

# PA FFA Aquatic Resources Career Development Event



### **Chairperson Information**

CDE Chairperson	Rebecca Mosemann, Lacy Miles
Email	rmosemann@sfsd.k12.pa.us
Best Contact Number	(717)294-3251
Contest Date/Times	Tuesday and Wednesday
Contest Location	Tuesday-Off campus-Shaver's Creek Environmental Center (School appropriate outdoor dress); Wednesday-On Campus-Forest Resources Building (Official Dress)
CDE Review Time	Wednesday @ 2:15 pm
CDE Review Location	On Campus-Forest Resources Building

## Basic CDE Guidelines

Event Type: Individual	# of Team Members: N/A	
<ul> <li>Individual Materials List</li> <li>Pencil</li> <li>Calculator</li> <li>Clipboard</li> <li>Waders or closed toed shoes that will get wet</li> </ul>	<u>Group Materials List</u> ● N/A	
<ul> <li><u>Attire</u></li> <li>Students are required to wear school appropriate clothes. They will need closed toed water shoes that will get wet during the practicums</li> <li>Students should be prepared for the weather as the contest held outside.</li> <li>Competition is Rain or Shine!</li> <li>Outside school appropriate dress is required Tuesday while at Shaver's Creek. Official dress is required on Wednesday during testing on campus.</li> </ul>	<ul> <li>CDE At-A-Glance (List of major components)</li> <li>Identification (Fish, Reptiles &amp; Amphibians, Birds &amp; Mammals, Equipment, Aquatic Insects, Bird &amp; Amphibian Calls and Aquatic Plants)</li> <li>Written Test</li> <li>Bird/Amphibian Calls</li> <li>Practicums – minimum of 2 will be chosen from the list of 6 practicums. (Water testing, Stream Flow, Calculating biotic index, Determining Watershed boundaries, Pond Management (Stocking or Stocking Density), and GPS Activity)</li> </ul>	

Pre-State CDE Expectations

• Study the identification lists and be prepared to complete the practicums using the attached

#### CDE Changes from Previous Years?

- Added Bird & Amphibian Calls Identification (5) •
- Updated Identification lists to better match the Environmental and Natural Resources CDE •
- Changed Pond Management Practicum (A. Stocking or B. Pond Stocking Density) & Added Total Alkalinity to Water Testing Practicum; Removed Pond volume practicum

<u>CDE Rules</u>			
CDE Component	Points	Component Description	
Written Test	200	50 comprehensive questions on Limnology (Stream ecology), groundwater, ecology of aquatic species, management practices, PA Fish & Boat Commission Laws, etc.	
Identification of Aquatic Species, Insects, and Plants	325	<ul> <li>10 identification of each of the following (each worth 50 points): <ul> <li>Fish</li> <li>Equipment</li> <li>Reptiles and Amphibians</li> <li>Aquatic Plants</li> <li>Aquatic Insects</li> <li>Birds and Mammals</li> </ul> </li> <li>5 identification of Bird / Amphibian Calls (25 points)</li> <li>*Mounted, preserved or live specimens, body parts, picture, and / or colored power point slides may be used for identification in this part of the CDE.</li> <li>*See Resources for references and Identification lists.</li> </ul>	
Practicums: Problem Solving / Analysis	50	<ul> <li>2 or 3 of the following practicums will be chosen each year. (each worth 50 points):</li> <li>Water testing (using Hach / Lamotte / Ward test kit): Dissolved Oxygen, Temperature, pH, Hardness, Nitrates, Nitrites, Phosphates, Chlorine, Ammonia, and Total Alkalinity.</li> <li>Stream Flow and volume of water in a stream</li> <li>Determining watershed boundaries</li> <li>Pond Management *Stocking or Pond Stocking Density</li> <li>GPS Activity (From National Environmental &amp; Natural Resources CDE)</li> </ul>	

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#### Causes for Disqualification:

- Use of cell phone to locate / share answers;
- Cheating / Talking during the CDE.

**Tie-breaker:** Exam score will be used as the tie-breaker.

#### <u>Resources</u>

#### Aquatic Resource CDE Resource Websites:

- PA Department of Conservation and Natural Resources: <u>http://www.dcnr.state.pa.us/index.aspx</u>
- PA Envirothon: <u>http://www.envirothonpa.org/station/aquatic-ecology/</u>
- PA Game Commission: <u>http://www.pgc.state.pa.us</u>
- PA Fish & Boat Commission: <u>http://www.fish.state.pa.us</u>
- PSU College of Agricultural Sciences: <u>http://pubs.cas.psu.edu/Publications.asp</u> (publications on water and water quality)
- <u>http://extension.psu.edu/natural-resources/water/ponds/pond-management/fisheries/fish-populationexercise</u>
- U.S. Fish and Wildlife Service <a href="http://www.fws.gov/">http://www.fws.gov/</a>

