Group members:

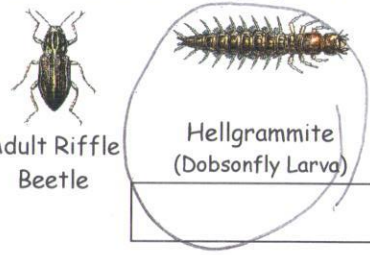
4/12/18

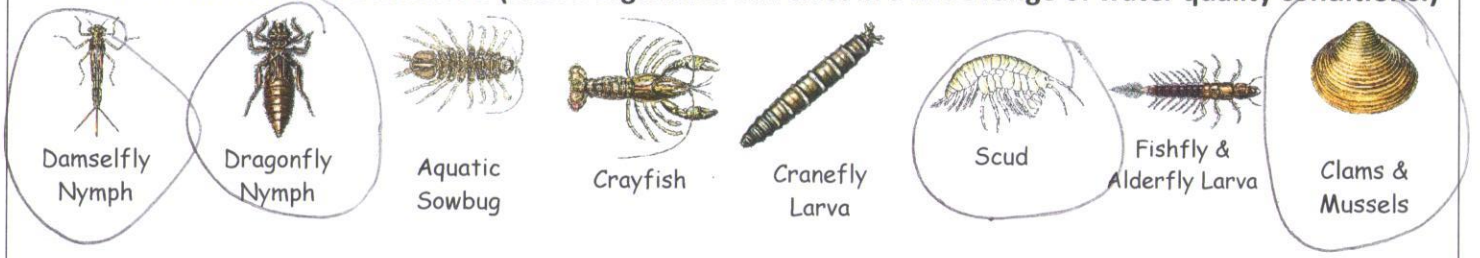
Your stream sample comes from: Bear Creek Lake

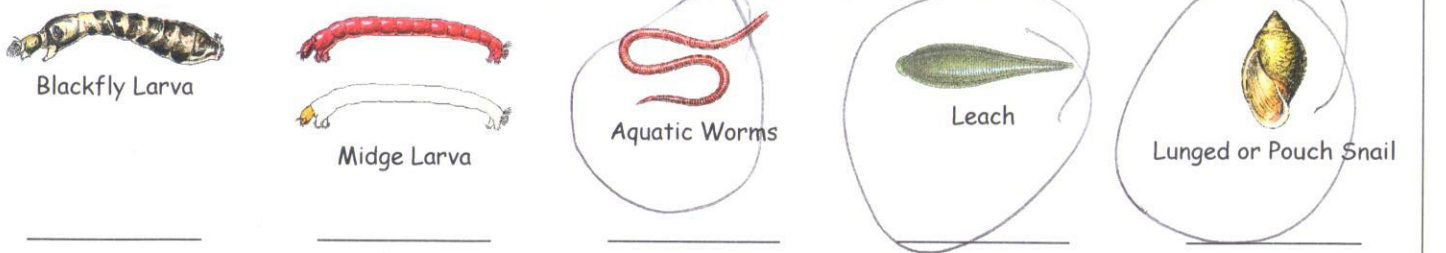
DATA COLLECTION TABLE

NOT TO SCALE

Index Value	Pollution Tolerance Categories
Number of Circled Organisms 2 x 3 = 6 index value (ex. Multiple Mayflies count as 1 circled organism)	**GROUP 1: Sensitive** (These organisms are generally pollution-intolerant.)
Number of Circled Organisms 4 x 2 = 8 index value (ex. multiple Crane-Fly larvae count as 1 circled organism)	**GROUP 2: Somewhat Sensitive** (These organisms can exist in a wide range of water quality conditions.)
Number of Circled Organisms 3 x 1 = 3 index value (ex. multiple aquatic worms count as 1 circled organism)	**GROUP 3: Tolerant** (These organisms are generally tolerant of pollution.)







WATER QUALITY RATING

Total Index Value = 17

(Add up the numbers in the boxes above.)

