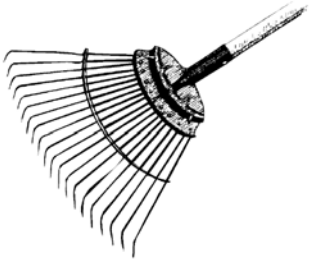
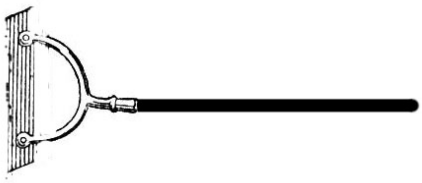
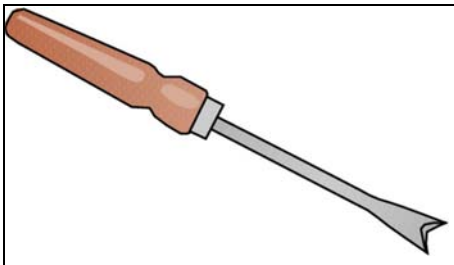
Square Point Shovel USE: This shovel is used to move material from a pile, this is not for digging. Mostly used as a scoop How to use: Hold parallel to the ground at the top of the pile of material and then scoop up and place where needed. Care: Wipe clean after each use	

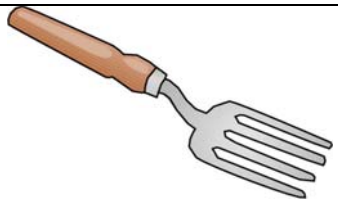
Rakes and Hoes

Garden Rake Use: This has hard tines (teeth) that are used to spread around dirt, rocks or mulch. How to use: Hold the handle with one hand forward and one towards the end of the handle. Gently push and pull the rake to gently spread the material. If trying to make a pile rake with a pulling motion across your body to make work easier. Care: Remove dirt clods and wipe with a clean cloth.	
Leaf Rake Use: This has flexible tines that are perfect to quickly clean up leaves. How to Use: hold the rake as you would a broom and sweep across the ground to lift fallen leaves and other debris onto the tines and pull into a pile. Care: when finished remove any debris remaining on the tines and put away	
	**Garden Hoe** Use: Used to gently remove young weeds with a push and pull action. Also used to make furrows for planting of seedlings in the ground. How to Use. Hold the flat side of the head parallel to the ground and pull towards you knocking down the weed. Then push back and then the weed will be removed. Care: clean off the head of dirt and then put away.

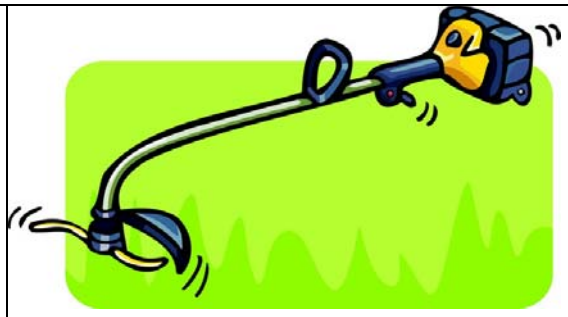
Posthole digger USE: This is used to make round holes for placing of posts or other straight items. How to use: Push straight into the soil and then pull apart the handles to remove the soil. Repeat until the desired width and depth has been reached. Care: clean off dirt and put away	
Weed Cutter USE: A manual weed whacker. How to Use: Use in a side to side motion holding the blade parallel to the ground and swinging across your body in front of you to cut weeds down. Care: clean the blade after each use	
Cultivator Use: Used to loosen soil, remove weeds and allow for fertilization of plants and trees. How to use: Use similar to a hoe for removing weeds. Tines may be dug into the earth to allow for aeration of the soil and fertilization. Care: Remove any dirt clods and clean the tines after each use.	

Hand Tools

	**Weeder** Use: Used to dig out tap-rooted weeds by forcing them out. Long stick with forked end that can slice the root How to use: Slide the forked end along the root and push up. The weed and root should be removed. If you have difficulty try to pull out the weed or try again. Care: Clean off dirt and store
	**Trowel** Use: Used to dig small holes to plant seedlings. Normally used for transplanting of plants into larger containers or for digging in the ground in small areas How to use: use as you would use a child's sand shovel but with dirt and fill flower pots. Care: Remove dirt and check for dents

	**Hand cultivator** Use: Used to weed and loosen soil in small areas. Ideal for home gardening How to use: use similar to the cultivator, and make sure your back and knees are in proper alignment. Care: clean off the dirt and store

Power tools

Weed Whacker Used to quickly cut weeds in small areas. Can have a blade or string that rotates to cut the weeds. MUST USE EYE PROTECTION when using. How to Use: Start motor once you have reached the area where you will work then using a back and forth motion cut the offending weeds. Care: Replace string or blade as needed, store upright and remove grass clippings from the body.	

