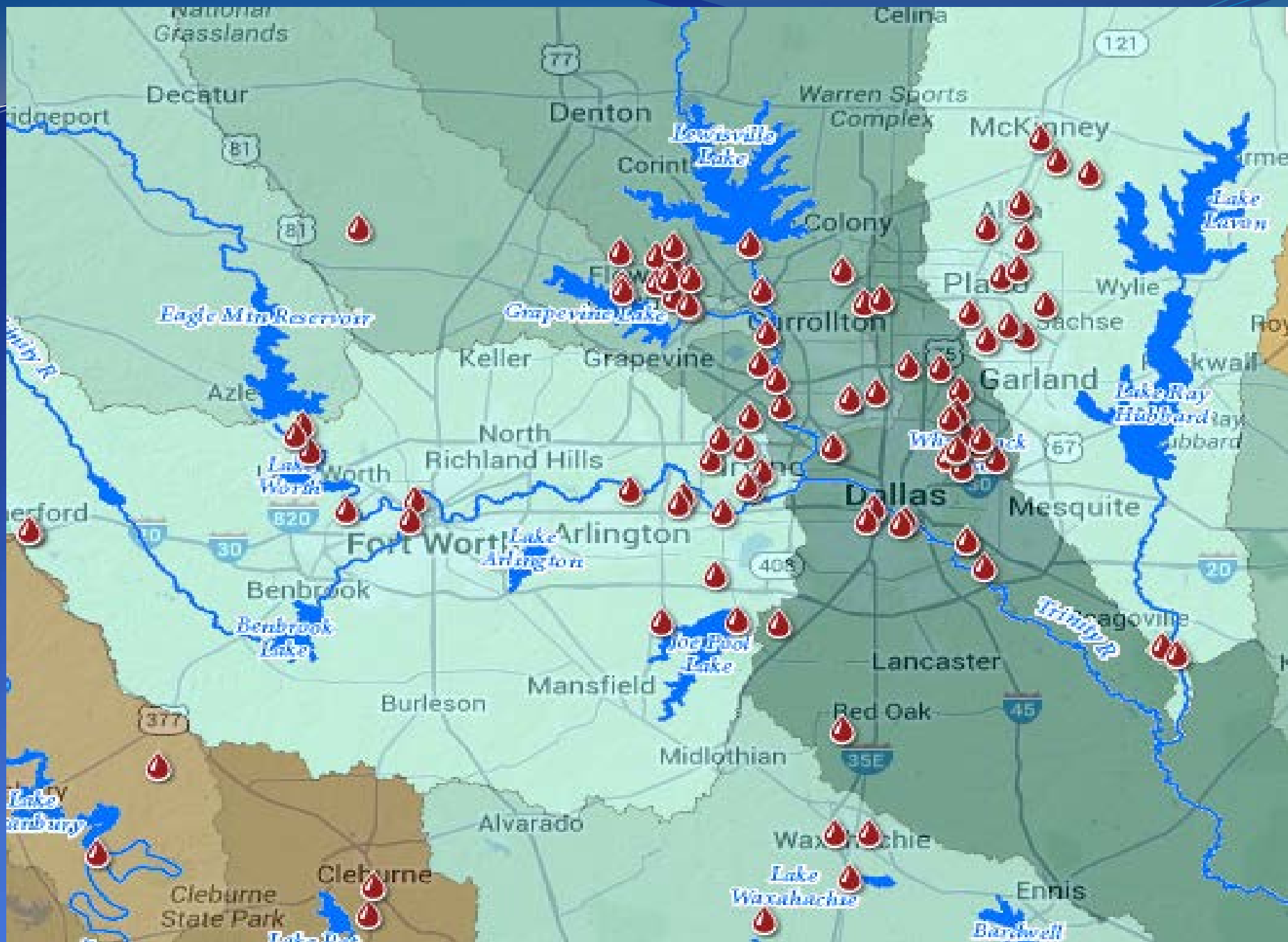
- Assists in making environmentally sound decisions.

