**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; Wednesday-On Campus-Forest Resources Building |
| **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 |
| Individual Materials List   * Pencil * Calculator * Clipboard * Waders or closed toed shoes that will get wet | Group Materials List   * N/A |
| Attire   * Students are required to wear school appropriate clothes. They will need closed toed water shoes that will get wet during the practicums * Students should be prepared for the weather as the contest held outside. * Competition is Rain or Shine! | CDE At-A-Glance (List of major components)   * Identification (Fish, Reptiles & Amphibians, Birds & Mammals, Equipment, Aquatic Insects, Bird & Amphibian Calls and Aquatic Plants) * Written Test * Bird/Amphibian Calls * 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) |
| Pre-State CDE Expectations   * Study the identification lists and be prepared to complete the practicums using the attached answer sheets. | |
| 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 | |

***CDE Rules***

|  |  |  |
| --- | --- | --- |
| **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.  \*See resources for references. |
| Identification of Aquatic Species, Insects, and Plants | 325 | 10 identification of each of the following  (each worth 50 points):   * Fish * Equipment * Reptiles and Amphibians * Aquatic Plants * Aquatic Insects * Birds and Mammals   5 identification of Bird / Amphibian Calls (25 points)  \*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.  \*See Resources for references and Identification lists. |
| Practicums: Problem Solving / Analysis | 50 | 2 or 3 of the following practicums will be chosen each year. (each worth 50 points):   * **Water testing** (using Hach / Lamotte / Ward test kit): Dissolved Oxygen, Temperature, pH, Hardness, Nitrates, Nitrites, Phosphates, Chlorine, Ammonia, and Total Alkalinity. * **Stream Flow and volume of water in a stream** * **Determining watershed boundaries** * **Pond Management**   **\*Stocking or Pond Stocking Density**   * **GPS Activity (From National Environmental & Natural Resources CDE)**   \*See Resources for references and Practicum sheets. |
| **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. | | |

***Resources***

|  |
| --- |
| **Aquatic Resource CDE Resource Websites:**   * PA Department of Conservation and Natural Resources: <http://www.dcnr.state.pa.us/index.aspx> * PA Envirothon: <http://www.envirothonpa.org/station/aquatic-ecology/> * PA Game Commission: <http://www.pgc.state.pa.us> * PA Fish & Boat Commission: <http://www.fish.state.pa.us> * PSU – College of Agricultural Sciences: <http://pubs.cas.psu.edu/Publications.asp>   (publications on water and water quality)   * <http://extension.psu.edu/natural-resources/water/ponds/pond-management/fisheries/fish-population-exercise> * U.S. Fish and Wildlife Service <http://www.fws.gov/> |
| **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” <http://www.pacode.com/secure/data/058/chapter75/chap75toc.html> <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” <http://pubs.cas.psu.edu/freepubs/pdfs/uh183.pdf> |
| **Suggested references for the Identification sections:**   * Fish - PFBC wall charts (Set of 6 posters) PA Fish PFBC “PA Fishes” <http://fishandboat.com/pafish/fishhtms/chapindx.htm> * 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: <http://www.forestry-suppliers.com/> * Insect - PFBC “Pond & Stream study Guide” References <http://fishandboat.com/education/catalog/pondstream.pdf> ; PFBC “Pond / Stream Study Guide & Key to Macroinvertebrates” <http://www.envirothonpa.org/documents/pondstream.pdf> ; Assorted field guides to aquatic insects * Plant - PSU “A field guide to common aquatic plants in PA” <http://pubs.cas.psu.edu/FreePubs/pdfs/agrs110.pdf> ; PSU “Management of Aquatic Plants” <http://pubs.cas.psu.edu/freepubs/pdfs/agrs102.pdf> ; Assorted field guides to Aquatic plants |

AQUATIC RESOURCES C.D.E.