#### Suggested references for the Written test:

- PFBC "Pennsylvania Fishes" http://fishandboat.com/pafish/fishhtms/chapindx.htm
- PFBC "Pennsylvania Reptiles and Amphibians" Book can be purchased from the PFBC (ISBN 1-930369-00X) (Envirothon teams can obtain a copy from the PA Envirothon)
- PFBC "Summary of Fishing Regulations and Laws" current year http://fishinpa.com/
- PFBC, PGC & DCNR "Endangered and Threatened Species of Pennsylvania" <u>http://www.pacode.com/secure/data/058/chapter75/chap75toc.html</u> http://www.portal.state.pa.us/portal/server.pt?open=514&objID=621014&mode=2
- PFBC "Basics of Water Pollution" http://fishandboat.com/education/catalog/waterpollutionpa.pdf
- PSU "A Quick guide to Groundwater in Pennsylvania" <u>http://pubs.cas.psu.edu/freepubs/pdfs/uh183.pdf</u>

#### Suggested references for the Identification sections:

- Fish PFBC wall charts (Set of 6 posters) PA Fish PFBC "PA Fishes" <u>http://fishandboat.com/pafish/fishhtms/chapindx.htm</u>
- Reptiles & Amphibians PFBC wall charts (set of 4 posters); PA Reptiles and Amphibians; Assorted field guides to reptiles and amphibians
- Birds & Mammals PGC wall charts (set of 8 posters); PA Birds and Mammals of PA; Assorted field guides to birds and mammals
- Equipment Forestry suppliers Inc. Catalog: <u>http://www.forestry-suppliers.com/</u>
- Insect PFBC "Pond & Stream study Guide" References
   <u>http://fishandboat.com/education/catalog/pondstream.pdf</u>; PFBC "Pond / Stream Study Guide & Key
   to Macroinvertebrates" <u>http://www.envirothonpa.org/documents/pondstream.pdf</u>; Assorted field
   guides to aquatic insects
- Plant PSU "A field guide to common aquatic plants in PA" <u>http://pubs.cas.psu.edu/FreePubs/pdfs/agrs110.pdf</u>; PSU "Management of Aquatic Plants" <u>http://pubs.cas.psu.edu/freepubs/pdfs/agrs102.pdf</u>; Assorted field guides to Aquatic plants

#### AQUATIC RESOURCES C.D.E. MASTER SCORE SHEET

Name		Student No.	
School		Score	
Scoring:	Maximu <u>Score</u>	um Points <u>Earned</u>	Total <u>Score</u>
Part I – Written Test (200 pts.) (50 questions at 4 points each)			
Total Score Part I	200		
Part II – Identification (300 pts.) (*10 species / identification; 5 pts.	Each)		
<ul> <li>A. Fish *</li> <li>B. Reptiles and Amphibians *</li> <li>C. Birds and Mammals *</li> <li>D. Equipment *</li> <li>E. Aquatic Insects *</li> <li>F. Aquatic Plants *</li> <li>G. Aquatic Birds &amp; Amphibian Calls (5 species / identification; 5 pts.)</li> </ul>	50 50 50 50 50 50 50 50 50 50 50 50 50 5		
Total Score Part II	325		
Part III – Practicums (150 pts.) (3 at 50 points each chosen from b	pelow)		
Practicum 1: Water Testing Practicum 2: Stream Flow Practicum 3: Biotic Index Practicum 4: Determining watershed Boundaries Practicum 5: Pond Management Practicum 6: GPS Activity Total Score Part III	50 50 50 50 50 50 50		
Maximum total possible FINAL TOTAL SCORE	675		

#### AQUATIC RESOURCES C.D.E. GENERAL KNOWLEDGE EXAM (200 PTS.)

Name		Student No
	3	score
1	18	35
2	19	36
3	20	37
4	21	38
5	22	39
6	23	40
7	24	41
8	25	42
9	26	43
10	27	44
11	28	45
12	29	46
13	30	47
14	31	48
15	32	49
16	33	50
17.	34.	

