Wyatt Farm Pond Fisheries Management Plan, May 2009

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Introduction

Ponds are a common feature of Virginia's landscape. Although they occur naturally in many parts of the state, tens of thousands have also been artificially constructed for a variety of purposes. Many were built to assist farming operations by providing drainage areas for runoff, and to provide water for livestock. However, in more recent years, the recreational uses of ponds have become increasingly important to pond owners. Pond owners benefit from these water bodies through recreational opportunities such as fishing and boating, as well as through the aesthetic enjoyment of having a pond on their property. Ponds also benefit wildlife by providing a source of food, water, and suitable nesting habitat. The pond located within the Wyatt Farm subdivision in Blacksburg, Virginia is a prime example of a water body that provides recreational opportunities and aesthetic enhancement for its human-users as well as habitat for a variety of wildlife species.

Virginia Tech was approached by the Wyatt Farm Homeowners Association (HOA) to provide guidance in the management of their small pond. The Wyatt Farm Pond is about one acre in size and was formed by impounding a small creek that flows through the subdivision. The land around the pond includes fertilized lawns, paved roads, sidewalks, single-family homes and 32 acres of dedicated "green-space". The land directly adjacent to the pond is made up of a cropped grassy field buffered by shrubs and trees along the shoreline. There is a dam at one end of the pond that controls the water level, and a dock about 90 ft from the dam. The average depth of the pond is about 1.5 feet, with holes as deep as 5 feet. During summer months, mats of floating algae cover about 25-30% of the pond's surface.

Generalizations can be applied to pond management, but each pond is unique and thus requires specific treatment to achieve a desired result. Wyatt Farm Pond is no exception. To better understand the pond, we assessed three important aspects of the pond.. These aspects included habitat, biota, and homeowner interests. Information from each aspect was considered in designing options for the Wyatt Farm HOA in managing their pond. A well-managed pond is an asset that can enhance a user's quality of life through the recreation and enjoyment it provides.

Methods

Fish Sampling

Biologists use a variety of sampling methods to get information about fish communities. One of the most commonly used techniques is 'electrofishing'. Electrofishing uses pulsed-DC electricity to temporarily paralyze fish so they can be collected without harming them. It is often referred to as "shocking". Afterward, fish can be returned safely to the water. Electrofishing is most useful in shallow areas for species such as bass and other sunfishes. The Wyatt Farm Pond

was electrofished twice during spring 2009 using a generator-mounted boat-electrofisher. During each fishing period, fish-fins were clipped to identify fish that had already been caught. Fin-clipping is an easy way to identify fish that have been caught so biologists can avoid double-sampling. This helps reduce stress on individual fish that results from handling, temperature, and suffocation. The fins will naturally regenerate within a few months

Once the fish are in-hand, there are several tools biologists can use to analyze the data they collect. Often, a series of indices are used to describe the relative health of the fish community in a system (lake, stream, pond, etc.). These indices are based on the size and numbers of fish in the system. Size can be defined as length, weight, or a combination of the two.

Size structure

After collecting a sample of fish from the pond, they are measured and can be evaluated based on different indices. Size-structure indices use the proportions of fish of various lengths as an index for the overall balance of the fish community in a specific system. Proportional Stock Density (PSD) is one index that is commonly used to examine size structure of fish communities. Fish are measured, and the total number in each length-class is tallied separately for all species present. PSD is calculated as the total number of stock-length fish (catchable size) that are also considered "quality" by most anglers. Fish in a given length-class are defined by a minimum size. As such, quality-length fish are considered to be stock-length fish, but stock-length fish are not quality-length fish. This can be likened to saying that a square is a type of rectangle, but a rectangle cannot be defined as a square. Because of this relationship, PSD can be mathematically defined by equation 1 to give the percentage of the stock-length fish in a population that have also achieved quality length.

$$\mathbf{PSD} = \frac{\mathbf{Number\ of\ fish} \geq \mathbf{Quality\ size}}{\mathbf{Number\ of\ fish} \geq \mathbf{Stock\ size}} \times 100$$

Equation 1.

PSD can be expressed as a ratio, or percent. 'Stock' and 'quality' are defined lengths, and are unique for every species. As an example, Table 1 shows these length-classes as defined for largemouth bass (*Micropterus salmoides*), bluegill (*Lepomis macrochirus*), and green sunfish (*Lepomis cyanellus*), the three species that we found in WFP.

Table 1. Minimum lengths used to define stock & quality sizes of largemouth bass and bluegill. Target PSD is defined as PSD for each species in a balanced system.