MASTER SCORE SHEET

Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Student No. \_\_\_\_\_\_\_\_\_\_\_\_\_

School \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Score \_\_\_\_\_\_\_\_\_\_\_\_\_\_

Scoring: Maximum Points Total

Score Earned Score

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)

1. Fish \* 50 \_\_\_\_\_\_\_\_\_\_
2. Reptiles and Amphibians \* 50 \_\_\_\_\_\_\_\_\_\_
3. Birds and Mammals \* 50 \_\_\_\_\_\_\_\_\_\_
4. Equipment \* 50 \_\_\_\_\_\_\_\_\_\_
5. Aquatic Insects \* 50 \_\_\_\_\_\_\_\_\_\_
6. Aquatic Plants \* 50 \_\_\_\_\_\_\_\_\_\_
7. Aquatic Birds & Amphibian Calls 25 \_\_\_\_\_\_\_\_\_\_

(5 species / identification; 5 pts. Each)

Total Score Part II 325 \_\_\_\_\_\_\_\_\_\_

Part III – Practicums (150 pts.)

(3 at 50 points each chosen from below)

Practicum 1: Water Testing 50 \_\_\_\_\_\_\_\_\_\_

Practicum 2: Stream Flow 50 \_\_\_\_\_\_\_\_\_\_

Practicum 3: Biotic Index 50 \_\_\_\_\_\_\_\_\_\_

Practicum 4: Determining watershed

Boundaries 50 \_\_\_\_\_\_\_\_\_\_

Practicum 5: Pond Management 50 \_\_\_\_\_\_\_\_\_\_

Practicum 6: GPS Activity 50 \_\_\_\_\_\_\_\_\_\_

Total Score Part III 150 \_\_\_\_\_\_\_\_\_\_

Maximum total possible 675

FINAL TOTAL SCORE \_\_\_\_\_\_\_\_\_\_

AQUATIC RESOURCES C.D.E.

GENERAL KNOWLEDGE EXAM (200 PTS.)

Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Student No. \_\_\_\_\_\_\_\_\_\_\_\_\_

School \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Score \_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. \_\_\_\_\_\_\_\_
2. \_\_\_\_\_\_\_\_
3. \_\_\_\_\_\_\_\_
4. \_\_\_\_\_\_\_\_
5. \_\_\_\_\_\_\_\_
6. \_\_\_\_\_\_\_\_
7. \_\_\_\_\_\_\_\_
8. \_\_\_\_\_\_\_\_
9. \_\_\_\_\_\_\_\_
10. \_\_\_\_\_\_\_\_
11. \_\_\_\_\_\_\_\_
12. \_\_\_\_\_\_\_\_
13. \_\_\_\_\_\_\_\_
14. \_\_\_\_\_\_\_\_
15. \_\_\_\_\_\_\_\_
16. \_\_\_\_\_\_\_\_
17. \_\_\_\_\_\_\_\_
18. \_\_\_\_\_\_\_\_
19. \_\_\_\_\_\_\_\_
20. \_\_\_\_\_\_\_\_
21. \_\_\_\_\_\_\_\_
22. \_\_\_\_\_\_\_\_
23. \_\_\_\_\_\_\_\_
24. \_\_\_\_\_\_\_\_
25. \_\_\_\_\_\_\_\_
26. \_\_\_\_\_\_\_\_
27. \_\_\_\_\_\_\_\_
28. \_\_\_\_\_\_\_\_
29. \_\_\_\_\_\_\_\_
30. \_\_\_\_\_\_\_\_
31. \_\_\_\_\_\_\_\_
32. \_\_\_\_\_\_\_\_
33. \_\_\_\_\_\_\_\_
34. \_\_\_\_\_\_\_\_
35. \_\_\_\_\_\_\_\_
36. \_\_\_\_\_\_\_\_
37. \_\_\_\_\_\_\_\_
38. \_\_\_\_\_\_\_\_
39. \_\_\_\_\_\_\_\_
40. \_\_\_\_\_\_\_\_
41. \_\_\_\_\_\_\_\_
42. \_\_\_\_\_\_\_\_
43. \_\_\_\_\_\_\_\_
44. \_\_\_\_\_\_\_\_
45. \_\_\_\_\_\_\_\_
46. \_\_\_\_\_\_\_\_
47. \_\_\_\_\_\_\_\_
48. \_\_\_\_\_\_\_\_
49. \_\_\_\_\_\_\_\_
50. \_\_\_\_\_\_\_\_