#### IDENTIFICATION OF AQUATIC SPECIES A. IDENTIFICATION OF FISH

(Bold Species = Non-Native Species Italicized Species = Invasive Species)

ame	Student No.
chool	Score
Bass (True)	Pikes
Striped Bass	Chain Pickerel
White Bass	Muskellunge
	Northern Pike
Catfishes	
Blue Catfish	Suckers
Bullhead Catfish	Northern Hogsucker
Channel Catfish	White Sucker
Flathead Catfish	
	Sunfishes
Eels	Black Crappie
American Eel	Bluegill
	Green Sunfish
Herrings	Largemouth Bass
American Shad	Pumpkinseed
 Gizzard Shad	Redbreast Sunfish
	Rock bass
Minnows	Smallmouth Bass
Blacknose Dace	White Crappie
Bluntnose Minnow	
Central Stoneroller	Trout / Salmon
Common Carp	Brook Trout
Common Shiner	Brown Trout
Creek Chub	Coho Salmon
Cutlips Minnow	
Fallfish	Palomino Trout / Golden Trout
Golden Minnow	Bainbow Trout
Longnose Dace	
	Others
Perches	Goby
Darter	Snakehead
Sauger	Sturgeon
020gci	
Valleye Vellow Perch	Gea Lampley
	i iiapia

Number Correct x 5 = SCORE \_\_\_\_\_

#### IDENTIFICATION OF AQUATIC SPECIES B. IDENTIFICATION OF REPTILES AND AMPHIBIANS (Bold Species = Non-Native Species Italicized Species = Invasive Species)

Name	Student No.
School	Score
<b>REPTILES</b>	Turtles - continued
Lizards	Painted
Broadhead skink	Redbellied
Coal skink	Red eared Slider
Collard Lizard	Ned eared onder
Eence lizard	Spirty Solitalien
Five-lined skink	Spolled
Green Anole Lizard	Stillkpot / Musk
	vvoou
Snakes	AMPHIBIANS
Black Racer	
Black Rat	
Brown	Frogs
Copperhead	Bullfrog
Coral	Gray Treefrog
Corn	Green
Cottonmouth	Leopard
Garter	Pickerel
Hognose	Spring Peeper
Massasauga	Wood
Milk	
Northern Water	Salamanders
Queen	Dusky
Redbelly	Four-toed
Ribbon	Hellbender
Ringneck	Jefferson
Rough Green	Longtail
Rubber Boa	Marbled
Scarlet Kingsnake	Mudpuppy
Smooth Earth	Red
Smooth Green	Redback
Timber Battlesnake	Red-spotted Newt
Worm	Slimy
Wom	Spotted
Turtles	Spring
Alligator Snapping	Two-lined
Blanding	
Bog	Others
209 Box	Alligator
Common Spapping	Crocodile
Eastern Mud	
Man	Number Correct v $5 = SCORF$
map	

#### IDENTIFICATION OF AQUATIC SPECIES C. IDENTIFICATION OF BIRDS AND MAMMALS (Bold Species = Non-Native Species Italicized Species = Invasive Species)

Name	Student No
School	Score

BIRDS	Waterfowl - continued	
Birds of Prey	Canada Goose	
Bald Eagle	Canvasback Duck	
Marsh Hawk (N. Harrier)	Common Goldeneye	
Osprey	Common Merganser	
	Green-winged Teal	
Marsh and Water	Hooded Merganser	
American Bittern	Lesser Scaup	
American Coot	Mallard Duck	
Belted Kingfisher	Northern Pintail Duck	
Black-crowned night Heron	Northern Shoveler	
Continion Shipe	Old Squaw	
Creat Blue Heron	Red Breasted Merganser	
Great Foret	RedHead	
Green Heron	Ring-necked Duck	
Herring Gull	Ruddy Duck	
Horned Grebe	Snow Goose	
King Rail	Tundra Swan	
Least Tern	White-winged Scoter	
Lesser Yellowlegs	Wood Duck	
Marsh Wren		
Pelican	MAMMALS	
Pied-billed Grebe	Beaver	
Red-winged Blackbird	Black Bear	
Ring-billed Gull	Grizzly Bear	
Sand hill Crane	Mink	
Solitary Sandpiper	Moose	
Sora	Muskrat	
Spotted Sandpiper	Nutria	
Tree Swallow	Otter	
Whooping Crane	Raccoon	
	Shrew	
Waterfowl	White-tailed Deer	
American Black Duck		
American Wigeon		
Blue-winged Teal	Number Correct x 5 = SCORE	

\_\_\_\_\_ Bufflehead

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#### IDENTIFICATION OF AQUATIC SPECIES D. IDENTIFICATION OF EQUIPMENT