Watershed Mechanics

The largest watershed for the DFW region is the Trinity River Watershed. This means all the streams, creeks and any pollutants found in them eventually flow into the Trinity River.

Objectives to look for:

- A base line health of creeks.
- Checking for Pollution:
  - Point Source.
  - Non-Point Source.

Point Source Pollution

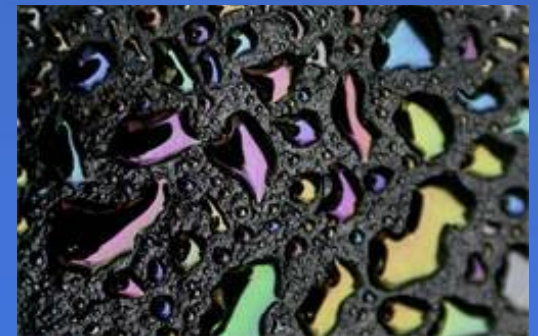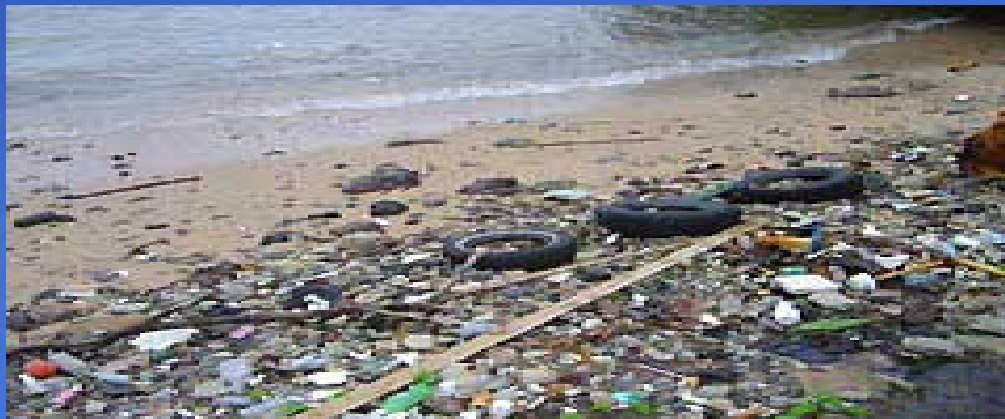Point Source

- Single, identifiable sources

- Largely regulated

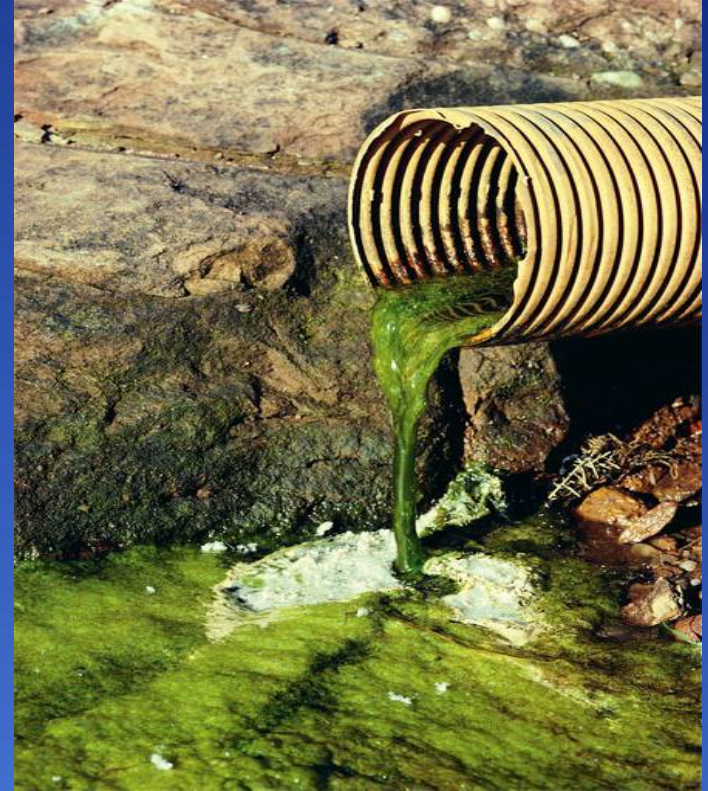Charlotte-Mecklenburg
Storm Water Services

