

Determining the Area and Volume of Your Pond

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Knowing the surface area and volume that a pond occupies is important for landowners. These measurements are necessary for activities such as stocking fish and accuracy is also very important in determining chemical applications since over- or underestimating can cause a treatment to be ineffective or cause unintended lethality to fish or other species.

Area Calculations

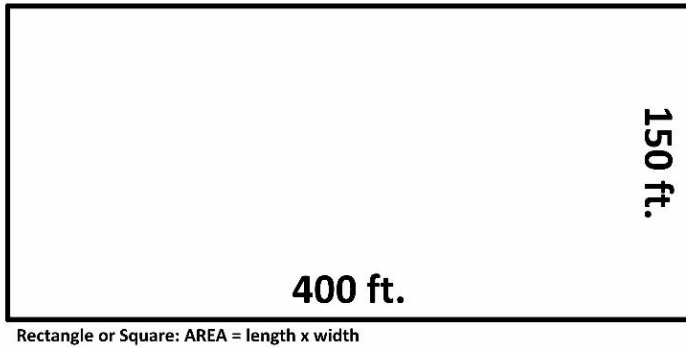
The first step is to determine the surface area of the pond. This is important since activities such as liming and fish stocking rates are typically based on area. If you built your pond, you should have records that will give you an accurate account of the area of the pond. However, these records are not always available. Professional surveyors are another option to accurately determine the area of your pond, but these services can be expensive. If neither of these options is available to you, there are other methods for determining the area of your pond.

There are many ways to determine the lengths that you will need when measuring a pond to get the surface area. Typically, a measuring tape or measuring wheel is used to determine distances between two points. Alternately, a known length of chain (rope) can be used as well. A final option is to use one's own pace or step to determine the distance between two points. If you are using the pacing method, you will need to determine the average distance of your pace. To do this, measure off a length of 100 ft. and count the number of strides that it takes you to cover the distance. Make sure that your stride is comfortable and normal. You will want to repeat the pacing a few times to determine the average number of paces that it takes to cover the one hundred feet. When you have this average, divide by 100 by the average number of paces. This determines the approximate length of your stride.

Square or Rectangular Ponds or Those Which are Almost Square or Rectangular

The easiest pond area calculations are made for those ponds that are either square or rectangular in shape. To determine the surface area of these ponds, simply multiply the length times the width. <Figure 1: rectangle.jpg>

FIGURE 1.



$$\text{AREA} = \text{LENGTH} \times \text{WIDTH}$$

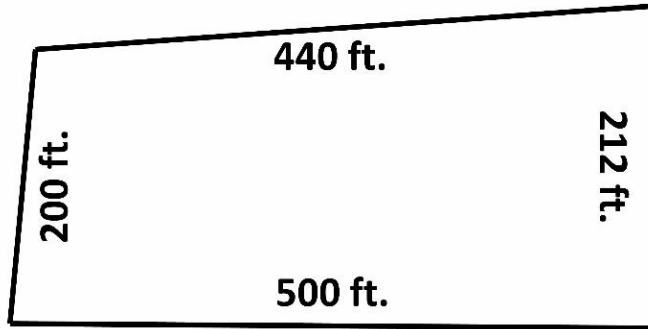
For a rectangle that has sides of 400 ft. and 150 ft., the **AREA = 400 ft. x 150 ft. = 60,000 ft²**.

The area of ponds which are almost square or rectangular in shape is a little more difficult to determine than a square or rectangular pond. Determining the area for these ponds involves calculating the average lengths of the sides. The formula is: $\text{AREA} = \frac{A+B}{2} \times \frac{Y+Z}{2}$

In this equation, **A** and **B** are the lengths of the pond, while **Y** and **Z** are the widths of the pond. For a pond that has lengths of 500 ft. & 440 ft. and widths of 200 ft. & 212 ft., the area calculation is $\text{AREA} = \frac{500+440}{2} \times \frac{200+212}{2} = \frac{940}{2} \times \frac{412}{2} = 470 \times 206 = 96820 \text{ ft}^2$.

<Figure 2: almost_rectangle.jpg>

FIGURE 2.



Almost Rectangular or Square: $AREA = \frac{A+B}{2} \times \frac{Y+Z}{2}$

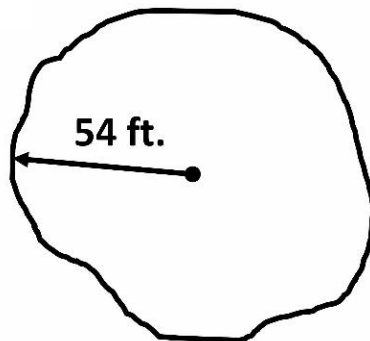
Ponds with Other Shapes

Many ponds do not fall into the square or rectangular shape categories. The formulas and examples for these shapes are listed below. Please remember that if your pond is not an exact shape, you can still get a good estimate by using one of the shape formulas below.