Name	Student No.
School	Score

- \_\_\_\_\_ Animal Tags / bands
- \_\_\_\_\_ Bottom-sampling dredge
- \_\_\_\_\_ Chemical Waste jug
- \_\_\_\_\_ Color Comparator
- \_\_\_\_\_ Dissolved oxygen water test kit
- \_\_\_\_\_ Fish measuring board
- \_\_\_\_\_ GPS Unit
- \_\_\_\_\_ Hach kit for water quality
- \_\_\_\_\_ Hip boots
- \_\_\_\_\_ Kick net / aquatic net
- \_\_\_\_\_ Mammal traps
- \_\_\_\_\_ Periphyton (multi-plate) sampler
- \_\_\_\_\_ pH water test kit
- \_\_\_\_\_ Plankton net
- \_\_\_\_\_ Radio Telemetry Unit
- \_\_\_\_\_ Refractometer
- \_\_\_\_\_ Secchi disk
- \_\_\_\_\_ Seine
- \_\_\_\_\_ Sieve
- \_\_\_\_\_ Snake / Reptile Stick
- \_\_\_\_\_ Stream bottom (surber) sampler
- \_\_\_\_\_ Topographic map
- \_\_\_\_\_ Transparency Tube
- \_\_\_\_\_ Water meter for physical / chemical parameters
  - (pH, Conductivity & / or Dissolved Oxygen)
- \_\_\_\_\_ Water sample bottle
- \_\_\_\_\_ Water sampler / Kemmerer Sampler
- \_\_\_\_\_ Water Thermometer

Number Correct x 5 = SCORE \_\_\_\_\_

#### IDENTIFICATION OF AQUATIC SPECIES E. IDENTIFICATION OF AQUATIC INSECTS (Bold Species = Non-Native Species Italicized Species = Invasive Species)

Name	Student No.
School	Score

#### AQUATIC

#### Pollution Intolerant (Class I)

- \_\_\_\_\_ Caddisfly
- Freshwater clam
- \_\_\_\_\_ Hellgramite / Dobsonfly
- Mayfly
- Riffle Beetle
- Stonefly
- \_\_\_\_\_ Waterpenny

#### Facultative (Class II)

- \_\_\_\_\_ Aquatic Sowbug
- \_\_\_\_\_ Blackfly
- \_\_\_\_ Cranefly
- \_\_\_\_ Crayfish
- \_\_\_\_\_ Damselfly
- \_\_\_\_\_ Dragonfly
- \_\_\_\_\_ Fingernail clam
- Flatworm
- Gilled Snail
- \_\_\_\_\_ Horsefly

#### Pollution Tolerant (Class III)

- \_\_\_\_\_ Air-breathing snail (Pouch / Orb)
- \_\_\_\_\_ Aquatic earthworm
- \_\_\_\_\_ Backswimmer
- \_\_\_\_\_ Freshwater Mussel
- \_\_\_\_\_ Freshwater shrimp / Clam Shrimp
- \_\_\_\_\_ Giant Water Bug
- \_\_\_\_ Leech
- \_\_\_\_\_ Limpet
- \_\_\_\_\_ Midge
- \_\_\_\_\_ Mosquito
- \_\_\_\_\_ Moth Fly
- \_\_\_\_\_ Predaceous Diving Beetle
- \_\_\_\_\_ Rat-tailed Maggot
- \_\_\_\_\_ Scud-side Swimmer
- \_\_\_\_\_ Water boatman
- \_\_\_\_\_ Water Strider
- \_\_\_\_\_ Whirligig Beetle
- \_\_\_\_\_ Zebra Mussel

#### OTHER

- \_\_\_\_\_ Asiatic Clam
- \_\_\_\_\_ Crab
- \_\_\_\_ Lobster
- \_\_\_\_\_ Saltwater Shrimp

Number Correct x 5 = SCORE \_\_\_\_\_

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#### IDENTIFICATION OF AQUATIC SPECIES F. IDENTIFICATION OF AQUATIC PLANTS (Bold Species = Non-Native Species Italicized Species = Invasive Species)

me Student No	
School	Score
Emergents	Submergents
Arrowhead	American (floating) Pondweed
Cattail	Bladderwort
Cinquefoil	Common Elodea (waterweed)
Common Reed	Coontail
Fern	Curly Pondweed
Horsetail	Hydrilla
Jewelweed	Milfoil (water Milfoil)
Marsh Marigold	Sago Pondweed
Pennywort	
Purple Loosestrife	Trees & Shrubs
Rushes	Ash
Sedges	Birch
Skunk Cabbage	Black Gum (Tupelo)
Water cress	Blueberry
Water Hemlock	Box elder Maple
Water Smartweed	Elderberry
	Elm
Floaters	Hemlock
Algae	Himalaya Blackberry
Duckweed	Japanese Knotweed
Spatterdock	Larch
Water Lily	Locust
Watersheild	Maple
	Mountain Laurel
	Russian Olive
	Salt Cedar
	Speckled Alder
	Spice Bush
	Sycamore
	Willow

