SERVICE IN ACTION

COLORADO STATE UNIVERSITY EXTENSION SERVICE

Calculating pond volume for chemical treatment

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Quick Facts

To control a pond for unwanted aquatic vegetation or fish you must first determine the volume of the pond.

Surface area (acres) and average depth (feet) of a pond is needed to calculate pond volume.

Surface area of a pond is based on whether the pond is considered regular-shaped (rectangle, circular or triangular) or irregular-shaped (semi-circles, rectangles or triangles).

When chemical treatment of a pond is needed to control aquatic vegetation or poison unwanted fish, the first step is to determine the volume of the pond. Two characteristics of the pond must be known to calculate volume: 1) surface area (acres) and 2) average depth (feet).

Surface area can be determined by contacting the agency or construction company that built the pond. If this is not possible, the Soil Conservation Service or county planning and zoning board might be able to determine the area based on aerial photographs.

If you have to determine surface area for yourself, the following examples may be helpful. Many ponds are shaped closely enough to rectangles, circles or triangles to use simple formulas. Determining the area of an irregular-shaped pond is more difficult.

Regular-shaped Ponds

Rectangle: The area of a rectangle is found by multiplying the length by the width (Figure 1). Many borrow pits are this shape.

Circle: The area of a circle is calculated by multiplying the radius (one-half the distance across) times itself and multiplying that answer by 3.14 (Figure 2). Not many ponds are round, but often a cove resembles a semi-circle (the area of a semi-circle is simply the area of a circle divided by two).

Triangle: The area of a triangle is one-half the base (b) multiplied by the height (h) (Figure 3). Ponds built by damming a gully often are this shape.

Irregular-shaped Ponds

Irregular-shaped areas often can be reduced into combinations of rectangles, semi-circles and triangles. Calculate the area of each and add them together to obtain the total area (Figures 4, 5, 6).

Areas with irregular shapes require more side to side measurements. The average of the side measurements can be used as the width; then the area is calculated as a rectangle.

An area such as the following example can be converted to a circle. Measure the distance across the pond intersecting at the pond center. At least six to 12 measurements should be taken, the more taken, the more accurate the measurement. Remember, area of a circle uses the radius, which is half the distance across the circle. So the average distance across the pond divided by two is equal to the radius.

After square footage for the pond is determined it is easier to make further calculations if square feet are converted to acres. The total area in square feet divided by 43,560 gives the acres covered by the pond.

A convenient measure of pond volume is acre-feet, which is one surface acre that is one foot deep. To determine acre-feet, multiply the acreage by the average depth (in feet). Bodies of water having uniform bottom slope have an average depth that can be approximated by dividing maximum depth by two (Figure 7).

More accurate determinations (Figure 8) can be made by taking a series of measurements along an s-shaped line across the length of the impoundment. Total the figures and divide by the number of measurements taken to determine average depth.

These measurements can be taken by using a satisfactory sounding device made by attaching a brick or similar weight to a rope marked at one-foot intervals.

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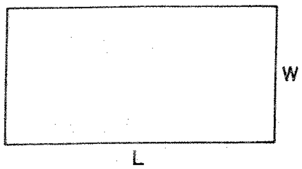
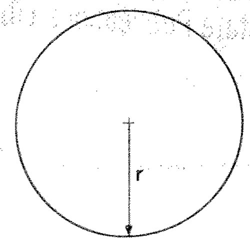
Total volume is determined by multiplying surface area in acres times average depth in feet. The resulting product will be in acre-feet. With the volume known, the correct amount of chemical needed can be calculated from dosages given on the chemical label.



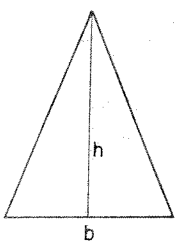
$$\text{AREA} = \text{LENGTH} \times \text{WIDTH}$$
$$L = 90' \quad W = 30'$$
$$90' \times 30' = 2700 \text{ square feet}$$

Figure 1: Calculation of the area of a rectangle.



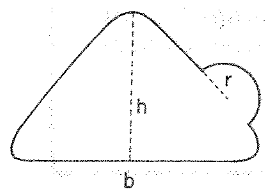
$$\text{AREA} = \text{RADIUS} \times \text{RADIUS} \times 3.14$$
$$r = 35'$$
$$35' \times 35' \times 3.14 = 3846 \text{ square feet}$$

Figure 2: Calculation of the area of a circle.



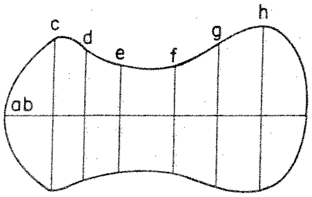
$$\text{AREA} = \frac{\text{BASE} \times \text{HEIGHT}}{2}$$
$$b = 50' \quad h = 75'$$
$$\frac{50' \times 75'}{2} = 1875 \text{ square feet}$$

Figure 3: Calculation of the area of a triangle.



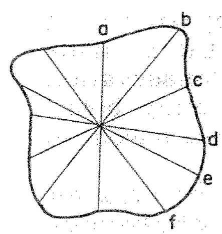
$$b = 75', \; h = 80', \; r = 25'$$
$$\text{AREA} = \frac{(b \times h)}{2} + \frac{(r \times r \times 3.14)}{2}$$
$$= \frac{(75 \times 80)}{2} + \frac{(25 \times 25 \times 3.14)}{2}$$
$$= 3000 \text{ ft}^2 + 981 \text{ ft}^2$$
$$= 3981 \text{ square feet}$$

Figure 4: Area calculation for an irregular-shaped pond.



$$\text{AREA} = ab \times \frac{(c+d+e+f+g+h)}{6}$$
$$ab = 45', \; c = 22', \; d = 21', \; e = 18'$$
$$f = 18', \; g = 20', \; h = 23'$$
$$45 \times \frac{(22+21+18+18+20+23)}{6}$$
$$= 45' \times 20'$$
$$= 900 \text{ square feet}$$

Figure 5: Area calculation for an irregular-shaped pond.



$$\text{Average distance across pond} = \frac{(a+b+c+d+e+f)}{6} = 25'$$
$$\text{radius} = 25'/2 = 12.5'$$
$$a = 27', \; b = 24, \; c = 26', \; d = 20', \; e = 22'$$
$$f = 30'$$
$$\text{AREA} = r \times r \times 3.14$$
$$= 12.5 \times 12.5 \times 3.14$$
$$= 490 \text{ square feet}$$

Figure 6: Area calculation for an irregular-shaped pond.

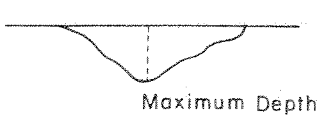


Figure 7: Maximum depth measurements for a pond having a uniform bottom slope.

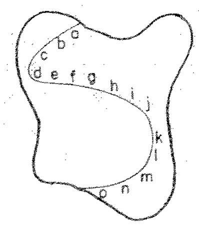


Figure 8: Use of a series of depth measurements to determine average depth.