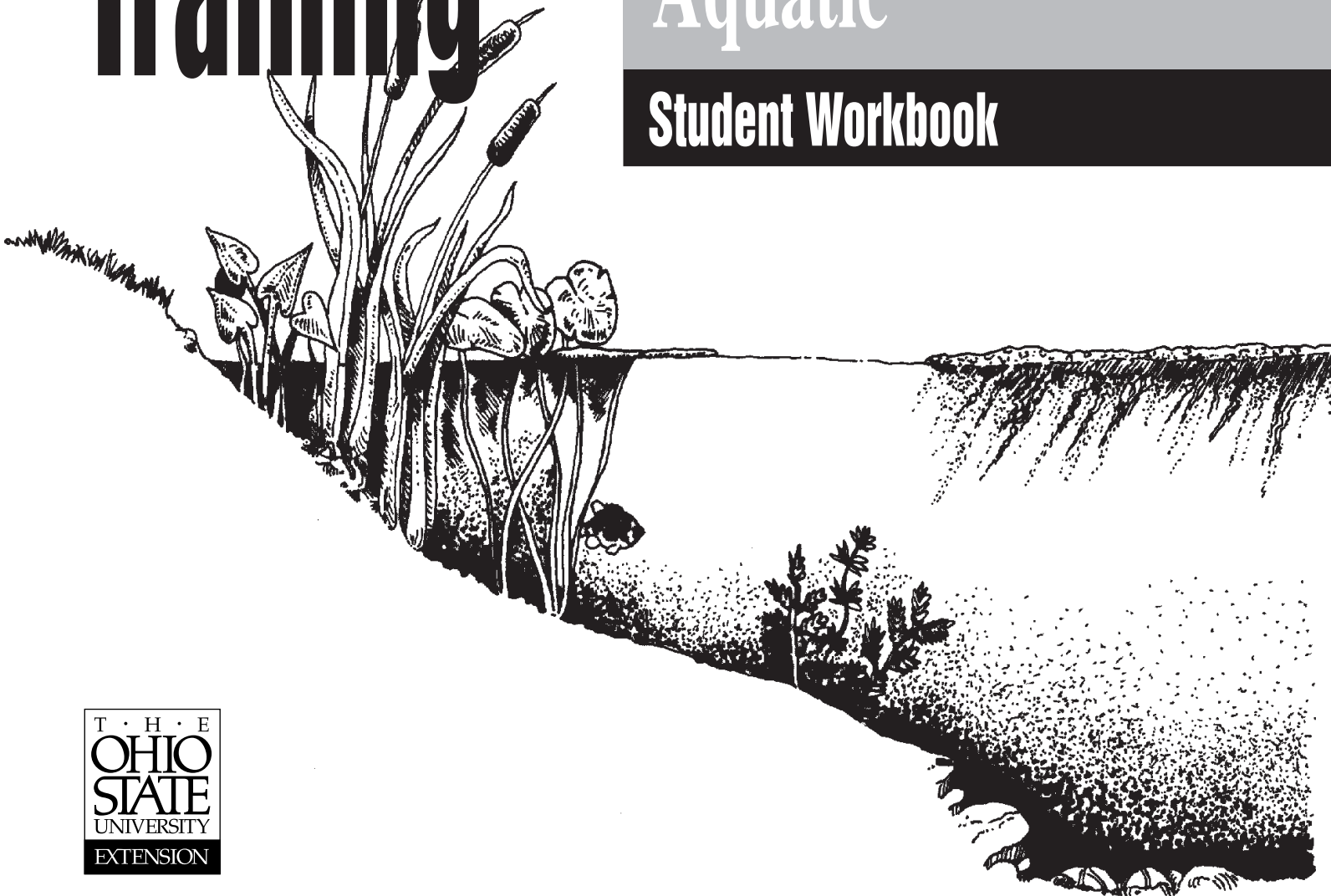


Ohio Pesticide Applicator Training

Aquatic

Student Workbook



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Acknowledgments

We would like to express our appreciation to the following individuals for contributing to or reviewing the manuscript prior to publication:

Eric Norland,
School of Natural Resources,
The Ohio State University

Tom Harrison,
Ohio Department of Agriculture

Preface

This workbook was prepared by Ohio State University Extension for use as a self-study guide or in combination with an educational program. It has been developed to assist pesticide applicators in better preparing themselves for taking the exams required for certification in the aquatic category. The sample questions presented in this manual will help the reader obtain a general understanding of

aquatic pest problems, approaches to control, and general information needed to apply and use pesticides safely.