Non Point Source Pollution

Nonpoint Source (NPS) -

• Originates from many sources

• Largely unregulated, variable, complex

(Cow manure from ranches, oil and litter from parking lots and streets, tire tread detritus, fertilizer run-off)

Things to Remember during Sampling

- Safety First: wear gloves and goggles when handling reagents
  - Read Chapter 1.8 – Safety Considerations
- Rinse Twice Rule: rinse everything <u>with the solution or water you are about to use…twice.</u> When finished, always remember to rinse the equipment <u>twice</u> with distilled water before putting away.

Things to Remember during Sampling

- Completely Fill Out Forms: all forms need to be complete to comply with the Federally Approved Quality Assurance Project Plan (QAPP) that ensures the scientific validity of the water quality data collected.

- Check expiration dates on all reagents before going into the field.

- Use a logical sequence of sampling steps

- Clean up and storage of equipment

Volunteer Requirements:

- What are you looking for in Volunteers?

- Minimum Commitments: Year(s)?

- Minimum Once Monthly: Ideally, 12/12 is the goal, but does not always happen. 10/12 can work. Equipment check-out:

  - Will you have a centralized location, or self check out?

  - Does citizen assume responsibility for safety and care of the equipment, the materials and supplies?

  - For the City of Dallas, return/receipt of the equipment and supplies to the City within (5) business days.

Stream Team Sampling Procedures

Texas Stream Team

- CORE Data Collected
  - Snapshots – Analyzed over an extended period
  - Dissolved Oxygen
  - pH
  - Specific Conductivity
  - Temperatures
  - Water Clarity
  - Field observations, etc.
- Uses of data
  - Problem Identification
  - Research
  - Education
  - Local decision-making

Picking a site:

One Day Class

- Ease of access
- Will need three water sources close by, or allow time for travel.

- Only have to schedule once, but longer time period commitment
- Set up the day before

Three Day Class

- Ease of access
- Can have three separate locations, or one sampled in different months.

- Classes are shorter, but will have to schedule three times, may have students miss one or more classes
- Can set up an hour before

Class supplies

- Sign in sheets – easy way to check that those that pre-registered have attended. Can also check spelling of names and emails from list.
- Surveys: feedback on how the training went
- Kits: to conserve materials, and to help them learn, pair up students in groups of 2-4
- Transparency tubes and secchi disks
- Clipboards: going to need something to write on while in the field
- Buckets: at least one per kit, or can have two kits share one bucket if needed for time and space
- Waste containers and distilled water spray bottles
- Paper towels: Lots of them.
- Safety gloves: Nitrile work best, multiple sizes

Introduction to kit

- Thermometer
- Alkaline Potassium Iodide Azide
- Sulfuric acid
- Maganous Sulfate Solution
- Starch Indicator Solution
- Wide Range Indicator
- Sodium thiosulfate

- 1413 Conductivity standard
- pH color viewfinders
- Water sampling bottles
- 20 mL Vials
- Test tubes
- TDS tester
- 100 mL beaker
- Titrator

Teaching points:

Walk the class room, don't just teach from the front. Check for understanding, and ensure procedures are conducted correctly.

Phase I should be fully instructional, introducing them to the processes.

Phase II, class should be getting the hang of processes, understanding procedures. Provide feedback and assistance

Phase III, now students should be self guided, but you should still assist them to make sure lesson sticks.

Prepared in cooperation with the Texas Commission on Environmental Quality and the United States Environmental Protection Agency.

Texas Stream Team
ENVIRONMENTAL MONITORING FORM
PLEASE PRINT (Black Ink or #2 Pencil)

Send to:
Texas Stream Team
Texas State University
The Landing
601 University Drive
San Marcos, TX 78666-4616
Toll Free: (877) 506-1401
Email: txstreamteam@txstate.edu

Group ID # ____

Station ID # _____

Sample Date _____ M M D D Y Y

Monitor's Name _____

Site Description _____

Sample Time (military) _____ H H M M

Sample Depth (meters) _____ (not total depth)

Meter Calibration: (Within 24 hours of sampling.) Store and calibrate standard at room temperature.