Transport equipment

	**Wheelbarrow** USE: This is a tool to move materials from one location to another. Usually slightly awkward to move but more maneuverable on certain surfaces. How to Use: fill the wheelbarrow with materials to move. Lift the handles to your waist and push the wheelbarrow. Do not overfill or it could tip. Care: Clean out after each use. NOT FOR PEOPLE TO RIDE

	**Garden Cart** Use: This sturdy four-wheeled cart is great for moving tools, materials and water to different locations easily. This is only for moving materials NOT for PEOPLE. How to use: fill with material to be moved then pull behind you using the handle. At steep grades make sure that the cart does not fall on you by turning it around and go backward. Care**:** Do not ride on the cart and clean out after each use.

Other useful items

Gloves (plastic or leather) Protects hands from germs or from thorns. Please clean off leather gloves before storing so that they are ready for the next person.	
Bags **Use:** To contain items such as weeds, garbage, and other materials. When full tie the bag closed, by tying one side closed and then take the other side and tie again. Do not overfill, you will break the bag. **Care**: do not drag the bag or overfill, you will have to rebag contents and waste time.	
Goggles **Use:** To protect eyes from flying debris How to use: Fully cover eyes with goggles and begin to work. Flying debris will not get into your eyes and damage them. **Care:** Wipe off any condensation/sweat and wash off dirt	

Assignment

Making Restoration Easy to Understand

Restoration can be a complex process, but it has many smaller parts that are much simpler. Once you understand the smaller, simpler portions of restoration the remaining project is much easier. One of the main concepts for any type of restoration is knowing how to use the tools to perform the task. Anything from loppers to hoes to garbage picker-uppers might be used during any project and correct usage will increase efficiency and reduce tool breakage.

In the past we have had great success using students to help other students learn different concepts by making a story or a "rap." This is an easy format to give to others and have them be able to remember the concepts that have been emphasized. For examples look at the following link:

http://msnucleus.org/membership/guide/storybooks.html

Assignment: Use a separate sheet of paper to create a story or poem using some of the following concepts. If you can draw, you might create a character that could be used to illustrate all these tools.

- Hedge shears are used to shape shrubs and trees
- Loppers are used to cut off unnecessary branches less than 1.5"
- Pruning saws are used to cut larger branches
- Pole saws are used to cut branches up high
- A hoe is used to remove weeds and to help aerate the soil
- Post hole diggers are used to make quick holes for posts or to plant trees
- Weed whackers are used to knock down weeds before chipping.
- Trees provide a canopy (shade), nutrients for the soil and homes for animals
- Healthy trees are the best habitat for animals
- Unhealthy trees breed disease, pests and can be a danger
- Pruning should be done on branches that go straight up, are twisted, coming out of the ground around the base of the tree's trunk, and any that are a danger.
- Weeds around the base of a tree can deplete the nutrients in the soil
- There are many tools that help to maintain trees
- Prune first for safety, next for health, and finally for aesthetics.
- For shallow rooted weeds cutting the tops is fine, tap rooted weeds need to have the root removed
- Mulch should not be directly at the base of a tree instead about 1' away.
- Mulch should be spread about 2-3 inches thick to prevent more weed growth and retain moisture in the soil.
- When planting make the hole 1.5 times larger than the pot of the plant
- Loosen roots before planting
- Never cover the root crown with soil
- When planting on a slope create a sill for the plant to sit on.

NOTES:

Monitoring

Monitoring for Chemicals


Polluted water

Testing of water is important to humans because we need clean, fresh water. Keeping the water healthy for plants and other organisms also provides recreational sports for humans. Polluting our water supplies causes a ripple effect that eventually harms the original polluters.

Many people feel that just put a little oil in the storm drain or riding gas driven boats on drinking water reservoirs won't hurt anything. If only one person polluted, maybe nothing would happen. But that is never the case.

Humans were originally **nomads** because their water and land would become polluted from their use. If you defecated into your water supply, mysterious diseases would occur. It took humans a long time before they figured out; they were the ones causing the health problems.


Water sampling

This lab looks at testing temperature, dissolved oxygen, nitrates, and pH of water. These are only four tests, out of many, you can determine for water. Directions are on your lab sheet. First, read the information on why these tests are important and then perform the test.