Your comments and suggestions to improve this study tool for future users would be appreciated. Comments should be directed to:

Pesticide Applicator Training,
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How to Use this Workbook

This workbook is designed to serve as a supplementary study guide to the following bulletins published by Ohio State University Extension. References are available from any Ohio State University Extension county office.

Reference Publications

Bulletin/Fact Sheets
374 *Ohio Pond Management*, 1991 (OPM)
A-2 *Pond Measurements*,
A-3 *Controlling Filamentous Algae in Ponds*,

Additional Reference
ILL *Manual 39-6, Illinois Pesticide Applicator Training Manual*

Users of this workbook should read the reference materials before attempting the workbook. When completing this workbook, use the flap on the back cover to conceal the answers while answering the questions on the left-hand page. Once all the questions are answered, the user should check to see if the responses are correct, mark those incorrect, and read the explanation for each question. If the explanation is the least bit confusing or if you disagree with the answer or explanation, refer to the section indicated in the reference.

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4/94—1M—115600

Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, Keith L. Smith, Director, Ohio State University Extension.

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POND MANAGEMENT

1. If fish are to be stocked, Ohio ponds should be at least _____ feet deep.
 - A. 6
 - B. 8
 - C. 10
 - D. 12

2. To discourage growth of aquatic vegetation:
 - A. Use gravel or sand on pond banks
 - B. Maintain large areas of pond water less than 3 feet depth
 - C. Build pond banks with a 3:1 slope
 - D. All of the above

3. Snow on the ice covering a pond may cause a fish kill because the living pond weeds use up all the oxygen.
 - A. True
 - B. False

4. Run-off is a major contributor to a pond's nutrient enrichment and aquatic weed growth. Sources of run-off may include:
 - A. Fertilized fields or lawns
 - B. Septic fields or storm sewers
 - C. Feedlots or pastures
 - D. All of the above

5. Phosphorus is the most important nutrient affecting the growth of phytoplankton, filamentous algae and free floating flowering plants.
 - A. True
 - B. False

ANSWERS FOR — POND MANAGEMENT

1. **Correct Answer: B, OPM**

Explanation: Ohio ponds should be at least 8 feet deep if fish are to be stocked, and banks should be built with 3:1 slopes. A properly built pond, when full, will have a minimum of water less than 3 feet deep to discourage growth of aquatic vegetation.

2. **Correct Answer: C, OPM**

Explanation: See answer for question 1.

3. **Correct Answer: B, OPM**

Explanation: Snow blanketing the ice prevents light penetration, and plants can no longer produce oxygen. When this situation exists and the decomposition of dead vegetation uses some of the available dissolved oxygen, there may be insufficient oxygen for fish and they may suffocate. Removal of snow from at least one-tenth of the pond surface will greatly reduce the likelihood of this happening.

4. **Correct Answer: D, ILL**

Explanation: Runoff is a major contributor to nutrient enrichment, so it is not unusual to see the most prolific weed growths occurring in shallow shoreline areas where the runoff is first received. Specific nutrient contributors from urban watersheds include sewage effluent, storm sewer drainage, and septic field seepage. A major agricultural source is runoff from fertilized fields, feedlots, and nearby pastures.

5. **Correct Answer: A**

Explanation: The nutrients that most often regulate aquatic plant growth are carbon, nitrogen, and phosphorus. Of the three, phosphorus is generally agreed to be the most important. Because the nitrogen and carbon content of most natural fresh waters exceeds that of phosphorus ten times or more, phosphorus is most likely to be the first nutrient to limit plant growth. Therefore, the addition of small amounts of phosphorus to phosphorus-depleted waters produces extremely large increases in the volume of living plant material (biomass).

DETERMINING POND SIZE

7. There are _____ square feet in a surface acre.

- A. 5,280
- B. 547,390
- C. 65,200
- D. 43,560

8. An acre foot of water equals:

- A. 3,258 gallons
- B. 32,585 gallons
- C. 325,850 gallons
- D. 3,258,500 gallons

Question 11 and 12 relates to the following situation:

A pond is circular, measuring 662 feet around the edge and 105 feet across. The average depth is 9 feet. Acreage is determined by multiplying the distance around the pond by itself and dividing by 547,390.

9. How many surface acres is this pond?

- A. .2
- B. .8
- C. 1
- D. 1.6

10. How many acre-feet of volume is this pond?

- A. 1.8
- B. 7.2
- C. 9
- D. 14.4

11. The average depth of a pond should be determined by averaging at least _____ individual soundings, uniformly spread over the entire pond surface.