Number Correct x 5 = SCORE \_\_\_\_\_

ame		Student No
hool		Score
	ANS	
,	Toad	
FR	065	
	Grav Treefrog	
	Green	
	Leopard	
	Pickerel	
	Spring Peeper	
	Wood	
BIRDS		
	Bald Eagle	
	Belted Kingfisher	
	Canada Goose	
	Common Shipe	
	Gleat Blue Heron	
	Ospiey Rod wingod Blackbi	ird
		i u

Number Correct x 5 = SCORE

#### PART III: PRACTICUMS 1. <u>Water Testing: Alkalinity (CaCo3), Dissolved Oxygen (D.O.), Temperature and</u> pH (scorecard #1)

Name	Student No.
School	Score

A. Using the test kit (s) and thermometer provided, perform the following water tests on the sample and record the results below:

Test Results:	D.O.	Temperature
	рН	Total Alkalinity

B. Based on the Dissolved Oxygen level you found, use the chart below to predict the major species of aquatic life supported in this water (Circle your results):

	•
Examples of Life	D.O. in parts per million or / milligrams per liter
Cold – water organisms, including salmon and trout Spawning, growth and well-being (Caddisfly, stonefly, & mayfly)	6 ppm and above
Warm-water organisms, (including game fish such as bass, crappie, catfish and carp) growth and well-being (some caddisfly)	5 ppm and below

Dissolved Oxygen Requirements for Native Fish and Other Aquatic Life

C. Based on the Temperature you found, use the following chart to predict the major species of aquatic life supported in this water: (Circle your results)

Temperature Requirements for Native Fish and Other Aquatic Life
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Examples of Life	Temperature
Cold-water organisms, including salmon and trout, caddisfly, stonefly, and mayfly nymphs	<55 ° F (<13° C)
Mayfly nymphs, caddisfly larvae, water beetles, and water striders	55 – 60 ° F (13 - 15° C)
Some plant life, some fish diseases, trout, and stonefly nymphs	61 – 68 ° F (16 - 20° C)
Much plant life, many fish diseases, bass, crappie, bluegill, catfish and carp	Above 68 ° F (> 20° C)

#### D. Dissolved Oxygen Percent Saturation

- a. Determine Water Temperature in degrees C, and find that value on upper (temperature scale).
- b. Determine Dissolved Oxygen and find that value on the lower (DO) scale.
- c. Using a straight edge, draw a line from the temperature value to the dissolved oxygen value. The point at which the line crosses the middle (Saturation) scale is the percent saturation of oxygen.



Percent Saturation \_\_\_\_\_ Circle your results in the below chart

% Satu	ration values and what the	ey mean
125% and grea	ater = too high, may be da	ngerous to fish
80-124%: Excellent	60 – 79%: Okay	Below 60%: Poor

Temperature	conversion formulas:	
$^{\circ}C = \frac{(^{\circ}F - 32)}{1.8}$	$^{\circ}F = (^{\circ}C \times 1.8) + 32$	

# E. Based on the pH you found, use the chart below to predict the major species of aquatic life supported in this water.

(011010	<i>J</i> e <i>m</i> 1 e e <i>m</i> 1 e					-						
	pH Ranges that Support Aquatic Life											
	Most Acid Neutral Most Alkaline							Alkaline				
	1 2	3 4	5	6	7 8	8	9	10	11	12	13	14
Bacteria	<u>1.0</u>											13.0
Plants (algae, Roote	ed, etc.)			<u>(</u>	6.5						12.0	<u>0</u>
Carp, suckers, catfi	sh, some ins	ects		<u>6.</u>	0		9.	.0				
Bass & Crappie				<u>(</u>	6.5		8.5					
Snails, Clams, & Mu	nails, Clams, & Mussels <u>7.0 9.0</u>											
Largest variety of an (trout, mayfly, stone	nimals fly, & Caddi	sfly)		<u>6</u>	5.5 7	<u>.5</u>						

(Circle your results on the pH scale & the aquatic life that would be found here.)

#### F. TOTAL ALKALINITY

Calcium Carbonate (CaCo3); Based on the Total Alkalinity you found, use the chart below to predict type of stream and sensitivity to acid precipitation.

(Circle your results below)

#### **Freestone streams**

10 mg/l or less:	Very Sensitive to acid precipitation
10 - 20 mg/l:	Somewhat sensitive to acid precipitation
20 mg/l or greater	Not Sensitive to acid precipitation

#### Limestone streams

75 mg/l or greater

TOTAL SCORE (max. 50 points)

# PART III: PRACTICUMS 1. <u>Water Testing: Dissolved Oxygen (D.O.), Temperature and pH (scorecard #2)</u>

Name	Student No.
School	Score

Your job today is to analyze the given water sample. You will need to find the given levels of the following possible factors: nitrites, dissolved oxygen, nitrates, pH, phosphates, water hardness, chlorine, ammonia and the current temperature. Using this information indicate if the water quality is suitable for the given species. Indicate the limiting factors and explain ways this water quality can be improved. (Each year, you will test for four of the categories listed in the handbook.)

