CHAPTER 3

INTEGRATED PEST MANAGEMENT

Michigan residents are fortunate to have and enjoy abundant, fresh, clean surface and groundwater. Natural lakes and ponds are plentiful, and artificial lakes and ponds continue to be designed and developed. Clean and attractive water systems can quickly become undesirable or even a liability when invaded by nuisance weeds or invertebrate pests. Several factors influence how and why a pest becomes established in an aquatic area. Thus, several management decisions must be made to recover the lost qualities of a body of water effectively and safely.

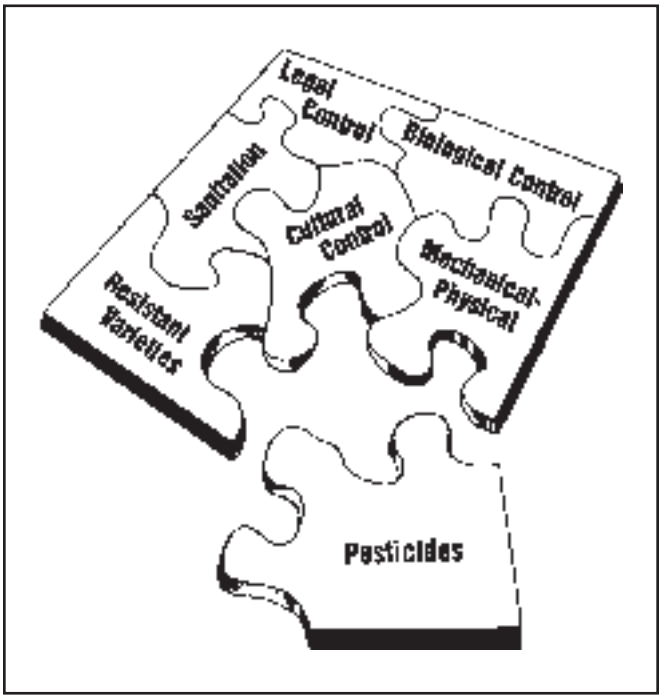
A system known as **integrated pest management (IPM)** is a useful way to effectively manage pests in complex biological systems using a variety of pest management tools. IPM is a logical sequence of events including gathering information, making decisions and taking action to control a pest. The goal of IPM is to reduce pest impacts to an acceptable level. Typical components of an IPM program are:

1. Site evaluation and detection.
2. Pest identification.
3. Economic, aesthetic and recreational significance.
4. Selection and use of management methods.
5. Evaluation of management methods used.

The core pesticide applicator manual (E-2195) discusses IPM in general pest management terms. This chapter will discuss IPM in aquatic environments.

IPM is the use of the most appropriate management tools and practices, selected from all available management tactics, to manage pests. The goal of IPM is to economically achieve a desirable aquatic environment with the least disruption to the water users and the environment. An IPM approach to pest management provides the applicator with pest management options that avoid sole reliance on one technique and its potential shortcomings.

IPM systems will vary from site to site. Changing water conditions, pests, available management techniques (natural and applied), weather conditions, and social and economic circumstances all contribute to variability. To have an effective pest management program, the aquatic pest manager must be able to recognize and understand what things affect the lake, pond or other water bodies they are managing. The following components are aspects of successful pest management programs.



Components of an IPM Program

1. Site Evaluation and Detection

An effective aquatic pest manager becomes familiar with each aquatic environment he/she manages. In an IPM program, monitoring is the process of information gathering and collection through observation of the site. Effective aquatic pest managers take a holistic approach to evaluating aquatic environments, drawing from the basic principles of geology, hydrology, biology and ecology. From this base of knowledge, the aquatic

manager can identify various site characteristics, make decisions about water quality and assess potential causes of poor aquatic conditions.

When monitoring aquatic sites, it is vital to take note of many characteristics, including:

- Location of the body of water and water uses — e.g., irrigation, recreational uses.
- History of the water uses and previous management practices.
- Desired goals, objectives, attitudes and expectations of the water users.
- Water quality, fertility, pH, clarity, temperature, hardness.
- Inflowing and outflowing water routes, springs.
- Fish species present, their age, size and abundance, and ecosystem roles.
- Diversity of birds and animals, including bottom-dwelling organisms.
- Native vs. exotic aquatic vegetation — submerged, emergent, shoreline and wetland.
- Bottom characteristics such as depth, slope, sediment type and quantity.
- Appearance of water's edge, shoreline or banks.
- Surrounding development and activity — housing, agriculture, industry, location of wells, etc.— that can influence aquatic environments.