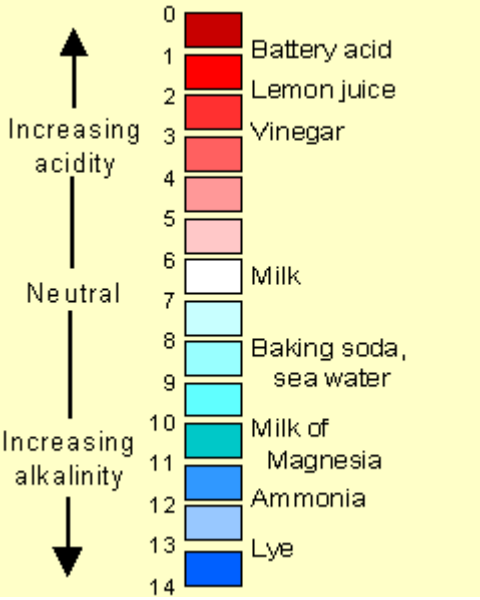
Water temperature is an important factor for survival of aquatic life. Very high and very low water temperature can kill many aquatic plants and animals. The temperature can affect how an organism's internal mechanisms (metabolism) work. For example salmon and trout prefer temperatures between 4.5° C (40°F) and 20° C (65° F). Different stages of the growth of fish are susceptible ranges of fish. In the summer when temperatures are high, juvenile fish actively look for the cooler pools of water. A fish must pump water across its gills to meet its need for oxygen. If the dissolved oxygen in water is low, the gills must move faster to get enough oxygen for the fish to survive.


Thermal pollution can come from industrial plants like this

Thermal pollution can occur when heated water is discharged into cooler streams or rivers. This heated water generally is from power plants or industrial processes. If the water is not cooled down

before entering into a stream or pond, it can cause organisms to die of increased temperature.

A simple test to determine chemicals dissolved in water that might be harmful to organisms is pH. The percentage of free hydrogen (H%) and a hydroxy ion (OH&) determines the pH of the liquid. Pure water (HOH) is made up one part hydrogen and one part hydroxy and given a neutral standing or a "7." If you have more hydrogen than hydroxy it is an acidic solution. If the hydroxy ions, are greater than the hydrogen ions you have a basic or alkaline solution. The concentration of the hydrogen ions [H+] in a solution determines the pH.



A pH of 6.0 to 9.0 is the range that fishes and invertebrates can successfully survive. Each species has its own tolerance level. The table below gives some special effects of pH on fish and aquatic life.

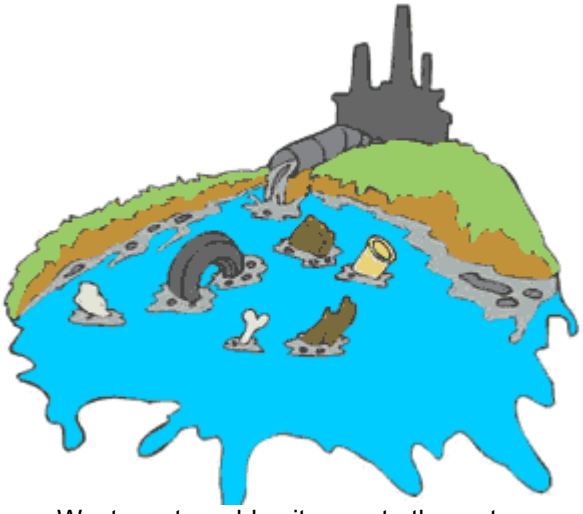
Minimum	Maximum	Effects
3.8	10.0	Fish eggs could be hatched, but deformed young are often produced
4.0	10.1	Limits for the most resistant fish species
4.1	9.5	Range tolerated by trout
	4.3	Carp die in five days
4.5	9.0	Trout eggs and larvae develop normally
4.6	9.5	Limits for perch
	5.0	Limits for stickleback fish
5.0	9.0	Tolerable range for most fish
	8.7	Upper limit for good fishing waters
5.4	11.4	Fish avoid waters beyond these limits
6.0	7.2	Optimum (best) range for fish eggs
	1.0	Mosquito larvae are destroyed at this pH value
3.3	4.7	Mosquito larvae live within this range

Oxygen rich water

Although water is made of H_2O, the oxygen is not available for organisms. Dissolved oxygen in water is required for most organisms. Dissolved oxygen (DO) refers to the volume of oxygen that is contained in water. Oxygen enters the water by photosynthesis of aquatic plants and by the transfer of oxygen across the air-water interface. The amount of oxygen that can be held by the water depends on the water temperature, salinity, and pressure. Gas solubility increases with decreasing temperature (colder water holds more oxygen)

Flowing water is more likely to have higher dissolved oxygen levels than is stagnant water because of the water movement at the air-water interface. In flowing water, oxygen-rich water at the surface is constantly being replaced by water containing less oxygen as a result of turbulence. Because stagnant water undergoes less internal mixing, the upper layer of oxygen-rich water tends to stay at the surface, resulting in lower dissolved oxygen levels throughout the water column.

Nitrogen is found in the cells of all living things and is a major component of proteins. Nitrogen may exist in the free state as a gas N_2, or as nitrate (NO_3-), nitrite (NO_2-), or ammonia (NH_3+). Organic nitrogen is found in proteins and is continually recycled by plants and animals. Nitrogen is important to organisms, but too much can cause damage.



Waste water adds nitrogen to the water

Nitrogen containing compounds act as nutrients in streams and rivers. Nitrate reactions in fresh water can cause oxygen depletion. Organisms depending on the supply of oxygen in the stream will die. The sources of nitrogen into bodies of water are municipal and industrial wastewater, septic tanks, feedlot discharges, animal wastes (including birds and fish), and discharges from car exhausts.