IDENTIFICATION OF AQUATIC SPECIES

1. IDENTIFICATION OF FISH

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

Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Student No. \_\_\_\_\_\_\_\_\_\_\_\_\_

School \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Score \_\_\_\_\_\_\_\_\_\_\_\_\_\_

***Bass* (True)**

\_\_\_\_\_ Striped Bass

\_\_\_\_\_ White Bass

**Catfishes**

\_\_\_\_\_ **Blue Catfish**

\_\_\_\_\_ Bullhead Catfish

\_\_\_\_\_ Channel Catfish

\_\_\_\_\_ Flathead Catfish

**Eels**

\_\_\_\_\_ American Eel

**Herrings**

\_\_\_\_\_ American Shad

\_\_\_\_\_ Gizzard Shad

**Minnows**

\_\_\_\_\_ Blacknose Dace

\_\_\_\_\_ Bluntnose Minnow

\_\_\_\_\_ Central Stoneroller

\_\_\_\_\_ Common Carp

\_\_\_\_\_ Common Shiner

\_\_\_\_\_ Creek Chub

\_\_\_\_\_ Cutlips Minnow

\_\_\_\_\_ Fallfish

\_\_\_\_\_ Golden Minnow

\_\_\_\_\_ Longnose Dace

**Perches**

\_\_\_\_\_ Darter

\_\_\_\_\_ Sauger

\_\_\_\_\_ Walleye

\_\_\_\_\_ Yellow Perch

**Pikes**

\_\_\_\_\_ Chain Pickerel

\_\_\_\_\_ Muskellunge

\_\_\_\_\_ Northern Pike

**Suckers**

\_\_\_\_\_ Northern Hogsucker

\_\_\_\_\_ White Sucker

**Sunfishes**

\_\_\_\_\_ Black Crappie

\_\_\_\_\_ Bluegill

\_\_\_\_\_ Green Sunfish

\_\_\_\_\_ Largemouth Bass

\_\_\_\_\_ Pumpkinseed

\_\_\_\_\_ Redbreast Sunfish

\_\_\_\_\_ Rock bass

\_\_\_\_\_ Smallmouth Bass

\_\_\_\_\_ White Crappie

**Trout / Salmon**

\_\_\_\_\_ Brook Trout

\_\_\_\_\_ Brown Trout

\_\_\_\_\_ Coho Salmon

\_\_\_\_\_ Lake Trout

\_\_\_\_\_ Palomino Trout / Golden Trout

\_\_\_\_\_ Rainbow Trout

**Others**

\_\_\_\_\_ *Goby*

\_\_\_\_\_ *Snakehead*

\_\_\_\_\_ Sturgeon

\_\_\_\_\_ *Sea Lamprey*

\_\_\_\_\_ **Tilapia**

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

IDENTIFICATION OF AQUATIC SPECIES

1. IDENTIFICATION OF REPTILES AND AMPHIBIANS

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

Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Student No. \_\_\_\_\_\_\_\_\_\_\_\_\_

School \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Score \_\_\_\_\_\_\_\_\_\_\_\_\_\_