Category	Answers	Possible points	Score		
1.		5			
2.		5			
3.		5			
4.		5			
Indicate if the quality of the sample	is suitable for the follow	wing use:		5	
Indicate the limiting factor (s):				12.5	
How can water quality be improved	?			12.5	

Tatal Casuar	CO mainta	
Total Score:	50 points	

#### PART III: PRACTICUMS <u>2. Stream Flow</u>

Name	Student No.
School	Score

For stream

- \*\*Students should be prepared to wade into stream for this practicum. In some cases, stream data may be given to save time.
  - A. Measure and mark a 100-foot distance along a straight section of your stream. If you can't find a 100-foot section, use 25' or 50'. Throw a stick (5 or 6 inches long; or 12.7 15.2 cm long) in the water above the upstream marker. Record the number of seconds it takes to float downstream between the markers. Record below. Now *divide* the 100-foot distance by the total seconds it took the stick to float between the markers. Do this three times and use the average time.

1 <sup>st</sup> : 100 ft. distance	÷	=	ft./ second	
Measurement	(Total seconds to fl	loat 100 ft.)	(# of feet stick floated each seco	ond)
2 <sup>nd</sup> : 100 ft. distance	÷	=	ft./ second	
Measurement	(Total seconds to fl	loat 100 ft.)	(# of feet stick floated each seco	ond)
3 <sup>rd</sup> : 100 ft. distance	÷	=	ft./ second	
Measurement	(Total seconds to fl	loat 100 ft.)	(# of feet stick floated each seco	ond)
+	+		=	
1 <sup>st</sup> measurement	2 <sup>nd</sup> measurement	3 <sup>rd</sup> measurer	ient Total	
(Ft./ second)	Ft. / Second)	(Ft. / Second	(Ft. / Second)	
Total (Ft./Second)	÷ 3 =		_(Ft./Second Average)	

B. Find the average width of your section of the stream. Measure the width of the stream at three places within the 100-foot area, then *divide* the total by three to get the average width of the stream.

1 <sup>st</sup> measurement 2 <sup>nd</sup> measurement 3 <sup>rd</sup> measurement	ft. ft. ft.		
Total	ft ÷ 3 =	ft. (Average width)	

C. Find the average depth of your section of the stream. Measure the depth of the stream in three places across the stream in a straight line, then *divide* the total by four to get the average depth of the stream.

1 <sup>st</sup> measurement 2 <sup>nd</sup> measurement 3 <sup>rd</sup> measurement	ft. ft. ft.		
Total	ft ÷ 4 =	ft. (Average depth)	

Note: The reason you take three depth measurements then divide by 4 is to take into account the shallow areas of the stream. It can be explained by the following examples of a drawing of a stream cross-section. If depth in three places is A (5'), B (10'), and C (5'), (total 20'), find an average by *dividing* by 3: 20'  $\div$  3 = 6 2/3'. Now look at the area or average depth (D), which is 5'. Take total of depths and *divide* by 4: 20'  $\div$ 4 = 5', the correct average depth.



D. Find the cubic feet of water per second: multiply the average width, average depth and the number of feet the stick floated each second. (A cubic foot is water in a container 1 foot wide, 1 foot high and 1 foot long, or 7.48 gallons. A cubic meter of water is the amount in a container 1 meter wide, 1 meter high, and 1 meter long, or 1,000 liters.)

	ft. x	ft. x	=	=
Average	average		# of feet	Cubic feet of water
Width (B)	Depth (D)		per second (A)	flowing per second

E. The average person uses about 200 gallons (757 liters) of water a day for home use. (This does not reflect each person's share of water used for public service and industrial and commercial uses.) In order to find out how many people could get their water needs for 1 day from this stream, complete the following calculations.

Cubic feet per seco	X nd	Gallons i	= in 1 cu. Ft of water	= Gallons	of water / second	
Gallons / second	_ X	seconds	s in a minute	= gallons	of water / minute	
Gallons of wate Per minute	< <u> </u>	= s in a	Total gallons of water / day	÷ 200 gals. = 1 persons daily water usage	Total # of people who could get daily water from this stream	

#### PART III: PRACTICUMS

3. Biotic Index

Name	Student No.
School	Score

Collecting actual specimens from the stream with equipment provided (Students may bring their own collection equipment, hand-lens, etc.); OR using the given specimens collected from a stream, calculate the biotic index of this stream. Use the aquatic insect identification guide to calculate the number of insects in each category.