Nitrites can produce a serious condition in fish called "brown blood disease." Nitrites also react directly with hemoglobin in human blood and other warm-blooded animals to produce methemoglobin. Methemoglobin destroys the ability of red blood cells to transport oxygen. This condition is especially serious in babies less than three months of age. It causes a condition known as "blue baby" disease.

WATER TESTING PROCEDURES
Using LaMotte Kits

pH

Procedure

1. Rinse each test tube with the water sample. Gloves should be worn to avoid skin contact with the water.

2. Fill the tube to the 5mL line with sample water.

3. While holding a dropper bottle vertically, add 10 drops of Wide Range Indicator Solution.

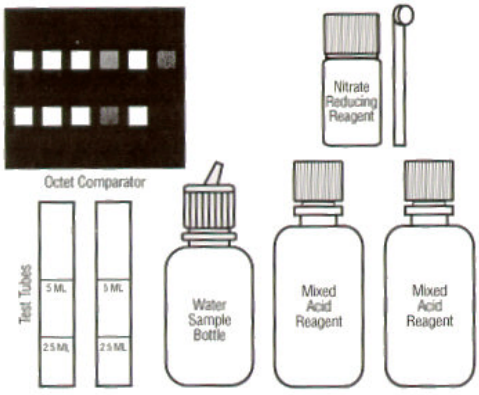
4. Cap and invert several times to mix.

5. Insert the tube into the Wide Range pH Comparator. Hold the comparator up to a light source. Match the sample color to a color standard.

6. Record the pH value.

7. Wash your hands

Nitrate



Procedure

1. Fill the sample bottle with sample water. Use gloves if drawing the sample by hand.

2. Rinse and fill one test tube to the 2.5 mL line with water from the sample bottle.

3. Dilute to the 5 mL line with the Mixed Acid Reagent. Cap and mix. Wait 2 minutes.

4. Use the 0.1 g spoon to add one level measure (avoid any 50-60 times in one minute). Wait 10 minutes.

5. Insert the test tube into the Nitrate Nitrogen Comparator. Match the sample color to a color standard. Record the result as mg/L (ppm) Nitrate Nitrogen (NO3-N). To convert to

mg/Nitrate (NO_3) multiply by 4.4.

6. Place the reacted sample in a clearly marked container. Arrangements should be made with toxic material handlers for safe disposal. Please wash your hands after this water test is completed.

Dissolved Oxygen

Procedure

1. If you have a barometer, record the atmospheric pressure. Remove the cap and immerse the DO bottle beneath the river's surface. Use gloves to avoid contact with the river.

2. Allow the water to overflow for two to three minutes (This will ensure the elimination of bubbles).

3. Make sure no air bubbles are present when you take the bottle from the river.

4. Add 8 drops of Manganous Sulfate Solution and 8 drops of Alkaline Potassium Iodide Azide.

5. Cap the bottle, making sure no air is trapped inside, and invert repeatedly to fully mix. Be very careful not to splash the chemical-laden water. Wash your hands if you contact this water. If oxygen is present in the sample, a brownish-orange precipitate will form (floc). The first two reagents "fix" the available oxygen.

6. Allow the sample to stand until the precipitate settles halfway. When the top half of the sample turns clear, shake again, and wait for the same changes.

7. Add 8 drops of Sulfuric Acid 1:1 Reagent. Cap and invert repeatedly until the reagent and the precipitate have dissolved. A clear yellow to brown-orange color will develop depending on the oxygen content of the sample.

8. Fill the titration tube to the 20 mL line with the "fixed": sample and cap.

9. Fill the Direct Reading Titrator with Sodium Thiosulfate 0.025 N Reagent. Insert the Titrator into the center hole of the titration tube cap. While gently swirling the tube, slowly press the plunger to titrate until the yellow-brown color is reduced to a very faint yellow.

If the color of the fixed sample is already a faint yellow, skip to step 10.

10. Remove the cap and Tritrator. Be careful not to disturb the Titrator plunger, as the tiration begun in step 8 will continue in step 11. Add 8 drops of Starch Indicator Solution. The sample should turn blue.

11. Replace the cap and Titrator. Continue titrating until the sample changes from blue to a colorless solution. Read the test result where the plunger top meets the scale. Record as mg/L (ppm) dissolved oxygen.

Data Sheet

Sample#	Temperature	Dissolved O_2	Nitrate	pH
Average				

Describe conditions

_____
_____
_____
_____
_____
_____

Describe Water

_____
_____
_____
_____
_____

Conclusions

_____
_____
_____
_____
_____
_____

Biological Assessment

Biological Assessment

The biological observation of the stream, pond, or salt water is probably the most rewarding to a non-scientist. It involves learning the vegetation and organisms that live along the creek. It is a life-long skill to observe and appreciate what nature brings to our doorstep. Understanding the biological component helps to determine if restoration was successful or not.