**REPTILES**

**Lizards**

\_\_\_\_\_ Broadhead skink

\_\_\_\_\_ Coal skink

\_\_\_\_\_ **Collard Lizard**

\_\_\_\_\_ Fence lizard

\_\_\_\_\_ Five-lined skink

\_\_\_\_\_ **Green Anole Lizard**

**Snakes**

\_\_\_\_\_ Black Racer

\_\_\_\_\_ Black Rat

\_\_\_\_\_ Brown

\_\_\_\_\_ Copperhead

\_\_\_\_\_ **Coral**

\_\_\_\_\_ **Corn**

\_\_\_\_\_ **Cottonmouth**

\_\_\_\_\_ Garter

\_\_\_\_\_ Hognose

\_\_\_\_\_ Massasauga

\_\_\_\_\_ Milk

\_\_\_\_\_ Northern Water

\_\_\_\_\_ Queen

\_\_\_\_\_ Redbelly

\_\_\_\_\_ Ribbon

\_\_\_\_\_ Ringneck

\_\_\_\_\_ Rough Green

\_\_\_\_\_ **Rubber Boa**

\_\_\_\_\_ **Scarlet Kingsnake**

\_\_\_\_\_ Smooth Earth

\_\_\_\_\_ Smooth Green

\_\_\_\_\_ Timber Rattlesnake

\_\_\_\_\_ Worm

**Turtles**

\_\_\_\_\_ **Alligator Snapping**

\_\_\_\_\_ Blanding

\_\_\_\_\_ Bog

\_\_\_\_\_ Box

\_\_\_\_\_ Common Snapping

\_\_\_\_\_ Eastern Mud

\_\_\_\_\_ Map

**Turtles - continued**

\_\_\_\_\_ Painted

\_\_\_\_\_ Redbellied

\_\_\_\_\_ ***Red eared Slider***

\_\_\_\_\_ Spiny Softshell

\_\_\_\_\_ Spotted

\_\_\_\_\_ Stinkpot / Musk

\_\_\_\_\_ Wood

**AMPHIBIANS**

\_\_\_\_\_ Toad

**Frogs**

\_\_\_\_\_ Bullfrog

\_\_\_\_\_ Gray Treefrog

\_\_\_\_\_ Green

\_\_\_\_\_ Leopard

\_\_\_\_\_ Pickerel

\_\_\_\_\_ Spring Peeper

\_\_\_\_\_ Wood

**Salamanders**

\_\_\_\_\_ Dusky

\_\_\_\_\_ Four-toed

\_\_\_\_\_ Hellbender

\_\_\_\_\_ Jefferson

\_\_\_\_\_ Longtail

\_\_\_\_\_ Marbled

\_\_\_\_\_ Mudpuppy

\_\_\_\_\_ Red

\_\_\_\_\_ Redback

\_\_\_\_\_ Red-spotted Newt

\_\_\_\_\_ Slimy

\_\_\_\_\_ Spotted

\_\_\_\_\_ Spring

\_\_\_\_\_ Two-lined

**Others**

\_\_\_\_\_ **Alligator**

\_\_\_\_\_ **Crocodile**

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

IDENTIFICATION OF AQUATIC SPECIES

1. IDENTIFICATION OF BIRDS AND MAMMALS

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

Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Student No. \_\_\_\_\_\_\_\_\_\_\_\_\_

School \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Score \_\_\_\_\_\_\_\_\_\_\_\_\_\_

**BIRDS**

**Birds of Prey**

\_\_\_\_\_ Bald Eagle

\_\_\_\_\_ Marsh Hawk (N. Harrier)