- A. 1
- B. 5
- C. 15
- D. 40

12. A pond owner desires to treat a 60 feet by 120 feet area for leeches, using a rate of 13.5 pounds of copper sulfate per acre foot. Average depth of the swimming area is 3 feet. How many pounds of copper sulfate will be required to treat this swimming area?

- A. .5
- B. 5.0
- C. 6.7
- D. 67.0

ANSWERS FOR— *DETERMINING POND SIZE*

7. Correct Answer: D

8. Correct Answer: C

9. Correct Answer: B

$$\text{Surface Acres} = \frac{(\text{Total Feet of Circular Shoreline})^2}{547,390} = \frac{(662)^2}{547,390} = .8 \text{ acres}$$

10. Correct Answer: B, OPM

$$\begin{aligned} \text{Surface area in acres} \times \text{average depth in feet} &= \text{volume in acre-feet} \\ .8 \times 9 &= 7.2 \text{ acre-feet} \end{aligned}$$

11. Correct Answer: C, OPM

12. Correct Answer: C, A2

$$\text{Explanation: Surface Area} = \frac{60 \times 120}{43560} = .16529 \text{ acres}$$

$$\text{Acres} \times 3 \text{ feet average depth} = .4959 \text{ acre-feet}$$

$$\text{Acre-feet} \times 13.5 \text{ pounds} = 6.7 \text{ pounds of copper sulfate in swimming area}$$

13. How many acres are in a rectangular lake, 350 feet by 187 feet?
- A. .5
 - B. 1.5
 - C. 5
 - D. 15
14. What is the average depth of a pond measuring 3, 1, 8, 7, 10, 4, 5, 2, 11, 12, 3, 5, 6, 2, and 3 feet deep?
- A. 5.5
 - B. 6.5
 - C. 8.1
 - D. 11.7

PHYSICAL & CHEMICAL PROPERTIES OF POND WATER

15. Which of the following statements is not true concerning water temperature of a pond?
- A. Bass spawn only once a season and only when the water warms to about 60 F.
 - B. Bluegill will first spawn when water temperatures reach 75 F.
 - C. Some herbicide labels discourage application when water temperatures reach 75 F.
 - D. Water temperature should be measured at a depth of one foot.
16. Which of the following statements is not true concerning dissolved oxygen in pond water?
- A. Pond fish require 4 ppm of oxygen
 - B. Normally pond water contains 20-30 ppm of oxygen
 - C. Oxygen depletion can be caused by decomposition of aquatic weeds.
17. Oxygen depletion in a pond can be caused by:
- A. A pond turnover
 - B. Run-off waters rich in organic matter and nutrients
 - C. Large masses of decomposing aquatic plants
 - D. All of the above
18. The production of plankton is directly related to oxygen content of the water.
- A. True
 - B. False
19. The density of plankton population determines the depth to which light will penetrate the water.
- A. True
 - B. False

13. **Correct Answer: B**

$$\text{Surface Acres} = \frac{\text{Length} \times \text{Width}}{43,560} = \frac{350 \times 187}{43,560} = 1.5 \text{ acres}$$

14. **Correct Answer: A, A2**

$$\frac{\text{Total the Readings}}{\text{Number of Readings}} = \frac{82}{15} = 5.5 \text{ feet average depth}$$

ANSWERS FOR - PHYSICAL & CHEMICAL PROPERTIES OF POND WATER

15. **Correct Answer: B, OPM**

Explanation: When the water temperature reaches 70 F, bluegill and redear nests will be seen in the shallow areas.

16. **Correct Answer: B, OPM**

Explanation: Normally pond water contains from 10 to 15 parts per million oxygen. Fish require about 4 parts per million.

17. **Correct Answer: D, OPM**

Explanation: A pond turnover, run-off waters rich in nutrients and organic matter and decomposition of large quantities of aquatic plants may cause oxygen depletion in a pond.

18. **Correct Answer: B, OPM**

Explanation: The production of plankton is directly related to the fertility of the water.

19. **Correct Answer: A, OPM**

Explanation: Plankton population determines the depth to which light will penetrate the water.