Understanding the biology of an area takes careful inventory and observation for many years. Seasons and weather is an important component on what life can be found in an area. Even places that are just a few kilometers apart may be very different.

Biological assessment of an area is a long and tedious process. A base survey just reflects the diversity, not abundance or specific location within the area under investigation. If a stream corridor has an abundance of larger animals, that infers an ecosystem which is supporting itself. The food web has an internal structure that supports the different layers of the food pyramid.

A complete survey of an area should include groups like land arthropods, annelids, and other small land invertebrates. Plants should include aquatic plants, trees, shrubs, other flower plants, and grasses. Vertebrates should include birds, mammals, amphibians, and reptiles. Birds usually dominate because in many wetlands they reflect the top of the food chain. The more birds documented the richer the food web supporting those animals.

Aquatic microorganisms are emphasized because they reflect most accurately the health of the water in which it lives. It can provide clues on the chemical balance of the creek.

Stream Study

use “Guide to Identification of Fresh Water Microorganisms”

Date:_____ Site Number _____

Investigators _____

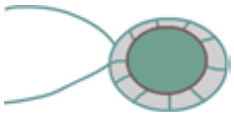
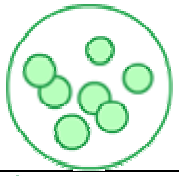
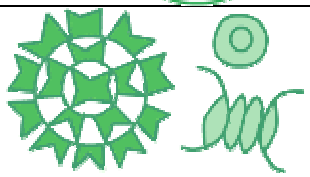
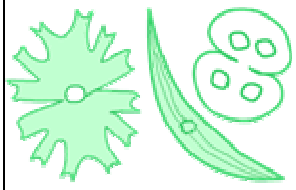
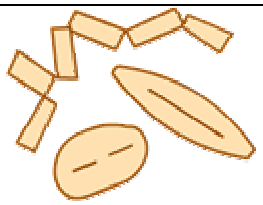
Weather conditions _____

SENSITIVE	SOMEWHAT SENSITIVE	TOLERANT
❑ Caddisfly larva	❑ Riffle beetle larva	❑ Aquatic worms
❑ Dobsonfly larva	❑ Cranefly larva	❑ Blackfly larva
❑ Mayfly larva	❑ Dragonfly larva	❑ Leeches
❑ Stonefly larva	❑ Alderflies	❑ Midge larva
❑ Water penny	❑ Clams	❑ Lunged snails
❑ Gilled Snails	❑ Whirligig	
❑ Riffle beetle adult	❑ Damselfly	
❑ Planarian		

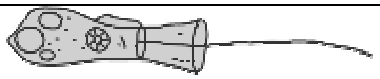
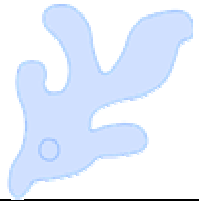
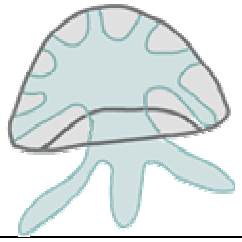
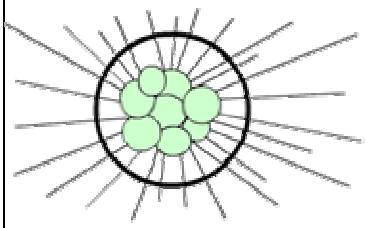
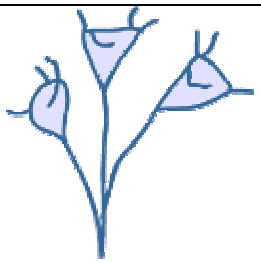
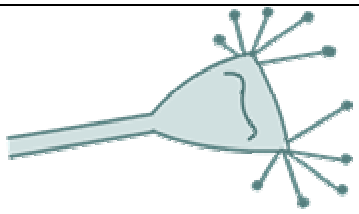
Describe or draw what you see in your samples.

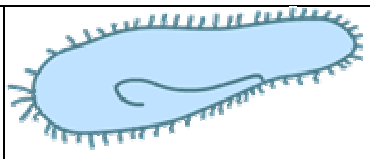
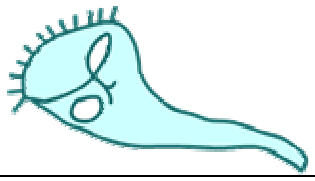
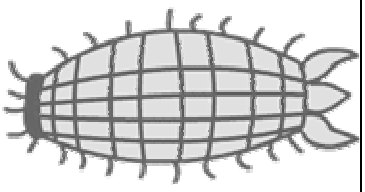
Guide to Identification of Fresh Water Microorganisms

Microscopic autotrophic organisms (i.e. algae)