\_\_\_\_\_ Osprey

**Marsh and Water**

\_\_\_\_\_ American Bittern

\_\_\_\_\_ American Coot

\_\_\_\_\_ Belted Kingfisher

\_\_\_\_\_ Black-crowned night Heron

\_\_\_\_\_ Common Snipe

\_\_\_\_\_ Coot

\_\_\_\_\_ Great Blue Heron

\_\_\_\_\_ Great Egret

\_\_\_\_\_ Green Heron

\_\_\_\_\_ Herring Gull

\_\_\_\_\_ Horned Grebe

\_\_\_\_\_ King Rail

\_\_\_\_\_ **Least Tern**

\_\_\_\_\_ Lesser Yellowlegs

\_\_\_\_\_ Marsh Wren

\_\_\_\_\_ **Pelican**

\_\_\_\_\_ Pied-billed Grebe

\_\_\_\_\_ Red-winged Blackbird

\_\_\_\_\_ Ring-billed Gull

\_\_\_\_\_ **Sand hill Crane**

\_\_\_\_\_ Solitary Sandpiper

\_\_\_\_\_ Sora

\_\_\_\_\_ Spotted Sandpiper

\_\_\_\_\_ Tree Swallow

\_\_\_\_\_**Whooping Crane**

**Waterfowl**

\_\_\_\_\_ American Black Duck

\_\_\_\_\_ American Wigeon

\_\_\_\_\_ Blue-winged Teal

\_\_\_\_\_ Bufflehead

**Waterfowl - continued**

\_\_\_\_\_ Canada Goose

\_\_\_\_\_ Canvasback Duck

\_\_\_\_\_ Common Goldeneye

\_\_\_\_\_ Common Merganser

\_\_\_\_\_ Green-winged Teal

\_\_\_\_\_ Hooded Merganser

\_\_\_\_\_ Lesser Scaup

\_\_\_\_\_ Mallard Duck

\_\_\_\_\_ Northern Pintail Duck

\_\_\_\_\_ Northern Shoveler

\_\_\_\_\_ Old Squaw

\_\_\_\_\_ Red Breasted Merganser

\_\_\_\_\_ RedHead

\_\_\_\_\_ Ring-necked Duck

\_\_\_\_\_ Ruddy Duck

\_\_\_\_\_ **Snow Goose**

\_\_\_\_\_ Tundra Swan

\_\_\_\_\_ White-winged Scoter

\_\_\_\_\_ Wood Duck

**MAMMALS**

\_\_\_\_\_ Beaver

\_\_\_\_\_ Black Bear

\_\_\_\_\_ **Grizzly Bear**

\_\_\_\_\_ Mink

\_\_\_\_\_ **Moose**

\_\_\_\_\_ Muskrat

\_\_\_\_\_ **Nutria**

\_\_\_\_\_ Otter

\_\_\_\_\_ Raccoon

\_\_\_\_\_ Shrew

\_\_\_\_\_ White-tailed Deer

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

IDENTIFICATION OF AQUATIC SPECIES

1. 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

1. 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 \_\_\_\_\_

IDENTIFICATION OF AQUATIC SPECIES

1. IDENTIFICATION OF AQUATIC PLANTS

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

Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Student No. \_\_\_\_\_\_\_\_\_\_\_\_\_

School \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Score \_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Emergents**

\_\_\_\_\_\_ Arrowhead

\_\_\_\_\_\_ Cattail

\_\_\_\_\_\_ Cinquefoil

\_\_\_\_\_\_ **Common Reed**

\_\_\_\_\_\_ Fern

\_\_\_\_\_\_ Horsetail

\_\_\_\_\_\_ Jewelweed

\_\_\_\_\_\_ Marsh Marigold

\_\_\_\_\_\_ Pennywort

\_\_\_\_\_\_ ***Purple Loosestrife***

\_\_\_\_\_\_ Rushes

\_\_\_\_\_\_ Sedges

\_\_\_\_\_\_ Skunk Cabbage

\_\_\_\_\_\_ Water cress

\_\_\_\_\_\_ Water Hemlock

\_\_\_\_\_\_ Water Smartweed

**Floaters**

\_\_\_\_\_\_ Algae

\_\_\_\_\_\_ Duckweed

\_\_\_\_\_\_ Spatterdock

\_\_\_\_\_\_ Water Lily

\_\_\_\_\_\_ Watersheild

**Submergents**

\_\_\_\_\_\_ American (floating) Pondweed

\_\_\_\_\_\_ Bladderwort

\_\_\_\_\_\_ Common Elodea (waterweed)

\_\_\_\_\_\_ Coontail

\_\_\_\_\_\_ Curly Pondweed

\_\_\_\_\_\_ ***Hydrilla***

\_\_\_\_\_\_ Milfoil (water Milfoil)

\_\_\_\_\_\_ Sago Pondweed

**Trees & Shrubs**

\_\_\_\_\_\_ Ash

\_\_\_\_\_\_ Birch

\_\_\_\_\_\_ Black Gum (Tupelo)