Species	Minimum Stock-size	Minimum Quality-size	Target PSD
Largemouth bass	8"	12"	40-70%
Bluegill	3"	6"	20-40%

For example, if a pond sample resulted in 48 9-inch largemouth bass and 52 13-inch largemouth bass, PSD would be 52/100 X 100 = 52%. This would mean that 52% of largemouth bass greater than 8" were also greater than 12", and the sample shows that the bass population is witin the target range for PSD (40-70%) Fish smaller than the minimum size for stock length are not

used in these calculations, but are considered in an assessment as an indication of sufficient reproduction in the pond.

Relative Weight

Another index used to assess fish health in a system is relative weight (W_r). Relative weight describes the health of a fish based on how fat it is at a given length. The weights of sampled fish in different length intervals can be compared to regional, national, or global standard weights (W_s) to yield a relative weight. This tells biologists how the fish in a pond compare to other places. Relative weight can be used to take a snapshot of fish health or to monitor a single population over time. Likewise, it can be used to determine the health of individual fish, or averaged to represent an entire population. Relative weight is calculated by equation 2.

$$\text{Relative weight} = \frac{\text{Individual fish weight}}{\text{Standard weight for fish of same length}} \text{ X } 100 \qquad \text{Equation 2.}$$

Relative weights are scaled from zero to over 100. Fish with a relative weight of 100 are considered to be in excellent physical health. An "average" fish has a relative weight around 93.

Aging

A small sample of fish from Wyatt Farm Pond was kept for aging in the lab at Virginia Tech. The age of a fish can be determined from many hard structures in a fish's body. Structures used in aging are made from calcium or other minerals. Two commonly used aging structures are scales and otoliths (inner ear-bones). In either of these structures, biologists can count "growth rings" similar to those used in aging trees. Growth rings are laid down during periods of slower growth (usually winter months) when minerals are deposited closer together. During periods of faster growth, the rings spread out. What biologists are actually counting, then, is the number of winter seasons that a fish has survived. Due to inaccuracies from aging hard structures without specialized equipment, it is common to present these results with a length-frequency distribution. The length-frequency distribution is a bar graph that shows the number of individual fish in specified length intervals. These figures can help interpret age data by pointing out gaps in the age structure of a fish community. They can even help detect missing age classes. In this way, a length frequency is an index of age like PSD is an index of size structure. The minimum sample-size recommended for length frequency analysis is 100 fish. For this reason, a length-frequency distribution was created for largemouth bass but not the bluegill in Wyatt Farm Pond.

Current Status of the Wyatt Farm Pond

Largemouth Bass

Electrofishing samples in March and April 2009 show that approximately 67% of largemouth bass in Wyatt Farm Pond that are greater than 8 inches long are also longer than 12 inches. This is within the recommended range of 40-70% for largemouth bass in a balanced

system (Anderson and Neumann 1996). Nearly 50% of all largemouth bass sampled were over 8 inches, and one fish was longer than 15 inches.

The average relative weight of largemouth bass in Wyatt Farm Pond was 91. Relative weights of 95-100 are those associated with quality largemouth bass populations (Wege and Anderson 1978). These results indicate that largemouth bass in Wyatt Farm Pond are in very good condition, and are only slightly below the weights they should be for a "quality" population.

Figure 1 shows the length-frequency distribution for largemouth bass in Wyatt Farm Pond. There are three main peaks in largemouth bass sizes. These occur at two inches, seven inches and twelve inches. These peaks likely correspond with one-, two-, and three-year-old largemouth bass in the pond. These sizes are small for fish of the corresponding ages compared to other bodies of water in the New River Valley. To minimize the impact of sampling, the largest fish sampled from the pond were not aged in the lab through the use of hard structures, as this would require sacrificing the fish.