Calibration	Date	Time	Standard Value	Standard Temp (°C)	Initial Meter Reading	Meter Adjusted To	Post Test
Conductivity							
pH (7.0)							

Core Tests and Measurements:

- CONDUCTIVITY (µS/cm)
  □ TDS Tester 3 (Low) □ TDS Tester 4 (High) □ Other
- AIR TEMPERATURE (°C)
- WATER TEMPERATURE (°C)
- DISSOLVED OXYGEN (mg/L)
  Average 1st titration _____ 2nd titration _____
- pH (standard units)
- SECCHI DISK TRANSPARENCY (meters)
- TOTAL DEPTH (meters)
- TRANSPARENCY TUBE (meters)
  Average 1st reading _____ 2nd reading _____

Field Observations:

- FLOW SEVERITY: 1-no flow 2-low 3-normal 4-flood 5-high 6-dry
- ALGAE COVER: 1-absent 2-rare (<25%) 3-common (26-50%) 4-abundant (51-75%) 5-dominant (>75%)
- WATER COLOR: 1-no color 2-light green 3-dark green 4-tan 5-red 6-green/brown 7-black
- WATER CLARITY: 1-clear 2-cloudy 3-turbid
- WATER SURFACE: 1-clear 2-scum 3-foam 4-debris 5-sheen
- WATER CONDITIONS: 1-calm 2-ripples 3-waves 4-white caps
- WATER ODOR: 1-none 2-oil 3-acrid (pungent) 4-sewage 5-rotten egg 6-fishy 7-musky
- PRESENT WEATHER: 1-clear 2-cloudy 3-overcast 4-rain
- DAYS SINCE LAST SIGNIFICANT PRECIPITATION (runoff)
- RAINFALL ACCUMULATION (inches, last 3 days)

Reagents/Media: Are any reagents (or media) expired? □Yes □No
List any expired:

Bacteria Test:
- _____ E. COLI (colonies/100 mL)
  Average Sample 1 _____ Sample 2 _____

INCUBATION: Period (hrs) _____ (28-31 hrs) Temp. (°C) _____ (33+/-3°C)

SAMPLE 1: Sample size _____ mL Dilution factor (100/sample size) _____
Colonies counted _____ x dilution factor _____ = _____ colonies/100 mL

SAMPLE 2: Sample size _____ mL Dilution factor (100/sample size) _____
Colonies counted _____ x dilution factor _____ = _____ colonies/100 mL

FIELD BLANK: E. coli colony growth (circle one) YES / NO

DATA QUALITY REVIEW: Checklist completed (circle one) YES / NO

Additional Tests Conducted (nutrients, etc.):
- TYPE: _____
- FECAL COLIFORM (colonies/100 mL)
  Source of readings: □ Certified Lab □ Monitor

Coastal Area Salinity Tests and Observations:
- SALINITY (ppt)
- SAMPLE TEMP (°C)
- TIDE STAGE: 1-low 2-falling 3-slack 4-rising 5-high

Measurement Comments and Field Observations:
_____
_____
_____
_____

_____ minutes TOTAL TIME SPENT SAMPLING AND TRAVELING

_____ miles TOTAL ROUNDTRIP DISTANCE TRAVELED

_____ TOTAL NUMBER OF PARTICIPANTS

I CERTIFY THAT ALL PROCEDURES HAVE BEEN FOLLOWED AND THIS INFORMATION IS ACCURATE TO THE BEST OF MY ABILITY.