20. Most Ohio ponds need fertilizer added to increase the plankton population.

- A. True
- B. False

21. If light penetrates deeper than 18 inches, the pond has good fertility.

- A. True
- B. False

22. Pond fertility may be improved by:

- A. Applying 80-100 pounds per surface acre of a balanced fertilizer like 12-12-12.
- B. Fertilizing twice during the season
- C. Applying fertilizer only after August 15th
- D. Applying fertilizer if light penetration is less than 12 inches

MAINTAINING GOOD FISHING

23. If the fish population is out of balance, correct the problem by use of the following method:

- A. Regulate bass harvest
- B. Encourage bluegill fishing and not putting them back
- C. Seine the pond or use fish traps
- D. Use a fish toxicant (rotenone)
- E. All of the above

24. When a pond is overpopulated with stunted fish, neither bass nor forage fish (bluegills) will reproduce.

- A. True
- B. False

25. A small flock of ducks or geese is recommended to keep swimming ponds weed free.

- A. True
- B. False

26. Leeches in Ohio ponds are blood suckers and must be controlled in swimming ponds.

- A. True
- B. False

20. Correct Answer: B, OPM

Explanation: Most Ohio ponds do not need additional fertilizer. Fertility is usually added to a pond from nutrients in runoff within the watershed.

21. Correct Answer: B, OPM

Explanation: A plankton population that permits light to penetrate 15 to 18 inches deep is an indicator of good fertility. Deeper than 18 inches, the plankton should be encouraged to bloom by adding fertilizer.

22. Correct Answer: A, OPM

Explanation: Starting in late March or early April, apply 80 to 100 pounds of a balanced fertilizer like 10-10-10 or 12-12-12. Fertilization applications are generally needed every 2 to 4 weeks. Continue your program until mid-August. Do not apply fertilizer after August 15th. Excessive fertility may exist if light penetration is less than 12 inches.

ANSWERS FOR — MAINTAINING GOOD FISHING

23. Correct Answer: E, OPM

Explanation: Several methods may be used to correct an out-of-balance problem. The first is to regulate harvest, Enforcement of a minimum length limit on bass harvested of 12 to 14 inches may help. You may even want to ban all bass harvest for a season. Encouraging forage fish harvest, with all bluegills and redears caught being kept, also may help.

Larger seines (at least 20 x 4 feet with 0.5 inch mesh) also may be used to reduce forage fish populations. Fish traps can be used to accomplish the same thing as seining. When seining or fish traps are not practical as population reduction methods, the forage fish population may be reduced using a fish toxicant. Rotenone, long used as an insecticide, can be used.

24. Correct Answer: True, OPM

Explanation: When a pond is overpopulated with stunted forage fish and neither bass nor forage are reproducing, removal of part of the fish population will seldom solve the problem. Complete elimination of all fish and subsequent restocking is recommended.

25. Correct Answer: False, OPM

Explanation: Waterfowl provide viewing pleasure and their feeding habits may help to control some weed problems; however, they also can create problems. Coliform bacteria thrive in water enriched with waterfowl droppings, especially when the ducks and geese use the pond year-round. For ponds used for swimming, maintenance of more than one pair of domestic ducks or geese per surface acre of water is discouraged.

26. Correct Answer: False, OPM

Explanation: Leeches present in Ohio ponds are usually small (less than 1 inch long), colorless and opaque. They are not blood suckers, but feed on decomposing organic matter in the pond. They attach themselves to swimmers, fish and the legs and feet of ducks and other water birds. Although harmless, leeches can be very frightening and thus detract from the recreational uses of a pond.

27. Swimmers itch is controlled by eliminating snails with copper sulfate.

- A. True
- B. False

28. Muskrats may burrow into pond banks or dams. They may be controlled by:

- A. Trapping in season
- B. Removing cattails
- C. Using repellents
- D. All of the above

29. To control an over-population of forage fish, a partial treatment of rotenone may be applied by putting down a line of this chemical 10 to 15 feet out from the bank.

- A. True
- B. False

30. What is the best prevention of weed-related fish kills?

- A. Kill all free floating weed and algae
- B. Allow large areas of living pond weeds
- C. Practice a good aquatic weed control program
- D. Never use weed control chemicals

CONTROLLING WEEDS

31. Mechanical weed control would be most effective on:

- A. Submerged weeds
- B. Emerged weeds
- C. Plankton
- D. Algae

32. The minimum water depth of 2 feet will prevent rapid establishment of aquatic vegetation.

- A. True
- B. False

33. Starting a fertilizer program early in the summer will assist in controlling weeds.

- A. True
- B. False

27. Correct Answer: True, OPM

Explanation: Although not common in Ohio ponds, this problem is occasionally reported. Swimmer's itch is caused by a free-swimming parasite that burrows into and irritates the skin of humans. The parasite develops in certain birds and snails before it becomes free-swimming. Elimination of swimmer's itch means controlling the snails. Snails can be eliminated by applying copper sulfate at the rate of 4 parts per million (ppm), or 10.8 pounds per acre-foot of water. Caution: At this rate any fish present in the pond may also be killed.