As you read this manual, you will notice how these site characteristics affect pest and non-pest organisms within an aquatic environment.

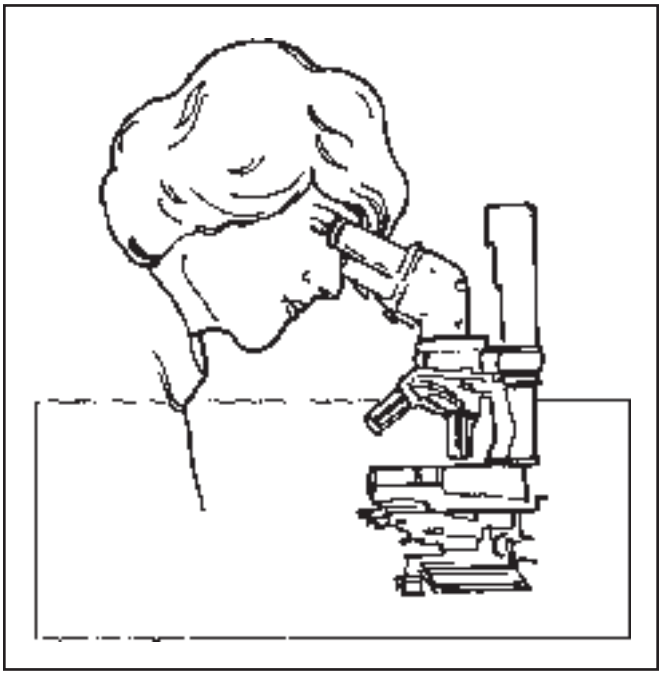
Monitoring should be done routinely throughout the year. This allows you to witness subtle changes in plant and animal development that occur on a yearly cycle. Routine monitoring occurs during scheduled site visits to detect pest populations. Record timely information about the pest and the site, such as:

- Water temperature, clarity and use.
- Pests' presence.
- Pests' development and density.
- Areas within the water body that are infested by the pest, noting the pests' desired habitat.
- Riparian (residents along the water) attitudes about various pest management strategies.

2. Pest Identification

Confirming the pest's identification, life cycle and population density and the pest's relationship to the aquatic environment is essential to an IPM program. Correct identification is necessary to select the most effective pest management strategies.

An organism should not be classified or treated as a pest until it is proven to be one. A species may be a pest in some situations and not in others. Many species look similar, and correct identification is necessary to avoid unnecessary pesticide applications. For example, the later chapters in this manual note that there are several species of leeches and lampreys. Most leeches and lampreys are beneficial, but look like undesirable species at certain life stages.



Accurate identification is critical to effective pest management.

The more you know about a pest and the factors that influence its behavior, the easier and more successful pest management becomes. When you identify a pest, you gain important biological information that influences management decisions. You can determine if controls are necessary and, if so, what tactics and tools should be used.

Knowing a pest's life cycle is essential. It allows you to time your treatment so it coincides with the pest's vulnerable life stage. A pest may be affected by your treatment only as an egg, a small plant, at flowering, as an adult, etc. Monitoring helps you pinpoint a pest's vulnerable stage in a particular body of water. The timing may be different from year to year and from one water body to the next.

Each water body should be monitored to determine pest management timing. For example, in a shallow lake, a plant or animal pest may be a week or more ahead in development than the same pest species in a deeper, colder lake.

Aquatic plants respond to water temperatures. Understanding these temperature responses allows the aquatic manager to predict plant emergence and developmental stages. Accurately timing herbicide applications enhances selectivity — removing the target pest without injuring nontarget species. Certain weed species grow earlier in the spring than many desirable plants. With this knowledge, the manager monitors the water body, anticipating the emergence of the weed pest. The herbicide application is made when it emerges so that nontarget (desirable) species are not influenced. This type of timing and selectivity can reduce competition from nuisance species so the growth of desired plants is enhanced.