CERTIFIED MONITOR'S SIGNATURE DATE DATA MANAGER'S SIGNATURE DATE

White - Texas Stream Team Yellow - Volunteer Data Manager or Texas Stream Team Partner Pink - Volunteer Monitor Rev. 05/2010

- DataViewer on-line data entry
- Live data input began 2012
- Requires registration and account creation
- New Data viewer in 2018

Specific Conductivity

- The ability of water to conduct electricity
- Inorganic materials in water also called: total dissolved solids, salinity, salt concentration, resistivity
- Freshwater - Measured in microSiemens / centimeter (μS/cm)
- An indirect measurement of total dissolved solids (TDS)
  - Electricity flows through dissolved material in water, not the water itself
- Can indicate presence of excessive sediment, nutrients, or salt
  - Contaminants tend to attach to sediment

Specific Conductivity

- Effects on a water body
  - Nutrients – lowering of dissolved oxygen due to excessive vegetation growth
  - Salt – dehydration of aquatic life and limiting of water absorption into roots of vegetation (in freshwater)
  - Sediment – Reduced visibility and clogging of gills

Meter Calibration: (Within 24 hours of sampling.) Store and calibrate standard at room temperature.

Calibration	Date	Time	Standard Value	Standard Temp (°C)	Initial Meter Reading	Meter Adjusted To	Post Test
Conductivity							
pH (7.0)							

Specific Conductivity

- 0-800 µS/cm
  - Suitable for drinking, irrigation, and livestock
  - Distilled water Specific Conductivity = 0.5-3.0 µS/cm
  - Dallas municipal tap water = 300-340 µS/cm
- 800-2,500 µS/cm
  - Suitable for drinking but not preferable
  - Suitable for irrigation but requires special treatment
  - Suitable for livestock
- 2,500 – 10,000 µS/cm
  - Not suitable for drinking and irrigation of any crops except those which are salt-tolerant
  - Suitable for some livestock
- Above 10,000 µS/cm
  - Not suitable for drinking, irrigation, or livestock

Specific Conductivity

Chapter 2.15

Temperatures

- Water temperatures 27°C to 35°C can be threatening to aquatic life, depending on the regular temperature
- Human-caused sources of temperature changes
  - Power plants' effluent after it has been used for cooling
  - Hydroelectric plants which release warmer or cooler water (depending on the time of year) near the point of release
- All species can tolerate slow, seasonal changes vs. rapid changes
- Thermal stress, shock can occur when water temperatures change more than 1 to 2 degrees Celsius in 24 hours
- Measure air temperature before water temperature, out of sunlight. Do not measure air temp with a wet thermometer.

Temperature

- On a yearly scale
  - When temperature goes up, dissolved oxygen goes down and vice versa.
    - Colder, more dense water can hold more dissolved oxygen
- On a daily scale
  - As temperature goes up, dissolved oxygen goes up.
    - More intense sunlight = more photosynthesis + higher temperatures $\rightarrow$ more O^2

Dissolved Oxygen

- D.O. is the amount of freely available oxygen in water
- Traditionally the single most important indicator of biological health of water
- Measured in milligrams per liter (mg/L)

  - > 5 mg/L: Sufficient for most species
  - < 3 mg/L: Stressful to most species
  - < 2 mg/L: Fatal to most species

- Temperature is critical to solubility
  - At $0°$C – Maximum solubility or saturation $= 14.6$ mg/L (fresh water)
  - At $15°$C ($59°$F) – Maximum solubility $= 10.2$ mg/L
  - At $31°$C ($88°$F) – Maximum solubility $= 7.4$ mg/L
  - It is possible to exceed maximum solubility