\_\_\_\_\_\_ Blueberry

\_\_\_\_\_\_ Box elder Maple

\_\_\_\_\_\_ Elderberry

\_\_\_\_\_\_ Elm

\_\_\_\_\_\_ Hemlock

\_\_\_\_\_\_ **Himalaya Blackberry**

\_\_\_\_\_\_ *Japanese Knotweed*

\_\_\_\_\_\_ Larch

\_\_\_\_\_\_ Locust

\_\_\_\_\_\_ Maple

\_\_\_\_\_\_ Mountain Laurel

\_\_\_\_\_\_ **Russian Olive**

\_\_\_\_\_\_ **Salt Cedar**

\_\_\_\_\_\_ Speckled Alder

\_\_\_\_\_\_ Spice Bush

\_\_\_\_\_\_ Sycamore

\_\_\_\_\_\_ Willow

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

IDENTIFICATION OF AQUATIC SPECIES

G. IDENTIFICATION OF BIRD & AMPHIBIAN CALLS

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

(5 species will be identified = 25 points)

Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Student No. \_\_\_\_\_\_\_\_\_\_\_\_\_

School \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Score \_\_\_\_\_\_\_\_\_\_\_\_\_\_

**AMPHIBIANS**

\_\_\_\_\_ Toad

FROGS

\_\_\_\_\_ Gray Treefrog

\_\_\_\_\_ Green

\_\_\_\_\_ Leopard

\_\_\_\_\_ Pickerel

\_\_\_\_\_ Spring Peeper

\_\_\_\_\_ Wood

**BIRDS**

\_\_\_\_\_ Bald Eagle

\_\_\_\_\_ Belted Kingfisher

\_\_\_\_\_ Canada Goose

\_\_\_\_\_ Common Snipe

\_\_\_\_\_ Great Blue Heron

\_\_\_\_\_ Mallard Duck

\_\_\_\_\_ Osprey

\_\_\_\_\_ Red-winged Blackbird

\_\_\_\_\_ Snow Goose

\_\_\_\_\_ Tree Swallow

\_\_\_\_\_ Tundra Swan

\_\_\_\_\_ Wood Duck

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

PART III: PRACTICUMS

1. Water Testing: Alkalinity (CaCo3), Dissolved Oxygen (D.O.), Temperature and pH (scorecard #1)

Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Student No. \_\_\_\_\_\_\_\_\_\_\_\_\_

School \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Score \_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. 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 \_\_\_\_\_\_\_\_\_\_\_\_\_

pH \_\_\_\_\_\_\_\_\_\_\_\_\_ Total Alkalinity \_\_\_\_\_\_\_\_\_\_

1. 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):

Dissolved Oxygen Requirements for Native Fish and Other Aquatic Life

D.O. in parts per million

Examples of Life or / milligrams per liter

Cold – water organisms, including salmon and trout 6 ppm and above

Spawning, growth and well-being (Caddisfly, stonefly,

& mayfly)

Warm-water organisms, (including game fish such as 5 ppm and below

bass, crappie, catfish and carp) growth and well-being

(some caddisfly)

1. 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

Examples of Life Temperature

Cold-water organisms, including salmon and trout, <55 º F (<13⁰ C)

caddisfly, stonefly, and mayfly nymphs

Mayfly nymphs, caddisfly larvae, water beetles, 55 – 60 º F (13 - 15⁰ C)

and water striders

Some plant life, some fish diseases, trout, and 61 – 68 º F (16 - 20⁰ C)

stonefly nymphs

Much plant life, many fish diseases, bass, crappie, Above 68 º F (> 20⁰ C)

bluegill, catfish and carp

1. **Dissolved Oxygen Percent Saturation**
   1. Determine Water Temperature in degrees C, and find that value on upper (temperature scale).
   2. Determine Dissolved Oxygen and find that value on the lower (DO) scale.
   3. 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

% Saturation values and what they mean

125% and greater = too high, may be dangerous to fish

80-124%: Excellent 60 – 79%: Okay Below 60%: Poor

Temperature conversion formulas:

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

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

pH Ranges that Support Aquatic Life

Most Acid Neutral Most Alkaline

1 2 3 4 5 6 7 8 9 10 11 12 13 14

Bacteria 1.0 13.0

Plants (algae, Rooted, etc.) 6.5 12.0

Carp, suckers, catfish, some insects 6.0 9.0

Bass & Crappie 6.5 8.5

Snails, Clams, & Mussels 7.0 9.0

Largest variety of animals 6.5 7.5

(trout, mayfly, stonefly, & Caddisfly)

1. 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. Water Testing: Dissolved Oxygen (D.O.), Temperature and pH (scorecard #2)

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

5

Indicate if the quality of the sample is suitable for the following use: 10

12.5

Indicate the limiting factor (s):

12.5

How can water quality be improved?