Circle the appropriate Water Quality Rating

Excellent (>22) Good (17-22) Fair (11-16) Poor (<11)

Group All Groups Cumberland 6th Grade MWEE

Temperature (Degrees F): **Air** 82 **Water** 60

	Excellent	**Good**	**Fair**	**Poor**
Dissolved oxygen ppm	7-11	5-6	3-4	0-2
pH	7	6 or 8		4, 5, 9, 10, 11
Nitrate ppm	0	1-4	5	Higher
Phosphate ppm	0 - 1	2	4	Higher
Turbidity (NTU)	1 to 5	5 to 25	25 to 55	55 or higher

April 12, 2018 Bear Creek Lake

Aquatic Macroinvertebrates

"Aquatic" **means** water, "macro" **means** big enough for us to see without using a microscope and "invertebrate" **means** without a backbone. So an aquatic **macroinvertebrate** is a water bug that we **can** see with our naked eye.

Aquatic macroinvertebrates are indicators of water quality. Different types of macroinvertebrates tolerate different stream conditions and levels of pollution. Depending on the types of macroinvertebrates found in a stream, predictions about water quality can be made. For example, caddisflies, mayflies, and stoneflies cannot live in polluted water. If these bugs are found in a stream, the water quality there is probably good. However, that doesn't mean that if these bugs are not found in a stream the water quality is bad. Other factors like temperature and flow also come into play. These bugs prefer cold rushing water, so a stream that has good water quality, but is a slow-moving stream in a desert may not have these bugs.

Aquatic macroinvertebrates are also an important part of aquatic and terrestrial food chains. They graze on algae and break down leaves and sticks that fall into the water and they themselves are a food source for fish.

2016

Biological Assessment:

Group 1 – Sensitive to Pollution

Species 2 Points 6

Group 2 – Somewhat Sensitive to Pollution

Species 3 Points 6

Group 3 – Tolerant of Pollution

Species 3 Points 3

Total – 15 points (Fair water quality)

Macroinvertebrates discovered:

Gilled snail, rifle beetle, dragonflies, clams
Crayfish, midges, leeches, worms

2017

Biological Assessment:

Group 1 – Sensitive to Pollution

Species 2 Points 6

Group 2 – Somewhat Sensitive to Pollution

Species 7 Points 14

Group 3 – Tolerant of Pollution

Species 3 Points 3

Total - 23

Macroinvertebrates discovered:

mayfly nymph, gilled snail, damselfly nymph, dragonfly nymph, sowbug, scud, clams, 2 species beetles, worms, leach, lunged snail

Assessment Chart:

Greater than 22 points	Potentially Excellent Water Quality
17 to 22 points	Potentially Good Water Quality
11 to 16 points	Potentially Fair Water Quality
Less than 10 points	Potentially Poor Water Quality

What's Your Watershed Address?

A **watershed** is defined as all of the land that drains into a particular body of water.

Let's start with our physical address and "zoom in" to where the park is located.

1. Planet: Earth
2. Hemisphere: Western
3. Continent: North America
4. Country: USA
5. State: Virginia
6. County: Cumberland
7. Street: Bear Creek Lake Road

Now let's figure out our watershed address—where the water runs from the park:

1. Little Bear Creek
2. Bear Creek Lake
3. Willis River
4. James River
5. Chesapeake Bay
6. Atlantic Ocean

****

Water Quality Monitoring Station

2016

Physical Assessment:

Weather Partly Cloudy, Breezy

Air Temperature - 60° F

Water Temperature - 57°F

Turbidity - 15 to 25 NTU's

Chemical Assessment:

pH - 7.0

Dissolved oxygen - 8 ppm

Nitrates – 0 ppm

Conclusion: Water quality good enough to support aquatic life? **Yes**/No

2017

Physical Assessment:

Weather Partly Cloudy, Breezy

Air Temperature 80° F

Water Temperature 70° F

Turbidity 30 NTU

Chemical Assessment:

pH 7

Dissolved oxygen 10 ppm

Nitrates - 0

Conclusion: Good water quality

Supports aquatic life? (Yes)/No

Water temperature--Warm water holds less oxygen than cold water and **most aquatic organisms can live in temperatures between 32°F and 90°F**

Turbidity is a measurement of the clarity of the water or how much suspended material in water like soil particles, algae, plankton, microbes, decreases the passage of light. High turbidity increases water temperature because the suspended particles absorb heat which reduces the dissolved oxygen needed to support aquatic life. **Acceptable turbidity range for aquatic life is less than 50 NTU's**

The **pH** scale goes from 0 (acidic) to 14 (basic) with 7 being neutral. A **pH between 6.5 and 8.2 is optimal** for most living organisms.

Dissolved oxygen is the amount of gaseous oxygen (O2) dissolved in the water. Although water molecules contain an oxygen atom, this oxygen is not what is needed by aquatic organisms living in natural waters. A small amount of oxygen, up to about ten molecules of oxygen per million molecules of water, is actually dissolved in water. Oxygen enters a stream mainly from the atmosphere, by rapid movement, or as a waste product of plant photosynthesis. Water temperature and the volume of moving water can affect DO levels. **DO levels of 5 to 6 ppm are required for growth and activity for aquatic organisms.**

Nitrogen gets in natural waters through human and animal waste, decomposing organic matter and fertilizer run off. Extra nitrogen can cause overstimulation of growth of aquatic plants and algae. Excessive growth of these organisms, raise the temperature of the water, use up dissolved oxygen as they decompose, remove carbon dioxide from water during photosynthesis which results in a significant increase in pH levels and block light to deeper waters raising the turbidity. This can produce unsightly scums of algae on the water surface. When fish and macroinvertebrates can't breathe they die. **Unpolluted waters generally have a nitrate-nitrogen level below 1 ppm**. Levels above 10 ppm are considered unsafe for drinking. Nitrate-nitrogen ppm x 4.4 = Nitrate ppm

Group A

2017

Group members:

Predacious Diving & Aquatic

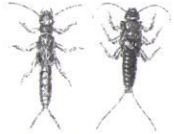
DATA COLLECTION TABLE

NOT TO SCALE

Index Value	Pollution Tolerance Categories
Number of Circled Organisms 1 x 3 = 3 index value (ex. Multiple Mayflies count as 1 circled organism)	**GROUP 1: Sensitive** (These organisms are generally pollution-intolerant.)
Number of Circled Organisms ~~34~~ 7 x 2 = ~~68~~ 14 index value (ex. multiple Crane-Fly larvae count as 1 circled organism)	**GROUP 2: Somewhat Sensitive** (These organisms can exist in a wide range of water quality conditions.)
Number of Circled Organisms ~~33~~ 9 x 1 = 9 index value (ex. multiple aquatic worms count as 1 circled organism)	**GROUP 3: Tolerant** (These organisms are generally tolerant of pollution.)


Adult Riffle Beetle


Hellgrammite (Dobsonfly Larva)


Stonefly Nymph


Most Caddis fly Larva


Mayfly Nymph


Water Penny Larva


Gilled Snail

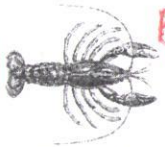

Damselfly Nymph

4


Dragonfly Nymph

12


Aquatic Sowbug


Crayfish

Beetle Predators 2 species


Cranefly Larva


Scud

14


Fishfly & Alderfly Larva


Clams & Mussels

4


Blackfly Larva


Midge Larva


Aquatic Worms

2


Leach

7


Lunged or Pouch Snail

WATER QUALITY RATING

Total Index Value = 80

(Add up the numbers in the boxes above.)

Circle the appropriate Water Quality Rating

Excellent (>22) Good (17-22) Fair (11-16) Poor (<11)

Your stream sample comes from: Bear Creek Lake