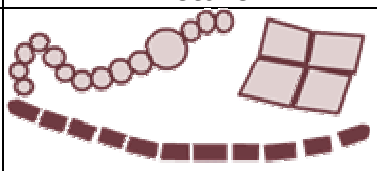
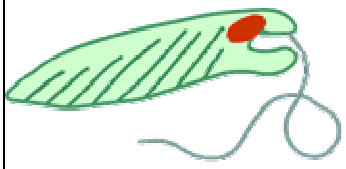
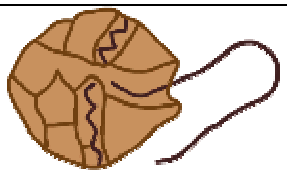
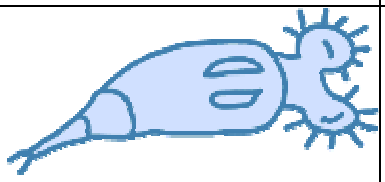
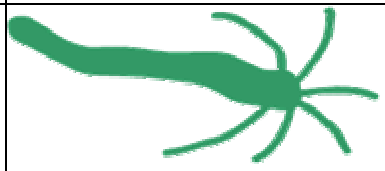
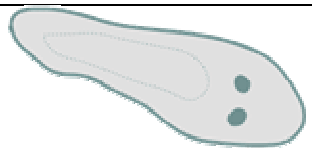
Name	Picture	Characteristic	Taxonomy
Green algae (with flagella, small) <.05 mm		1. flagella 2. small 3. solitary 4. rapid movement	Phylum Chlorophyceae i.e. *Chlamyolomonas* sp.
Green algae (with flagella) .5-2mm		1. spherical 2. colonial 3. with two flagella	Phylum Chlorophyceae i.e. *Volvox* sp.
Green algae (no flagella) <.5 mm		1. spherical to conical 2. not attached to surface 3. no movement	Phylum Chlorophyceae i.e. *Pediastrum* sp.
Filamentous green algae <.1 mm – cms		1. non branching 2. chains of cells with chloroplast 3. no flagella	Phylum Gamophyceae i.e. *Zygnema* sp. *Spirogyra* sp.
Desmids <.5 mm		1. green 2. no flagella 3. mainly solitary, some colonial 4. various shapes 5. two semi-cell, mirror image	Phylum Gamophyceae I.e. *Desmidium* sp *Closterium* sp.
Diatoms <.5 mm		1. one cell 2. slow gliding motion 3. solitary or colonial 4. cell wall (frustules) made of silica	Phylum Bacillariophyceae i.e. Pennales, Centric

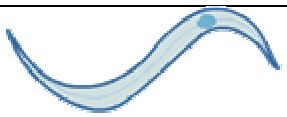
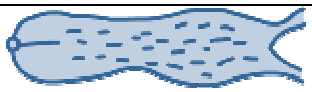
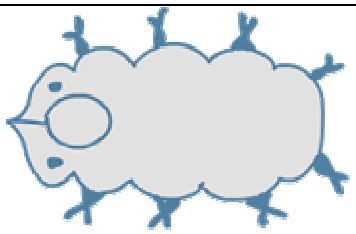
Protozoa – heterotrophic only

Name	Picture	Characteristic	Taxonomy
Flagellates <.5mm		1. one or more flagella 2. colonial or free living 3. with or without lorica	Zoomastigophora i.e choanoflagellates
Amoeba .02 –5 mm		1. pseudopodia 2. slow movement 3. engulfs food	Sacrodina Order Amoebina i.e. *Amoeba proteus*
Shelled Amoeba .1-.4 mm		1. amoeba with a shell, usually sand grains 2. pseudopodia 3. slow movement	Sacrodina Order Testacea i.e *Arcella* sp.
Heliozoans .01-1 mm		1. spherical 2. radiating hair like pseudopods 3. no movement	Sacrodina Order Heliozoea
Ciliates – Peritrich < .25 mm		1. cylindrical or bell shaped bodies 2. undulating cilia 3. some stalked 4. often colonial 5. attached to different substrate	Ciliophora Order Peritrichida i.e. *Vorticella* sp.
Ciliates – Suctoria <.7 mm		1. no cilia, sticky tentacles 2. some attached to other organisms (i.e. *Suctoria*)	Ciliophora Order Eridogenida i.e. *Tokophyra* sp.