The biotic index is calculated using the following formula:

(2 x number of Class I X's) + (# of Class II X's) = Biotic Index

Put an "X" next to each species you identify.

	<u>Class</u>	<u>l</u>			<u>Class II</u>
	Caddia Freshv Hellgra Mayfly Riffle I Stone Water	sfly water clam amite Beetle fly penny			Blackfly Cranefly Crayfish Damselfly Dragonfly Fingernail clam Flatworm Gill Snail Horsefly Sowbug
(2 x _	)	+	(	) =	_Stream Pollution Index number
Stream Pollu	tion Inde	ex Number: (Cir	rcle you	r result	)
Biotic Biotic Biotic	Index Index Index	10 of greater 1 – 9 0	= = =	Clean Moder Severe	Stream rately polluted ely polluted

Stream Pollution Index Number =

Score \_\_\_\_\_

## PART III: PRACTICUMS

### 4. Determining Watershed Boundaries

Name Schoo	bl	Student	No		
Provid	le your definition of a watershed:				
Find y	our location of this stream (pond, lake) on	the map provided.			
Where	e does the water come from?				
Where	e does it go?				_
Draw I	lines around the boundaries of our watersh	ed. Which watersh	ned are we in?	?	
					_
Conce Activit	AWARENE ept: Watershed map interpretation can provide y: Have students use the provided map of the	ESS: WATERSHED preliminary informatio watershed to answer	MAP on about water the questions I	quality. celow.	
Conce Activity 1.	AWARENE ept: Watershed map interpretation can provide y: Have students use the provided map of the Where is the water quality the best?	ESS: WATERSHED preliminary informatic watershed to answer	MAP on about water the questions l	quality. below.	
Conce Activity 1. 2.	AWARENE ept: Watershed map interpretation can provide ty: Have students use the provided map of the Where is the water quality the best? Where would you find the greatest amount	ESS: WATERSHED preliminary informatic watershed to answer ut of pollution from	MAP on about water the questions l human waste	quality. below. s?	
Conce Activity 1. 2. 3.	AWARENE ept: Watershed map interpretation can provide y: Have students use the provided map of the Where is the water quality the best? Where would you find the greatest amoun Where is the stream velocity the greatest?	ESS: WATERSHED preliminary informatic watershed to answer it of pollution from	MAP on about water the questions b human waste	quality. below. s?	
Conce Activity 1. 2. 3.	AWARENE ept: Watershed map interpretation can provide by: Have students use the provided map of the Where is the water quality the best? Where would you find the greatest amoun Where is the stream velocity the greatest? The lowest?	ESS: WATERSHED preliminary informatic watershed to answer it of pollution from	MAP on about water the questions b human waste	quality. below. s?	
Conce Activity 1. 2. 3. 4.	AWARENE ept: Watershed map interpretation can provide by: Have students use the provided map of the Where is the water quality the best? Where would you find the greatest amoun Where is the stream velocity the greatest? The lowest? Where could the surface runoff have the lowest	ESS: WATERSHED preliminary informatic watershed to answer it of pollution from	MAP on about water the questions b human waste	quality. below. s?  zer?	
Conce Activity 1. 2. 3. 4. 5.	AWARENE ept: Watershed map interpretation can provide by: Have students use the provided map of the Where is the water quality the best? Where would you find the greatest amoun Where is the stream velocity the greatest? The lowest? Where could the surface runoff have the P	ESS: WATERSHED preliminary informatic watershed to answer nt of pollution from nighest contaminatio	MAP on about water the questions b human waste on from fertili	quality. below. s?  zer?  nent?	
Conce Activity 1. 2. 3. 4. 5. 6.	AWARENE ept: Watershed map interpretation can provide by: Have students use the provided map of the Where is the water quality the best? Where would you find the greatest amoun Where is the stream velocity the greatest? The lowest? Where could the surface runoff have the P Where could the surface runoff have the P	ESS: WATERSHED preliminary informatic watershed to answer nt of pollution from nighest contamination nighest contamination ole to flooding?	MAP on about water the questions h human waste on from fertili	quality. below. s?  zer?  nent?	
Conce Activity 1. 2. 3. 4. 5. 6. 7.	AWARENE ept: Watershed map interpretation can provide by: Have students use the provided map of the Where is the water quality the best? Where would you find the greatest amoun Where is the stream velocity the greatest? The lowest? Where could the surface runoff have the best? Where could the surface runoff have the best? Where could the surface runoff have the best? What portion of the river is most vulneral What is the highest elevation in this water	ESS: WATERSHED preliminary informatic watershed to answer at of pollution from highest contamination highest contamination highest contamination highest contamination highest contamination highest contamination highest contamination	MAP on about water the questions b human waste on from fertili	quality. below. s? 	
Conce Activity 1. 2. 3. 4. 5. 6. 7.	AWARENE ept: Watershed map interpretation can provide by: Have students use the provided map of the Where is the water quality the best? Where would you find the greatest amoun Where is the stream velocity the greatest? The lowest? Where could the surface runoff have the I Where could the surface runoff have the I What portion of the river is most vulneral What is the highest elevation in this water	ESS: WATERSHED preliminary informatic watershed to answer nt of pollution from nighest contaminatio nighest contaminatio ble to flooding?	MAP on about water the questions b human waste on from fertili	quality. below. s? 	
Conce Activity 1. 2. 3. 4. 5. 6. 7. 8.	AWARENE ept: Watershed map interpretation can provide by: Have students use the provided map of the Where is the water quality the best? Where would you find the greatest amoun Where is the stream velocity the greatest? The lowest? Where could the surface runoff have the P Where could the surface runoff have the P Where could the surface runoff have the P What portion of the river is most vulneral What is the highest elevation in this water What is the lowest elevation in this water What is the lowest elevation in this water What is the ridge line in this watershed?	ESS: WATERSHED preliminary informatic watershed to answer nt of pollution from nighest contamination nighest contamination ple to flooding?	MAP on about water the questions h human waste on from fertili	quality. below. s? zer? hent?	