Total Score: 50 points

PART III: PRACTICUMS

2. Stream Flow

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.

1. 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.

1st: 100 ft. distance ÷ \_\_\_\_\_\_\_\_\_\_\_\_\_ = \_\_\_\_\_\_\_\_\_\_\_\_\_ ft./ second

Measurement (Total seconds to float 100 ft.) (# of feet stick floated each second)

2nd : 100 ft. distance ÷ \_\_\_\_\_\_\_\_\_\_\_\_\_ = \_\_\_\_\_\_\_\_\_\_\_\_\_ ft./ second

Measurement (Total seconds to float 100 ft.) (# of feet stick floated each second)

3rd: 100 ft. distance ÷ \_\_\_\_\_\_\_\_\_\_\_\_\_ = \_\_\_\_\_\_\_\_\_\_\_\_\_ ft./ second

Measurement (Total seconds to float 100 ft.) (# of feet stick floated each second)

\_\_\_\_\_\_\_\_\_\_\_\_\_ + \_\_\_\_\_\_\_\_\_\_\_\_\_+ \_\_\_\_\_\_\_\_\_\_\_\_\_ = \_\_\_\_\_\_\_\_\_\_\_\_\_

1st measurement 2nd measurement 3rd measurement Total

(Ft./ second) (Ft. / Second) (Ft. / Second) (Ft. / Second)

Total (Ft./Second) \_\_\_\_\_\_\_\_\_\_\_\_\_ ÷ 3 = \_\_\_\_\_\_\_\_\_\_\_\_\_ (Ft./Second Average)

1. 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.

1st measurement \_\_\_\_\_\_\_\_\_\_\_\_\_ ft.

2nd measurement \_\_\_\_\_\_\_\_\_\_\_\_\_ ft.

3rd measurement \_\_\_\_\_\_\_\_\_\_\_\_\_ ft.

Total \_\_\_\_\_\_\_\_\_\_\_\_\_ ft ÷ 3 = \_\_\_\_\_\_\_\_\_\_\_\_\_ ft. (Average width)

1. 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.

1st measurement \_\_\_\_\_\_\_\_\_\_\_\_\_ ft.

2nd measurement \_\_\_\_\_\_\_\_\_\_\_\_\_ ft.

3rd measurement \_\_\_\_\_\_\_\_\_\_\_\_\_ 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’ ÷ 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’ ÷4 = 5’, the correct average depth.

Water surface

5’

5’

10’

Stream Bottom

**Stream Bottom**

1. 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

1. 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.

\_\_\_\_\_\_\_\_\_\_\_\_\_ x \_\_\_\_\_\_\_\_\_\_\_\_\_ = \_\_\_\_\_\_\_\_\_\_\_\_\_

Cubic feet per second Gallons in 1 cu. Ft of water Gallons of water / second

\_\_\_\_\_\_\_\_\_\_\_\_\_ x \_\_\_\_\_\_\_\_\_\_\_\_\_ = \_\_\_\_\_\_\_\_\_\_\_\_\_

Gallons / second seconds in a minute gallons of water / minute

\_\_\_\_\_\_\_\_\_\_\_\_x\_\_\_\_\_\_\_\_\_\_\_\_\_ = \_\_\_\_\_\_\_\_\_\_\_\_\_ ÷ 200 gals. = \_\_\_\_\_\_\_\_\_\_\_\_\_

Gallons of wate # of minutes in a Total gallons of 1 persons Total # of people

Per minute day water / day daily water who could get

usage daily water from

this stream

PART III: PRACTICUMS

1. 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.