28. Correct Answer: D, OPM

Explanation: Muskrats in ponds usually dig a burrow into the bank as a den. Such burrows may present problems, especially if dug into the dam of a pond. Since muskrats are furbearers and are protected by wildlife laws, the recommended method of control is to trap them heavily during the legal trapping season. Also, large areas of cattails and other aquatic plants will encourage muskrat activity. Get rid of this vegetation, particularly near the dam, if you expect to reduce muskrat populations. Repellents may be used to drive muskrats from an embankment.

29. Correct Answer: A, OPM

Explanation: Apply a line of the rotenone under the surface following the shoreline of the pond 10 to 15 feet out from the bank. The rotenone will settle downward and mix with the water on each side of the line of application. Most of the fish between the line of rotenone and the bank will be killed, while those outside the line are likely to move away. If weather conditions are right and care is taken with this method, only small fish will be killed.

30. Correct Answer: C, ILL

Explanation: An algal bloom or a heavy infestation of weeds can cause a significant drain on the oxygen content of the water. The best way to prevent a fish kill is to control the vegetation before one can occur.

ANSWERS TO — CONTROLLING WEEDS

31. Correct Answer: B, OPM

Explanation: Mechanical weed control can be effective against emergent weeds such as cattails and some submerged weeds and should be started early and repeated to eliminate the food supply in the underground tuber causing it to die.

32. Correct Answer: B, OPM

Explanation: Eliminating shallow areas will help control weed growth. A minimum water depth of 3 feet will prevent rapid establishment of aquatic vegetation.

33. Correct Answer: A, OPM

Explanation: Maintenance of a level of fertility high enough to foster plankton population will cloud the water and prevent light penetration necessary for submerged weed growth.

34. Controlling weeds by preventing light penetration is the principal behind applying:
- A. Lime
 - B. Inert Dyes
 - C. Fertilizer
 - D. B & C
35. Which of the following statements is not true concerning the white amur?
- A. They prefer submerged weeds
 - B. They must be triploid in Ohio
 - C. They live up to 15 years
 - D. They prefer algae
36. Which of the following is not true concerning the white amur?
- A. White amurs have a natural tendency to move with moving water
 - B. They should be at least 8 inches in length when stocked where fish already exist in a pond
 - C. They are the ultimate aquatic weed control tool
 - D. Copper sulfate can kill white amurs
37. Inert dyes:
- A. Helps to control both filamentous algae and submerged weeds
 - B. Are usually blue in color
 - C. Are not effective in water less than 2 feet deep
 - D. All of the above

CHEMICAL WEED CONTROL

38. Which of the following is not an important consideration in planning a successful aquatic herbicide program?
- A. Proper identification of the weed(s)
 - B. Uses of the water
 - C. Water temperature
 - D. Clarity of the water
 - E. Toxicity to fish
39. Which of the following is not a true statement concerning copper sulfate?
- A. Copper sulfate is strictly used for filamentous algae control
 - B. Copper sulfate is a preemergent herbicide
 - C. Copper sulfate is greatly affected by carbonate alkalinity of the water
 - D. Copper Sulfate has a short period of phytotoxicity
 - E. Copper sulfate has no restrictions on the use of the water

34. **Correct Answer: D, OPM**

Explanation: Fertilizers to encourage a plankton bloom and inert dyes both can reduce light penetration which helps to control both filamentous algae and submerged weeds.

35. **Correct Answer: D, OPM**

Explanation: Filamentous algae is the least desirable food of amurs. Other aquatic plants will likely be eaten first.

36. **Correct Answer: C, OPM**

Explanation: The white amur should be considered as another “tool” for aquatic weed control and not the ultimate solution. Amurs represent a biological control option that may reduce the need to use aquatic herbicides.

37. **Correct Answer: D, OPM**

Explanation: Inert dyes reduce light penetration and thereby controls filamentous algae and submerged weeds. They are usually blue in color and are not effective in water less than 2 feet deep.

ANSWERS TO — CHEMICAL WEED CONTROL

38. **Correct Answer: D, ILL**

Explanation: There are nine essential considerations before using herbicides to control weeds in a pond. Clarity of water can effect the amount of weeds present, but has little effect when determining herbicides to be used.