Dissolved Oxygen

- Sources of low dissolved oxygen
  - High temperatures
  - Excessive vegetation growth
    - Blocks out sunlight from subsurface vegetation
      - Less sunlight →less photosynthesis →less oxygen
      - Subsurface vegetation dies
        - Decomposition consumes oxygen
  - High groundwater inflow
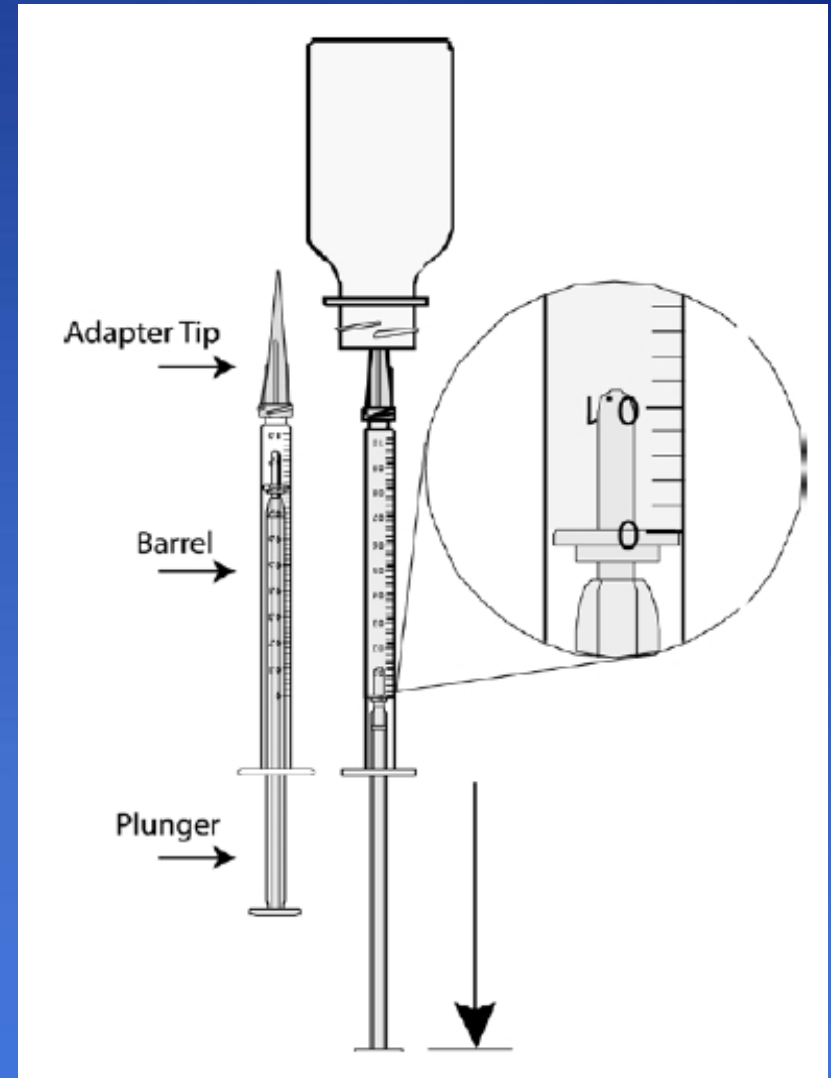   - Groundwater tends to be low in DO due to reduced aeration

Dissolved Oxygen

Chapter 2.13

Dissolved Oxygen

Fill the titrator until the top (not the bottom) of the ring of the green plunger tip lines up with the 0.0 mark (see photo). Check to ensure the plunger does not move

Adapter Tip →

Barrel →

Plunger →

pH

- Potential of hydrogen ions
- Measure of acidity or alkalinity
  - pH scale: 0 – 14
  - < 7 = acidic; 7 = neutral; > 7 = alkaline
  - < 7 – More hydrogen ions; = 7 – Equal ions; >7 – More hydroxyl ions