Circular Shaped Ponds

Determining the area for ponds that are circular or almost circular in shape is achieved by using the formula $AREA = \pi r^2$ where π is 3.14 and r is equal to the distance from the center of the circle to the edge of the circle (radius). For a circular pond with a radius of 54 ft., the calculation is $AREA = 3.14 \times (54)^2 = 3.14 \times 2916 = 9126.54 \text{ ft}^2$. <Figure 3: circular.jpg>

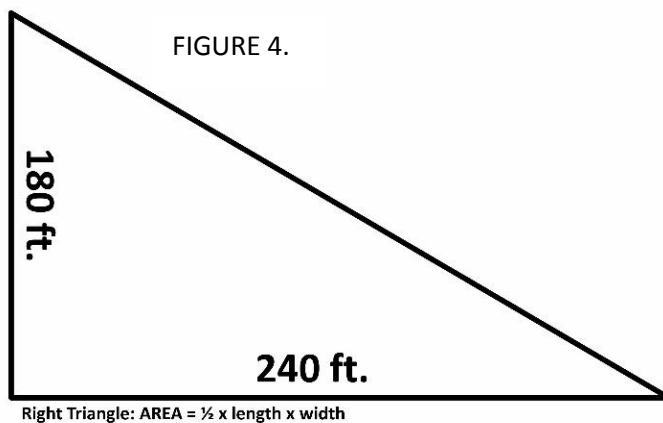
FIGURE 3.



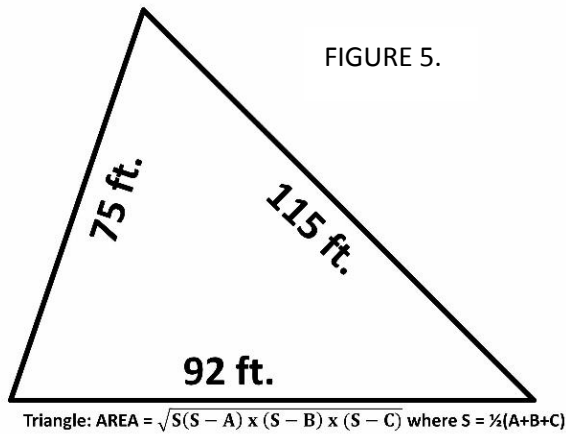
Circular: $AREA = \pi r^2$

Triangular Shaped Ponds

Determining the area for triangular shaped ponds is achieved by using one of two formulas, depending on whether the triangle has a 90° angle in it. If the triangle has a 90° angle (right triangle), then use the formula **AREA = ½ x length x width**. For a right triangle pond that has a width of 180 ft. and a length of 240 ft., the area calculation is **AREA = ½ x 180 x 240 = 21600 ft²**.
<Figure 4: triangle1.jpg>



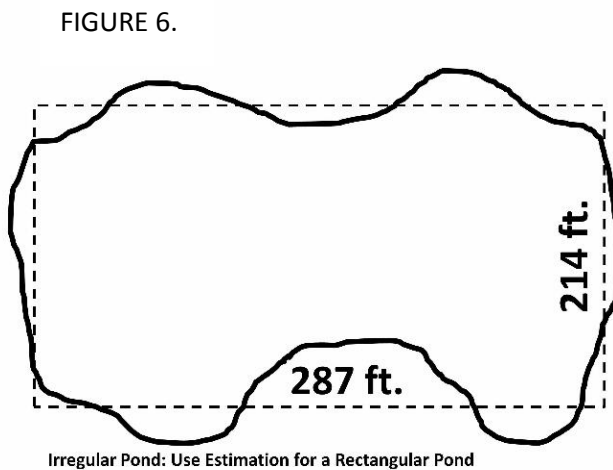
If the triangular shaped pond does not have a 90° or right angle, the formula is more complex and you need to know the length of all three sides. The formula for calculating the area of this type of pond is **AREA = $\sqrt{S(S - A) \times (S - B) \times (S - C)}$** , where **S** is equal to ½(A+B+C). For a triangular shaped pond with sides that are 75 ft., 92 ft., and 115 ft., the area calculation is **AREA = $\sqrt{141(141 - 75) \times (141 - 92) \times (141 - 115)}$ = $\sqrt{141 \times 66 \times 49 \times 26}$ = 3443.23ft²**.
<Figure 5:triangle2.jpg>



Irregularly Shaped Ponds

There are also ponds that do not fall into a regular shape. In these cases it is best to make an estimate of the area of the pond by using a formula that is the closest to representing the shape of the pond. The pond area can be broken up into manageable shapes that have easy calculations, such as a rectangle and $\frac{1}{2}$ of a circle or a rectangle and a triangle. For the irregularly shaped pond pictured below, the best estimation would be to use the formula for a rectangular shaped pond with a length of 287 ft. and a width of 214 ft.