Class I Class II

\_\_\_\_ Caddisfly \_\_\_\_ Blackfly

\_\_\_\_ Freshwater clam \_\_\_\_ Cranefly

\_\_\_\_ Hellgramite \_\_\_\_ Crayfish

\_\_\_\_ Mayfly \_\_\_\_ Damselfly

\_\_\_\_ Riffle Beetle \_\_\_\_ Dragonfly

\_\_\_\_ Stonefly \_\_\_\_ Fingernail clam

\_\_\_\_ Water penny \_\_\_\_ Flatworm

\_\_\_\_ Gill Snail

\_\_\_\_ Horsefly

\_\_\_\_ Sowbug

(2 x \_\_\_\_) + (\_\_\_\_) = \_\_\_\_ Stream Pollution Index number

Stream Pollution Index Number: (Circle your result)

Biotic Index 10 of greater = Clean Stream

Biotic Index 1 – 9 = Moderately polluted

Biotic Index 0 = Severely polluted

Stream Pollution Index Number = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Score \_\_\_\_\_\_\_\_

PART III: PRACTICUMS

1. Determining Watershed Boundaries

Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Student No. \_\_\_\_\_\_\_\_\_\_\_\_\_

School \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Score \_\_\_\_\_\_\_\_\_\_\_\_\_\_

Provide your definition of a watershed:

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Find your location of this stream (pond, lake) on the map provided.

Where does the water come from? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Where does it go? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Draw lines around the boundaries of our watershed. Which watershed are we in? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

AWARENESS: WATERSHED MAP

Concept: Watershed map interpretation can provide preliminary information about water quality.

Activity: Have students use the provided map of the watershed to answer the questions below.

1. Where is the water quality the best? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Where would you find the greatest amount of pollution from human wastes? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. Where is the stream velocity the greatest? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

The lowest? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Where could the surface runoff have the highest contamination from fertilizer? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Where could the surface runoff have the highest contamination from sediment? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. What portion of the river is most vulnerable to flooding? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. What is the highest elevation in this watershed? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

What is the lowest elevation in this watershed? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. What is the ridge line in this watershed? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Explain how all of the above questions can affect water quality within the watershed. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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

PART III: PRACTICUMS

5. Pond management

A. STOCKING

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

1. 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

1. 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

1. Depending on your choice above (Either A or B below will be chosen for you)
   1. The fact that you do not wish to have to fish for anything but trout or bass, OR
   2. 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

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

\_\_\_\_\_ Spillway

\_\_\_\_\_ Pipe water out from bottom

PART III: PRACTICUMS

5. Pond management

B. POND STOCK DENSITY (Proportional Stock Density Method (PSD))

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** |  |
| 3 – 6 inches long |  |  |
| Over 6 inches long |  | A |
| **Total** |  | B |

Arithmetic:

PSD Bluegill = **A ÷** **B** x 100

PSD Bluegill = \_\_\_\_\_\_\_\_\_

|  |  |  |
| --- | --- | --- |
| **Size** | **# of Bass** |  |
| 8 – 12 inches long |  |  |
| Over 12 inches long |  | C |
| **Total** |  | D |

Arithmetic:

PSD Bass = **C ÷** **D** x 100

PSD Bass = \_\_\_\_\_\_\_\_\_

Plot the result on the chart

**PSD Fishing Evaluation**

**Bluegill PSD**

**Bass PSD**

100

80

60

40

20

0

|  |  |  |
| --- | --- | --- |
| **Bass Crowded**  Small bass  Big bluegills |  | **Rare Condition**  A severe environmental event that caused widespread juvenile death? |
| Increase bass harvest | **Good Bluegill Fishing** | Decrease bass harvest |
| **Good Fishing for both** |
| Low fertility?  Excess  weeds?  Too Many  Species? |  | **Bluegill Crowded**  100  80  60  40  20  0  Big Bass  Small bluegills |

Answer the following questions:

This pond is: \_\_\_\_\_\_\_ bluegill crowded \_\_\_\_\_\_\_ bass crowded \_\_\_\_\_\_\_ just right

How should bass fishing change?

\_\_\_\_\_\_\_ catch more bass \_\_\_\_\_\_\_ catch fewer bass \_\_\_\_\_\_\_ no change

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**