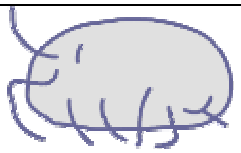
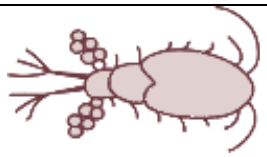
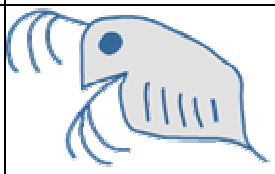
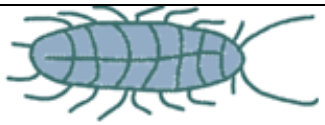
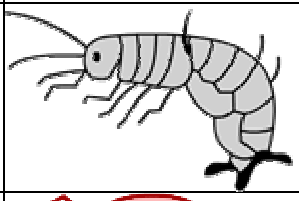
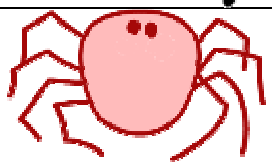
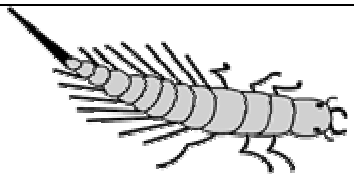
Ciliates Paramecium .01 – 4mm		1. mostly free living forms 2. cell of fixed shape 3. movement by contraction and use of cilia 4. fixed mouth and anal pore	Ciliophora Order Oliogohymenophorea i.e. *Paramecium* sp
Ciliates Stentor .01 – 4 mm		1. large body 2. contractile 3. cilia on mouth end	Ciliophora Orer Heterotrichea i.e. *Stentor* sp.
Ciliates Coleps .01-4mm		1. barrel-shaped 2. spinous projection at posterior end 3. cytosome apical	Ciliophora Order Prostomatea i.e. *Coleps* sp.

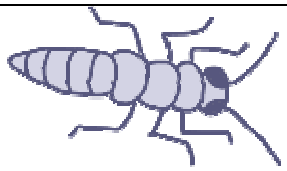
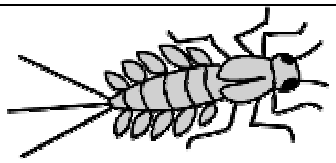
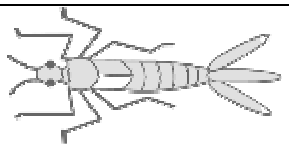
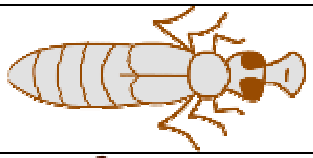
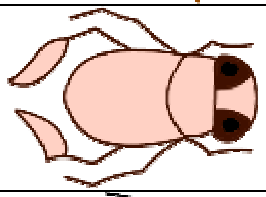
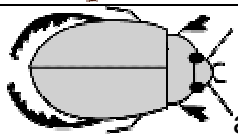
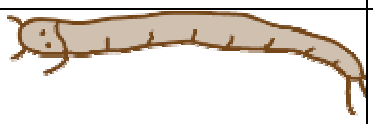
Other fresh water plankton (Animalia, Monera, etc)

Name	Picture	Characteristic	Taxonomy
Blue-green algae (cyanobacteria)		1. blue green color 2. gliding movement 3. prokaryote	Kingdom Monera i.e. *Annabella* sp.
Euglenoids <.4mm		1. sometimes green 2. flagellate 3. red eye spot	Phylum Euglenida i.e. *Euglena* sp.
Dinoflagellates <.4mm		1. free swimming 2. tough armor 3. flagellate 4. autotrophic, heterotrophic	Phylum Dinoflagellate
Rotifers .4mm - 2 cm		1. corona with cilia 2. hairy appendages 3. transparent with lorica 4. free swimming or attached 5. organs, compressed body	Phylum Rotifer Class Bdelloided Class Monogononta
Hydra 2 cm		1. green brown or colorless 2. body and tentacles contract and stretch 3. primitive organs	Phylum Cnidaria i.e. *Hydra* sp.
Flatworms 1-15+ mm		1. flattened 2. eye spots 3. move in gliding motion	Phylum Platyhelminthes Class Turbellaria I.e. *Planaria* sp.

Roundworms .2-10 mm		1. moves in rapid "s" form 2. round body 3. bilateral 4. anterior, posterior openings	Phylum Nematodes
Oligochaetes 1.5 mm - >2 cm		1. segmented 2. worm motion 3. hair bundles (setae)	Phylum Annelida Class Oligochaeta
Leeches > 1 cm		1. predatory or parasitic 2. terminal suckers 3. hermaphroditic	Phylum Annelida Class Hirudinea
Gastrotricha .1-1.5mm		1. mainly benthic 2. head bristles 3. eat algae, bacteria, protozoa	Phylum Gastrotricha Order Chaetonotida
Tardigrades Little water bears < 1 mm		1. head and 4 trunk segments 2. 4 pair legs 3. eyes 4. herbivores	Phylum Tardigrada

Arthropods - segmented, exoskeletons

Name	Picture	Characteristic	Taxonomy
Ostracods <2mm		1. bean-like shell 2. filter feeders 3. bivalve carapace	Class Crustacea Order Ostracoda i.e. *Cypris* sp.
Copepods .5-3mm		1. long antennae 2. tiny eyespot 3. holoplankton	Class Crustacea Order Copepoda
Water fleas .3-10mm		1. antennae 2. large compound eye 3. holoplankton	Class Crustacea Order Cladocera i.e. *Daphnia* sp
Isopods 5-20mm		1. flattened 2. 7 pairs legs 3. scavengers	Class Crustacea Order Isopoda
Amphipods 5-25mm		1. curved 2. compressed body 3. humped back 4. scavengers	Class Crustacea Order Amphipoda
Water mites .5-5mm		1. 8 legs 2. round body 3. larvae (parasitic) 4. nymph looks like adult	Class Arachnida Order Acarina
Alderfly nymph 5-25mm		1. one tail 2. long filaments along the abdomen 3. meroplankton	Class Insecta Order Megaloptera Family Sialidae
Caddisfly larva 3-40mm		1. cylindrical case for protection 2. distinct case but different materials	Class Insecta Order Trichoptera