<Figure 6:irregular.jpg>



These calculations will help you to determine the surface area of your pond in square feet (ft²). To determine the surface area in acres, divide the total number of square feet by 43,560 to calculate the acreage of the pond.

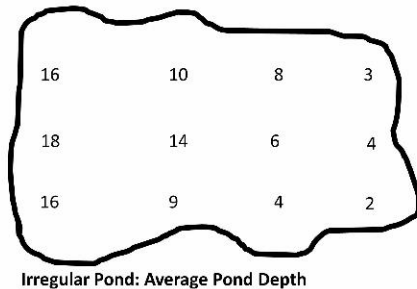
Volume Calculations

Once you have determined the surface area that your pond occupies, you then need to determine the volume of the pond. Knowing the volume of the pond is important, since many chemical applications are based on volumetric calculations. Volume is typically measured in cubic feet (ft³), gallons, or acre-feet (ac-ft). If the volume is given in another measurement, the conversion tables at the end of this document can help.

The formula for determining the volume of any pond for which the surface area has already been calculated is **VOLUME = Surface Area x Average Depth**. To get the average depth of your pond, you will need to take at least three (3) depth measurements: one at the shallow end, one in the middle and one at the deep end. Using only 3 measurements is fairly inaccurate, so increasing the number of depth measurements will greatly decrease the chance that your calculations are incorrect. Many average depth calculations are done in a grid pattern along the pond. This type of pattern is shown in Figure 7.

<Figure 7:average_depth.jpg>

FIGURE 7.



Irregular Pond: Average Pond Depth

To determine the average depth, simply add all of the depths that you have taken and divide that number by the number of measurements taken. For example, if you have taken 12 depth measurements (4 in the deep, 4 in the middle and 4 in the shallow) and the measurements are: 18, 16, 16, 14, 10, 8, 6, 9, 2, 3, 4, 4; then the total depth measured is 82. If you divide 82 by 12, then you have an average depth of **9.17 ft**. If this pond is rectangular in shape and has the same dimensions as our very first example (400 ft. by 150 ft.), then the calculation for the volume of this pond is **VOLUME = 400 ft. x 150 ft. x 9.17 ft. = 550200 ft³**. If we want to determine how many gallons this is, by using the conversion table, we know that one cubic foot (1 ft³) is equal to 7.48 gallons. Multiply 7.48 times 550200 and the pond contains **4,115,496**

gallons. To determine the acre-feet of this pond, divide the cubic feet by 43,560 and there is **12.63 acre-feet** of water in the pond.

Using these calculations will help you determine the surface area and volume that your pond occupies. Remember to keep accurate records of your measurements. Finally, if the season has been extremely wet or extremely dry, you may need to re-measure the surface area and average depth before performing any applications as the pond may be holding much more or less water than previous measurements can account for. Additional information on calculating the area and volume of ponds and tanks can be found via the Southern Regional Aquaculture Center at <https://srac.tamu.edu/index.cfm/event/getFactSheet/whichfactsheet/4/>.

Conversion Tables

Table 1. Conversions for Length

	Centimeters	Inches	Feet	Yards	Meters
Centimeter	1	0.3937	0.0328	0.0109	.01
Inch	2.54	1	0.0833	0.0278	0.0254
Foot	30.48	12	1	0.3333	0.3048
Yard	91.44	36	3	1	0.9144
Meter	100	39.37	3.281	1.0936	1

Table 2. Conversions for Volume

	Fl. Oz.	Cup	Pint	Quart	Gal.	Ft ³	M ³
Fl. Oz.	1	0.125	0.0625	0.02602	0.00065	0.00104	-
Cup	8	1	0.5	0.25	0.0625	0.0083	-
Pint	16	2	1	0.5	0.125	0.0167	-
Quart	32	4	2	1	0.25	0.0334	-
Gal.	128	16	8	4	1	0.1336	0.00378
Ft ³	957.5	119.69	59.844	29.922	7.481	1	0.0283
M ³	33814	4226.74	2113.37	1056.69	264.17	35.31	1
Fl. Oz. = fluid ounce, Gal. = gallon, Ft³ = cubic feet, M³ = cubic meter							