39. **Correct Answer: B, ILL**

Explanation: Copper sulfate is a contact herbicide. Direct exposure of the algae to the compound is required and good distribution in the water where the plants are growing is essential.

40. Which of the following is not true about copper sulfate?
- A. It is toxic to fish at spawning
 - B. It is extremely corrosive to metals
 - C. It works best when the carbonate alkalinity of the water is high
 - D. The normal rate is 1 part per million or 2.7 pounds per acre-foot of water
41. Which of the following is not an advantage of using copper chelates like Cutrine-Plus over copper sulfate?
- A. They provides longer-lasting results
 - B. They are less toxic to fish
 - C. They work better in alkaline water
 - D. They are less expensive
42. Fish are extremely sensitive to the amine salt of endothall.
- A. True
 - B. False
43. Potassium salt of endothall is available in liquid and granule formulation.
- A. True
 - B. False
44. Diquat is a contact herbicide and can be applied in both clear and muddy waters.
- A. True
 - B. False
45. Dichlobenil (Casoron) is a preemergent, granular, aquatic herbicide.
- A. True
 - B. False
46. 2,4-D is as effective on underwater plants as it is on terrestrial plants.
- A. True
 - B. False
47. Which of the following is not true about dalapon?
- A. It provides long-term control of cattails and rushes
 - B. Cattails and rushes should be treated after they form flowering heads
 - C. Surfactants should be added to dalapon
 - D. Thorough coverage of the plants is required

40. **Correct Answer: C, ILL**

Explanation: Copper sulfate is greatly affected by carbonate alkalinity of the water. Higher concentration of copper sulfate are usually required to control plants in hard, alkaline waters than in softer, acid waters.

41. **Correct Answer: D, ILL**

Explanation: Copper chelates are considerably more expensive per unit of copper than copper sulfate.

42. **Correct Answer: A, ILL**

Explanation: Fish are extremely sensitive to the amine salt (particularly the liquid formulation), but not to the potassium salt.

43. **Correct Answer: A, OPM**

Explanation: A potassium salt is available in both liquid and granular formulations of endothall. Fish are extremely sensitive to the amine salt, but not the potassium salt.

44. **Correct Answer: B, ILL**

Explanation: When diquat is added to water, diquat dissociates to form a cation. This property makes the compound extremely susceptible to adsorption to negatively charged clay and organic matter. In muddy waters, the diquat will be tied up by the organic matter and clay, and will be inactivated.

45. **Correct Answer: A, ILL**

Explanation: Casoron is formulated as a granule and is applied to the water or to exposed sediments in early spring before the weeds emerge.

46. **Correct Answer: B, ILL**

Explanation: In general, 2,4-D is not as effective on underwater plants as it is on terrestrial plants. An exception is the granular ester formulation of 2,4-D, which is effective on watermilfoil and coontail.

47. **Correct Answer: B, ILL**

Explanation: Plants should be treated when they are 3 to 4 feet tall and before they form flowering heads.

48. Which of the following is not true about glyphosate (Pondmaster/Rodeo)?
- A. Glyphosate moves systemically through the plant
 - B. Works best in full sunlight
 - C. Needs six hours before rainfall to work effectively
 - D. It works best if applied late in season but before leaf color change
 - E. It has a 7 day restriction for the use of water for swimming and fishing

49. Fluridone (Sonar) is a:
- A. Systemic herbicide that inhibits a plant's ability to make food
 - B. Contact herbicide that controls emergent weeds
 - C. Systemic herbicide that works very quickly
 - D. Preemergent herbicide that works very quickly

50. Dosage recommendations are usually given in parts per million. How much herbicide active ingredient would it take for a recommended dosage of 3 ppm for 1 acre foot of water?
- A. 5.4
 - B. 3.0
 - C. 8.1
 - D. 6.0

POND WEED IDENTIFICATION

51. This most common floating weed in Ohio ponds looks like a dense mat of hairlike fibers, growing on the pond bottom and on submerged vegetation.
- A. Waterweed
 - B. Floating-Leaf pondweed
 - C. Water milfoil
 - D. Filamentous algae
52. This weed is commonly called muskgrass or stonewort. It grows in clumps in shallow areas and has a musky or skunky odor when crushed.
- A. Chara
 - B. Coontail
 - C. Duckweed
 - D. Water milfoil
53. The following weed usually has three-lobed leaves with rootlets that hang down in the water. It is usually found in sheltered ponds that have little wind action, covering the pond with a green blanket.
- A. Brushy pondweed
 - B. Waterweed
 - C. Duckweed
 - D. Algae

48. **Correct Answer: E**

Explanation: There are no restrictions when used for these purposes.