\*\*\* This is an example of watershed questions. Questions may vary based on the Topographic map used.

#### PART III: PRACTICUMS <u>5. Pond management</u> <u>A. STOCKING</u>

Name	Student No.
School	Score

Given the following information, make choices as to how you would manage this habitat.

Pond Size \_\_\_\_\_ Average Maximum Temperature \_\_\_\_\_ PH range = \_\_\_\_\_

- 1. Which Species would you manage for?
  - \_\_\_\_\_ Largemouth bass
  - \_\_\_\_\_ Brook Trout
- 2. Would you stock a food species with the primary species for which you are managing? \_\_\_\_\_Yes
  - \_\_\_\_\_No

Assume the following ratios:

- 100 fingerling largemouth bass per acre
- 500 bluegill fingerlings per acre
- 400 adult golden shiners per acre
- 600 fall fingerling trout per acre
  - 3. What would be the stocking plan that you would recommend for this pond? List the number for each species that you would stock. (Select only those species appropriate to be consistent with other decisions and conditions.)
    - \_\_\_\_\_ Fall Fingerling trout
    - \_\_\_\_\_ Largemouth bass fingerlings
  - 4. Depending on your choice above (Either A or B below will be chosen for you)
    - a. The fact that you do not wish to have to fish for anything but trout or bass, OR
    - b. The fact that you want to maximize your fishing opportunities,

What would you recommend (fill in number as appropriate)?

Stock	bluegill fingerlings

\_\_\_\_\_ Stock \_\_\_\_\_\_ golden shiner adults

\_\_\_\_\_ Don't stock any food fish, just let the natural food chain develop

5. Which would you recommend for removing excess water from the pond?

\_\_\_\_\_ Spillway

Pipe water out from bottom

#### PART III: PRACTICUMS <u>5. Pond management</u> <u>B. POND STOCK DENSITY (Proportional Stock Density Method (PSD))</u>

Name	_ Student No	
School	Score	

Given the following information, determine the Proportional Stock Density (PSD) for your pond to help in managing the bass and bluegill population.

	Size	# of Bluegill		A
3 – 6 inches long				F
Over 6 inches long			А	F
Total			В	

Arithmetic: PSD Bluegill = **A ÷ B** x 100 PSD Bluegill = \_\_\_\_

Size	# of Bass		Arithme
8 – 12 inches long			PSD Ba
Over 12 inches long		С	PSD Ba
Total		D	

Arithmetic: PSD Bass = **C ÷ D** x 100 PSD Bass = \_\_\_\_

Plot the result on the chart



#### PART III: PRACTICUMS 6. GPS Locations

Name	Student No.	
School	Score	

Participants will utilize the global position systems (GPS) unit (supplied by the team) to complete one of the following:

- 1. Identify the longitude and latitude of a given set of points using a GPS unit and a map.
- 2. Identify boundaries of a given area including calculation of land area and linear feet of boundary.
- 3. Use GPS unit and topographic map to layout the location of fence line, pond, drainage structure or other related facility.
- 4. Use a GPS unit to mark the location of a path or road through a given area.
- 5. Use GPS unit to determine slope of land area for installation of drainage and / or other related facilities.

List your numbers for each location point following the latitude and longitude given.				
Location point	Point number	Possible points	Score	
1		10		
2		10		
3		10		
4		10		
5		10		
Total Points				