pH of Common Substances
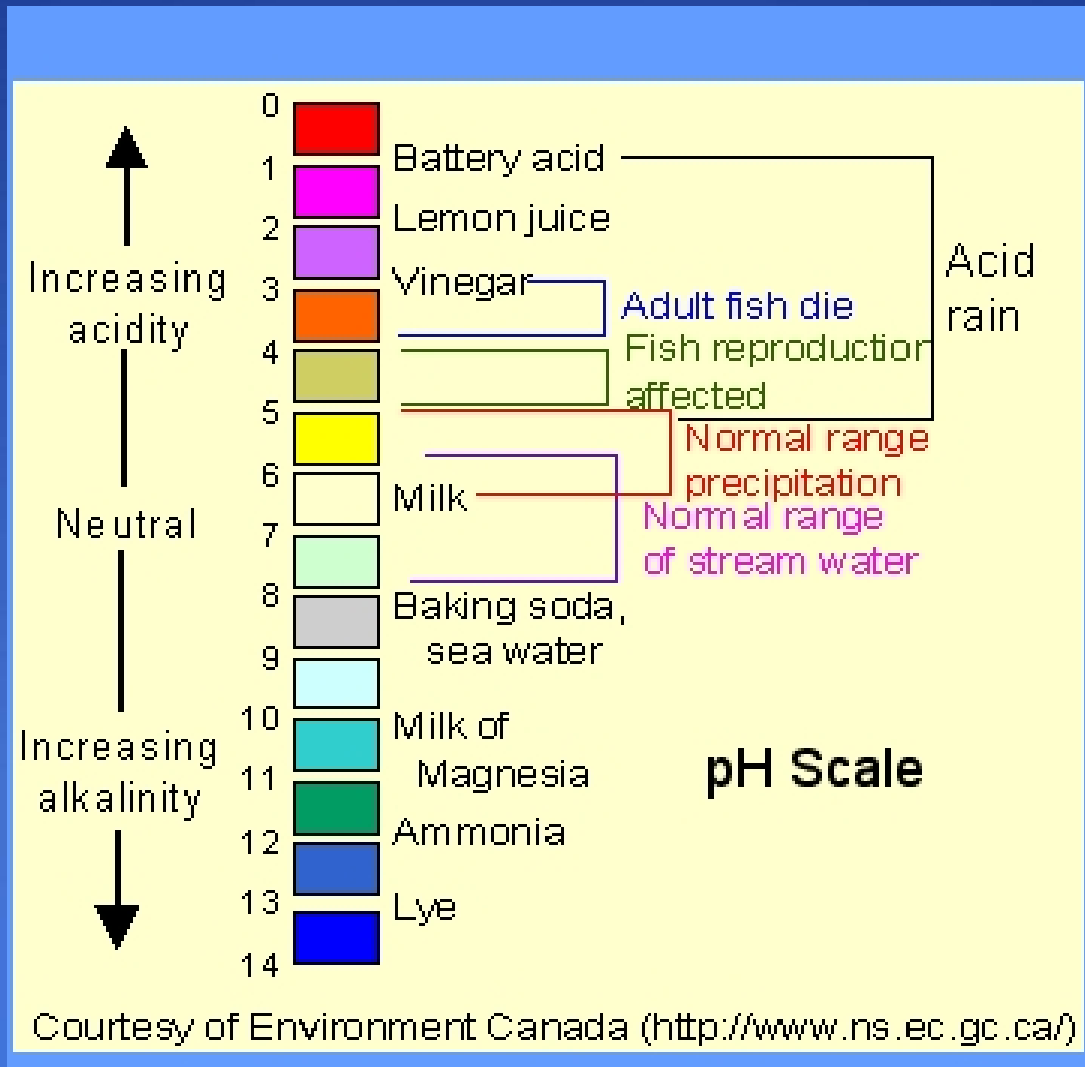
Courtesy of Environment Canada (http://www.ns.ec.gc.ca/)

pH

- Most suitable range for aquatic life = 6.5-9
- Sources of acidic pH
  - Acid rain – caused by coal power plants & volcanoes
  - Runoff from acidic soils
- Sources of alkaline pH
  - Decomposition of limestone
  - Dissolved carbon dioxide in water
  - Uncontained construction site concrete run-off
- Using a Color Comparator Viewer, estimate results to the nearest 0.1 unit
  - Color vision quiz: http://www.xrite.com/custom_page.aspx?PageID=77