3. Economic, Aesthetic and Recreational Significance

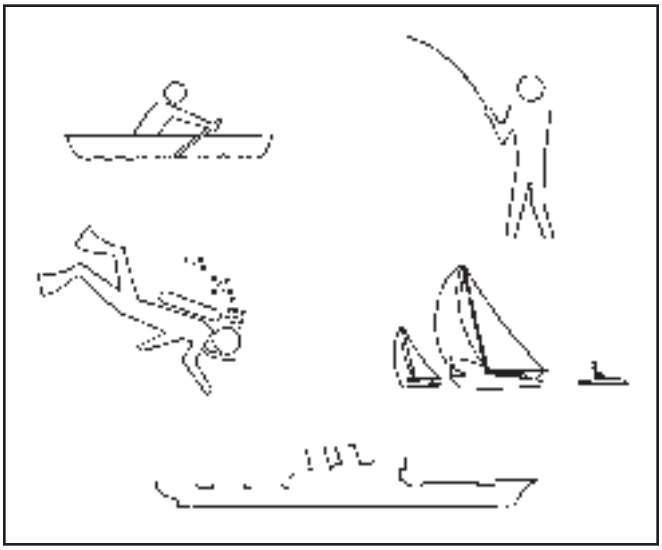
Control of pests should be considered only when valuable species are threatened by the invasion of nonnative organisms, when pests hinder recreational activities or other water usages, or when they detract from the aesthetics of the water body. These undesirable situations can influence the value of property adjacent to the water body as well as the quality of life of the people living there.

How and when to implement aquatic pest management tactics will vary by location. A selected pest management procedure must be economical and have minimal potential for harming people, nontarget species and the environment, yet, effectively reduce the nuisance.

Lakes and ponds with limited access or few shoreline residents or visitors may tolerate a higher density of weeds or less desirable fish species than other water bodies. For more intensively used water, the **pest management action threshold** — a level, such as a pest population, at which management actions will take place and below which action will not take place — is lower than in the more remote, less heavily used aquatic setting.

Pest management measures may be implemented when algae and/or plants reduce the aesthetic value of the water body. This aesthetic impairment causes perceived and real losses in property values that justify the cost of pest management procedures.

Certain waterways are used for business purposes. When pests impede navigation or hinder recreational pursuits — such as marina operations, sport fishing, scuba diving or shipping of freight — the cost of most pest management procedures is justified by continued or return business.



Excessive weed growth impedes many kinds of aquatic activities.

When aquatic pest infestations limit fishing, boating, swimming, water skiing and other recreational activities, riparians may choose to reduce pest levels. In each case, the choice to use a pest management procedure depends on the people affected by the pest, the cost of retaining or recovering the water quality they desire, and their willingness to accept the risk of potential personal and environmental injury.

Improved economics as it relates to aquatic business and property values, enhanced aesthetics and pursuit of recreational activities are the primary incentives that lead to a coordinated aquatic IPM program. Clearly identifying goals for each water body — i.e., desired water conditions after a pest management treatment — determining when a treatment is necessary and identifying the most opportune time to take action to achieve these goals are all components of an IPM program. These goals and decisions should be clearly stated, understood and acceptable to everyone involved: the riparians, visitors to the water body, the Michigan Department of Natural Resources and the aquatic pest manager.

4. Selection and Use of Management Methods

Once a pest problem is recognized, the biology and the habits of the pest understood, and the economic, aesthetic or recreational impacts identi-

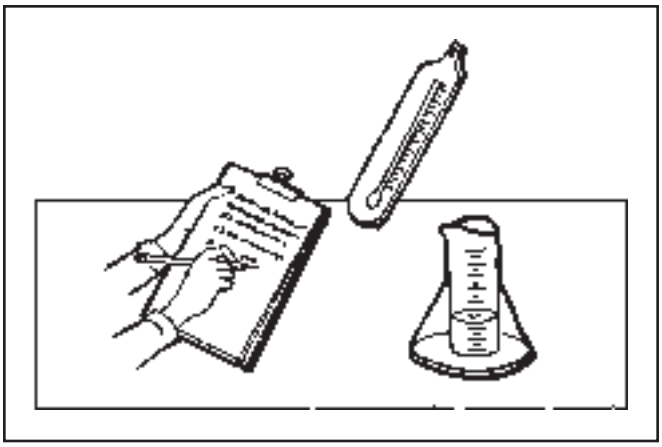
fied, then the appropriate method or combination of methods can be selected to manage the pest. Management methods must be effective, practical, economical and environmentally sound. Proper method selection requires familiarity with all available management methods. Evaluate the benefits and risks of each management method applied to a given situation. Preventive, physical, mechanical, biological and chemical methods should be evaluated for short- and long-term effectiveness, applicability to the situation, level of pest control desired, environmental implications and cost. For example, when selecting a chemical tool, consider the toxicity of your choice and whether something less toxic is an effective option. Understanding what actions or events led to a pest problem may allow an aquatic pest manager to recommend a change in practices to correct or prevent a certain condition.