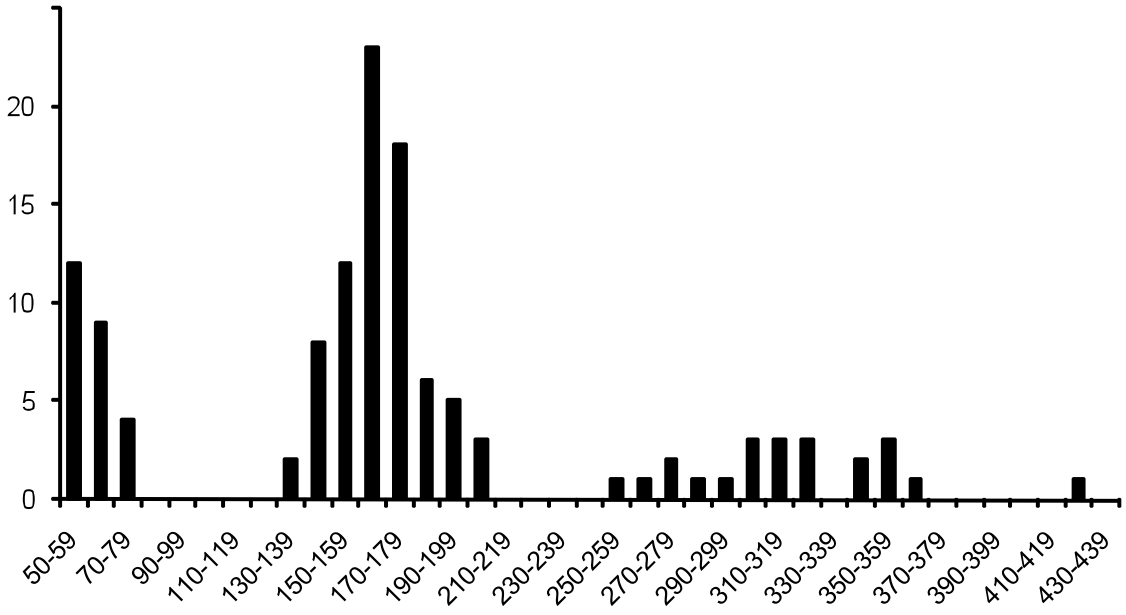

Figure 1. Length-frequency distribution for largemouth bass in Wyatt Farm Pond, spring 2009.

Bluegill

Electrofishing samples in March and April 2009 show that approximately 30% of bluegill in Wyatt Farm Pond that are greater than 3 inches long are also longer than 6 inches. This estimate covers the recommended range of 20-40% for bluegills in a balanced system (Anderson and Neumann 1996). Nearly 100% of all bluegill sampled were longer than 3 inches. Four of the bluegills sampled were longer than 8 inches.

The relative weight of bluegill measured by students during their sampling in Wyatt Farm Pond was 66. This average is extremely low, and very likely represents sampling errors in weighing these small fish. The PSD evaluation shows that the size-structure of the bluegill

population is essentially 'perfect' for a balanced pond, and such low relative weights would not be biologically possible in such a balanced pond. Size structure based on length is easier to measure, and in this case is the index that should considered to be more accurate than the relative weight estimate.

Recommendations

Fish

The Wyatt Farm Pond supports a healthy largemouth bass population. It offers a balance between large fish and high catch-rates. However, there are few small prey fish available. This is likely due to the introduction of green sunfish to the pond since the last sampling. The low numbers of juvenile bluegills in electrofishing samples indicated that they are unable to escape predation by largemouth bass and green sunfish. A simple solution to this problem is to add some structure to the pond so that young bluegills have a refuge from the predators. This can be accomplished very easily by placing some dead Christmas trees under the dock. By placing the trees under the dock, the aesthetics of the pond won't be adversely affected, and the structure won't interfere with recreational fishing.

Algae control

Algal blooms are a common problem in nutrient-rich ponds. They reduce the aesthetic appeal of the pond, and can have detrimental effects on water quality that could affect fish in the pond. There are several simple treatments for out-of-control blooms. We recommend Cutrine-Plus in a pelletized form. It can be purchased locally (Southern States or Tractory Supply) , for about $39 per 12 pounds. The recommended dosage to treat the entire Wyatt Farm Pond is about 8 pounds of pellets. This treatment should be applied to about 1/3 of the pond at a time, using approximately 2.5 pounds of the pellets. Treatment can be accomplished by simply hand-broadcasting the pellets along the shoreline, out to approximately 20 feet from shore, which is where the algae is likely concentrated. Wait at least 4 days before treating the next 1/3 of the pond. Treatment for algae can be repeated 2-3 times during a summer season, if necessary. Instructions and advisories for Cutrine-Plus application can be found online at http://www.appliedbiochemists.com/labels/CutrinePLUS.pdf.

Angler Education

Keeping stakeholders involved is an essential component of any management strategy. These recommendations should be made available to Wyatt Farm residents via the HOA newsletter, or some equivalent means of mass communication. There should also be some mechanism to receive comments from the homeowners. By giving the homeowners in the development a stake in the management of the pond, we can develop more local interest that will insure closer monitoring of management issues in the future. A popular way of doing this in state waters is to erect a small kiosk near the pond (dock) to educate anglers about the species of fish in the pond, and their current status. This might include pictures of the different fish, regulations, or even a fishing log. A fishing log is a good way to keep an eye on angling pressure in the pond. It could include such information as angler statistics (age, hours fished,

gear, etc.), size and numbers of species caught, and overall satisfaction with the fishery in the pond. Dedicated anglers are often willing to keep such a fishing log, to help improve future fishing. These resources will prove invaluable in monitoring the Wyatt Farm Pond, and in forming future management objectives.

References

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