49. **Correct Answer: A, OPM**

Explanation: Fluridone is a systemic aquatic herbicide that inhibits a plant's ability to make food. This process takes 30 to 90 days to work so treatment early in the growing season is recommended.

50. **Correct Answer: C, III**

Explanation: The correct amount of formulated herbicide to use per acre-foot of water in order to give the required parts per million is usually provided in a table on the herbicide label. The amount can also be calculated easily if the following relationship is used. Since an acre-foot of water weighs approximately 2.7 million (2,718,144) pounds, 2.7 pounds of any material dissolved in 1 acre-foot of water will equal 1 part per million by weight. Therefore,

$$\begin{aligned} \text{Pounds required} &= 2.7 \text{ lb} \times \text{ppm desired} \times \text{acre-ft required} \\ \text{Pounds active ingredient} &= 2.7 \text{ lb} \times 3 \text{ ppm} \times 1 \text{ acre ft.} \\ &= 8.1 \text{ lbs.} \end{aligned}$$

ANSWERS FOR — POND WEED IDENTIFICATION

51. **Correct Answer: D, OPM**

Explanation: The most common type of floating weed in Ohio ponds is filamentous algae ("moss" or "pond scum"). This weed, which looks like a dense mat of hairlike fibers, starts to grow on the pond bottom and on submerged vegetation. It floats to the surface, often covering large areas of the pond. Most species of this plant group can be controlled with very low concentrations of copper sulfate.

52. **Correct Answer: A, OPM**

Explanation: Another form of algae that grows attached to the bottom is chara. Commonly called muskgrass or stonewort. It usually grows in clumps in shallower areas. When crushed it may have a musky or skunky odor.

53. **Correct Answer: C, OPM**

Explanation: Another group of weeds occasionally occurs in Ohio ponds, especially very sheltered ponds that have little wind action on the surface. These weeds are duckweed and watermeal. Although they float freely on the water surface, they are treated as emergent weeds. Duckweed has tiny, usually three-lobed leaves with rootlets that hang down in the water. Watermeal appears as minute green grains floating on the water. Dense populations of these weeds often form a green blanket on the water surface.

54. Emergent weeds, growing along the margin of the pond and shallow waters, have stems protruding above the water. Examples are:

- A. Cattails, leafy pondweed, waterweed and coontail
- B. Cattails, bulrushes, arrowhead and spatterdock
- C. Cattails, water milfoil and coontail
- D. Cattails, brushy pondweed and muskgrass

55. Thriving in clear, calm, shallow water, these plants grow below the surface. They may be loosely or firmly rooted or suspended clusters. Some may blossom on a stem that extends above the surface.

- A. Filamentous algae
- B. Submerged weeds
- C. Floating weeds
- D. Emergent weeds

56. This persistent plant reproduces by plant fragments, spores and cell division. Common forms range from green and slimy to cottony to a very coarse texture.

- A. Watermeal
- B. Coontail
- C. Pondweeds
- D. Filamentous Algae

57. Coontail, water milfoil, water weeds and naiads are commonly found

- A. Emergent weeds
- B. Submerged weeds
- C. Algae
- D. Floating weeds

58. Match the following descriptions:

- | | |
|------------------------------|---|
| _____ Algae | A. Simple plants without true roots, leaves or flowers. |
| _____ Emergent Plants | B. Plants living beneath the surface, usually rooted in bottom sediments. |
| _____ Submerged Plants | C. Flattened or boat shaped clusters of leaves with roots extending into the water for nutrients. |
| _____ Rooted Floating Plants | D. Rooted in water 1 to 5 feet depth, plants consist of floating or erect leaves extending from rhizomes, often having flowers. |
| _____ Free Floating Plants | E. Plants extend above the water, rooted in 1 to 3 feet of water |

54. **Correct Answer: B, OPM**

Explanation: This group of weeds includes those growing along the margin of the pond as well as in other shallow waters. Their stems and leaves protrude above the water surface. Examples are cattails, bulrushes, arrowhead and spatterdock. Some, especially cattails, may spread rapidly by growth of underwater stems and may reach depths of three feet or more.

55. **Correct Answer: B, OPM**

Explanation: Many water weeds grow below the surface of the water. Some are loosely rooted and others are firmly rooted. Still others appear to be suspended fragments or clusters. Some have a few leaves that float on the surface, while many blossom and produce seed on a stem that extends above the water surface. This general group is referred to as submerged weeds. They thrive in clear, calm, shallow waters.