Following chapters discuss methods for managing vertebrates and invertebrates. The dominant pest the aquatic pest manager faces is weeds. Options for managing weed problems are discussed in the aquatic vegetation management chapter of this manual. Management options may include:

- Reducing nutrient inputs.
- Dredging and deepening shoreline areas.
- Harvesting weeds with mechanical equipment.
- Drawing down water levels in the winter.
- Using nontoxic dyes or benthic barriers, or aerating water bodies.
- Using aquatic pesticides.

5. Evaluation of Management Methods Used

Keeping records and evaluating your management strategies are extremely important. Thorough records can be referred to when you're making future decisions. Evaluate the efficacy of various management techniques and their performance under the wind, water and weather conditions present at the time they were used. Trying various methods allows you to determine the techniques that provide desired results for particular sites or conditions.



Effectiveness is likely to vary from site to site. Records help you recognize these variations and the conditions that may have caused them.

Evaluating pest management results may entail sampling pest populations before and after treatments. These records can be compared from year to year, allowing you to determine changes in pest pressures. An increase in pest pressure should cause you to reevaluate your management program and consider using other strategies.

The diversity of plant, animal and insect species should be monitored. Generally, good water quality supports a diverse group of species. The number of each type is low and an equilibrium exists. Poorer water quality frequently results in fewer species that may be at nuisance levels. Aquatic earthworms, for instance, are tolerant of poor water quality, so large populations may indicate poor conditions. Some water bodies with poor quality do support many species, but they tend to be less desirable types. As you manage various sites, your treatments may improve the aquatic environment or cause undesirable changes. Evaluating changes or stability in species diversity is a useful indicator of aquatic environmental quality. This information will help you understand the impact of your management activities.

Records of pesticide use by commercial applicators must be kept according to Regulation 636. Read the "Laws and Regulations" chapter in this manual for more details.

Chapter 3 – Integrated Pest Management Review Questions

Write the answers to the following questions, and then check your answers with those in the back of this manual.

1. The goal of integrated pest management is to reduce pest impacts completely. True or False?

2. Which is essential when using an IPM program?
   a. Confirming the pest's population density.
   b. Correct identification of the pest.
   c. Knowledge of the pest's life cycle.
   d. All of the above.

3. The process of information gathering and collection through observation of the site is _____.

4. List at least four site characteristics that are important to take note of when monitoring aquatic areas.
   1.
   2.
   3.
   4.

5. Although an organism may not be a proven pest, it should be treated if it looks similar to a harmful organism. True or False?

6. Why is knowing a pest's life cycle essential?
   a. It allows you to time your treatment to coincide with the pest's vulnerable life stage.
   b. You can determine if controls are necessary and what tactics and tools should be used.
   c. It helps you know what environment they will be in at a particular stage in their life.
   d. Both a and b.
   e. All of the above.

7. What do we call the level at which management actions will take place and below which action will not take place?
   a. Selectivity.
   b. Threshold.
   c. Minimum pesticide level.
   d. None of the above.

8. The dominant pest facing the aquatic pest manager is _____.

9. Which of these statements is not true?
   a. Good water quality supports a balanced diversity of species; the number of each type is high and an equilibrium exists.
   b. Management techniques are likely to vary from site to site.
   c. Poorer water quality frequently results in fewer species that may be at nuisance levels.
   d. The efficacy of various management techniques and their performance under the wind, water and weather conditions should be evaluated and recorded.

10. Which of the following is necessary to have an effective pest management program?
    a. Complete elimination of the pest.
    b. Repeated use of the same technique to destroy the pests.
    c. The aquatic pest manager must be able to recognize and understand what things affect the lake, pond or other water body he/she manages.
    d. The manager must do anything possible to destroy the pests.

11. Control of pests should be considered when:
    a. Any organism takes residence in the system.
    b. Valuable species are threatened by the invasion of nonnative organisms.
    c. Pests hinder recreational activities or water usages or detract from the aesthetics of the body of water.
    d. Both a and b.
    e. Both b and c.