Stonefly nymph <15 mm		1. two jointed tails (cerci) 2. carnivorous 3. indicates clean water	Class Insecta Order Plecoptera
Mayfly nymph <15mm		1. three jointed tails0 2. leaf-like gills on sides	Class Insecta Order Ephemeroptera
Damselfly Nymph <15mm		1. three leaf like tail appendages (gills) 2. extendable jaws	Class Insecta Order Odonata Zygoptera
Dragonfly nymph <15mm		1. robust 2. no tail appendages 3. extendable jaws	Class Insecta Order Odonata Anisoptera
Water boatman nymph.and adult 10-15mm		1. no jaws 2. tube-like beak 3. nymphs don't have wings	Class Insecta Order Hemiptera Family Corixidae
Water beetle <45mm	 adult	1. strong jaws 2. tough shield 3. fierce predator	Class Insecta Order Coleoptera Family Elmidae
	 nymph	1. strong jaws 2. long segmented body 3. short legs	
Mosquito larva 1-20 mm		1. long slender body 2. moves in undulating s curves	Class Insecta Order Diptera

Drawings redrawn from http://www.microscopy-uk.org.uk/pond/index.html

Assignment

Look at the manual on Tule Ponds and look at how the organisms were identified. Answer the following questions using the book as your guide:

List the native trees in this area?

List the native aquatic plants in this area?

What animals are the top predators in the area?

Do you think all the flora and fauna have been documented? Why or Why not?

NOTES

Planning your own Project

Things to consider when planning a project include:

- Accessibility- can you get to the area?
- Convenience - is the area easy to get to, or do you have to hike 5 miles to reach the area
- Maintenance – would you have to maintain the area? If so for how long
- Workability - can you work at the area easily?
- Interest – what makes this area special,
- Extent of project – what are you planning to do?
- Time – how long of a project are you looking planning

Accessibility

Is your potential project behind a fence? If so you need to find out who owns the area, what can you do there, how can you get there, is there a gate, a lock and many other questions. Where is your project located? Is it on a private or public road? What are the slopes like, steep or gradual? If you cannot get to an area you cannot restore an area.

Convenience

After asking about the accessibility you need to ask yourself if this area is convenient for you to monitor/care for plants you may have planted or the area itself. Completing a restoration project 30 miles away is a nice idea but you need to think about how you plan to continue to care for the area. **Restoration is not a one-time thing**.

Extent of project

What are you planning to accomplish? Are you trying to increase habitat for a certain fish or a type of bird? Are you removing debris from the creek bed to provide a better flow and to reduce the erosion caused by the rushing water in this area? Can the project be completed by one or do you need many people (remember the number you think you will get is never right)

Monitoring

Before you begin to restore you need to look at the environment you are going to be working. The first part must include mapping the area where you will be doing your restoration. Answering the questions of where does this creek come from would be appropriate for creek restoration so that you know where the water is coming from and the possible reasons for the detriment of the creek. Doing a biological survey of the area at both night and day (at least 2 of each during different seasons) will help to get an idea of what the area is lacking or what needs to be enhanced. A chemical analysis of the types of chemicals that could potentially affect the area is also necessary. Mapping the area gives you a good idea of the locations of potential hazards and or sources of pollution that could be affecting the health of the area.

Restoration site selection survey

Location (site name, cross streets and city):
_____

Area type (riparian, lake side, bay waters, grassland etc): _____

Water source _____

Surrounding area uses (include agriculture, streets etc.)
_____

Ease in finding (easy, need some directions, need very detailed directions, nearly impossible to find) _____

Convienence (in regards to ease in getting there) _____

What is the interest in this area _____

Vegetation general types rough% of each
□ Grasses _____ □ Barren _____ □ Brush _____
□ Deciduous trees _____ □ Conifers _____ □ Other _____

Bank slope circle one
□ Steep □ Moderate □ Slight

Bank Stability:
□ Stable □ Sightly eroded □ Moderately eroded □ Severely eroded

Will the bank slope and stability cause dangers when working? _____
How can these be reduced? _____

Water quality quick visual assessment (murkey, odor, pools and riffles present, fish, aquatic plants etc.) _____
_____
_____

What needs to be done to area (more trees, bank stabilization, non-native removal etc)
_____

How long will it take? _____

Will this keep the intrest of those involved?

NOTES