56. **Correct Answer: D, A-3**

Explanation: Filamentous algae is often a persistent problem because it reproduces by plant fragments, spores and cell division. There are many species of filamentous algae and microscopic examination is usually required to make an exact identification. However, some of the more common forms can be distinguished by their texture. Spirogyra is bright green and slimy to the touch; Cladophora has a cottony feel, and Pithophora is often referred to as "horse hair" algae because its coarse texture resembles that of horse hair and it may feel like steel wool.

57. **Correct Answer: B, OPM**

Explanation: Many species of submerged weeds are found in Ohio ponds. The common kinds include the large family of pondweeds: coontail, water milfoil, water weeds, and naiads.

58. **Correct Answers: ILL**

- A Algae
- E Emergent Plants
- B Submerged Plants
- D Rooted Floating Plants
- C Free Floating Plants

DIAGNOSIS AND PREVENTION OF FISH KILLS

59. The most common cause of fish kills in Ohio is:
- A. Pesticides which accidentally enter the pond
 - B. Natural mortality
 - C. Suffocation due to a lack of oxygen
 - D. Runoff from barnyards, cropland, and septic tanks
60. An inversion or turnover may result when:
- A. A strong wind occurs during late spring or early summer
 - B. A large rain creates an inflow
 - C. A rapid temperature change occurs
 - D. All of the above
61. Agricultural pesticides cause only a small percentage of fish kills. Which class of pesticides are considered most toxic to fish and other aquatic organisms?
- A. Herbicides
 - B. Miticides
 - C. Fungicides
 - D. Insecticides
62. The cooler layer of water in the bottom of the pond has less potential to hold more oxygen because it is denser.
- A. True
 - B. False
63. Which of the following would prevent oxygen depletion?
- A. Using an aerator
 - B. Utilizing a good aquatic weed control program
 - C. Keeping portions of the ice free of snow in the winter
 - D. All of the above
64. Oxygen levels in a pond would be highest at:
- A. Sunrise
 - B. Noon
 - C. Midday
 - D. Midnight

ANSWERS FOR - *DIAGNOSIS AND PREVENTION OF FISH KILLS*

59. Correct Answer: C, OPM

Explanation: The most common cause of fish kills in Ohio is suffocation due to lack of oxygen.

60. Correct Answer: D, OPM

Explanation: A turnover results when a strong wind, rapid temperature change, or inflow of a large volume of cold water causes the upper layer of water to be replaced by the lower layer of oxygen -deficient water.

61. Correct Answer: D, OPM

Explanation: Agricultural pesticides, particularly insecticides, may be toxic to fish and other aquatic organisms if they enter a pond in sufficient quantities.

62. Correct Answer: B, OPM

Explanation: The bottom, cooler layer of water in the pond has the potential to hold more oxygen than the top layer because it is denser. However, the lack of photosynthesis and the decomposition of organic matter actually results in a lower level of dissolved oxygen compared to the top layer.

63. Correct Answer: D, ILL

Explanation: Using an aerator, controlling weeds so they don't decompose, and keeping snow off the ice in the winter are all ways to prevent oxygen depletion.

64. Correct Answer: B, ILL

Explanation: Plants cease photosynthesizing at night but continue to utilize oxygen for respiration. Thus, oxygen levels are lowest just before sunrise and highest at midday.

65. Cloudy, cool, or rainy weather can cause some algae scums to die.

- A. True
- B. False

66. Once a fish kill is in process, little can be done to stop it.

- A. True
- B. False

AQUATIC PEST CONTROL

SCORE CARD

# OF CORRECT ANSWERS	% CORRECT	EVALUATION
60-66	> 90%	<u>Excellent</u> You have a very good understanding of aquatic pests and their control.
53-59	> 80%	<u>Good</u> Be sure you understand those questions that you missed. It may help to read the references again, and re-answer the questions you missed.
47-52	> 70%	<u>Poor</u> Your score indicates a borderline level of expertise. Be sure to re-read the cited references again and re-answer the questions you missed.
0-46	< 70%	Re-read the recommended references and work through the workbook again.

65. **Correct Answer: A, ILL**

Explanation: In some cases, cloudy, cool, or rainy weather can cause algae scums to die. The death and rapid decomposition of these algae can reduce dissolved oxygen content from 8 to 0 parts per million within 24 hours.

66. **Correct Answer: A, ILL**

Explanation: Once a fish kill is in progress, little can be done to stop it. Aeration should be provided, but sometimes even aeration cannot overcome the oxygen deficit.