pH

Chapter 2.14
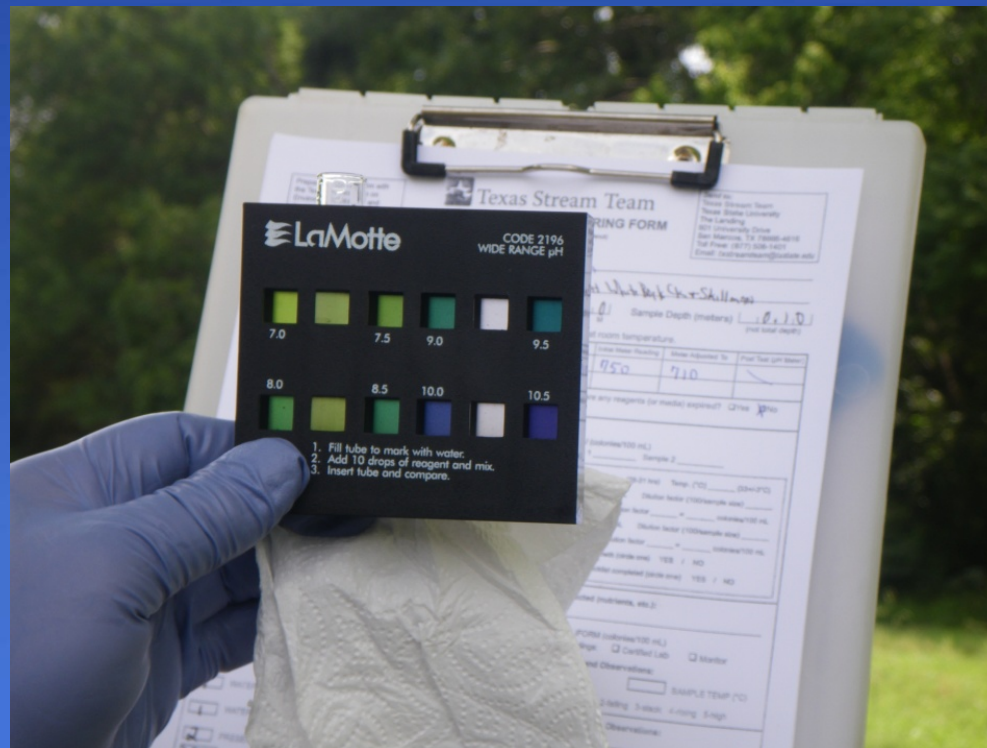
Field Observations

Field Observations

- Field observations can be some of the most important information collected and can significantly contribute to the process of evaluating a site's data
  - Flow severity
  - Algae cover
  - Water color *+
  - Water clarity +

Field Observations

- Water surface *

- Water conditions

- Water odor *+

- Present weather

- Recent rainfall and accumulation
  - (No tests during flood or very high water)

- Aquatic flora and fauna present

* See "Color, Odor, Surface" handout
\+ Color, Clarity and Odor values are determined in collection bucket

Water Clarity & Depth

- Materials suspended in water reduce clarity, increase turbidity
  - Plankton, microscopic organisms, algae
  - Silt from run-off and erosion
  - Wind and waves can stir up sediment from bottom
  - Clarity also affected by water color (tannins in East Texas)
- Effects on aquatic life
  - Reduces sunlight needed for photo-synthesis
  - Suspended particles can transport toxics into aquatic habitat
  - Excess sediment in normally clear water detrimental to aquatic life
- Secchi Disk & Transparency Tube – Provides an easy method to measure light penetration (clarity, transparency) and depth

- Helpful and Related Web Sites:
  - Stream Team Home: http://txstreamteam.rivers.txstate.edu
  - DataViewer On-line Data Entry: https://aqua.rivers.txstate.edu/login.aspx
  - Dallas County Flood Insurance Rate Maps: http://www.dallascounty.org/department/pubworks/media/preDFIRM/48113CIND0D.pdf
  - Dallas Watershed Maps: http://www.wheredoesitgo.com/watershed_map.html
  - TRA Basin Reports: http://www.trinityra.org/default.asp?contentID=97
  - National Water Quality Assessment Program: http://water.usgs.gov/nawqa/digmap.html
  - Texas 303(d) Impaired Water Bodies List http://www.tceq.texas.gov/assets/public/compliance/monops/water/08twqi/2008_303d.pdf
  - Dallas Precipitation: http://www.ci.dallas.tx.us/sts/html/fc.html
  - Test for Color Vision Deficiency: http://www.xrite.com/custom_page.aspx?PageID=77