

ISU FISHERIES EXTENSION

Managing Iowa Fisheries

Calculations and Conversions for Fisheries

Calculating Surface Areas

Facts to Remember

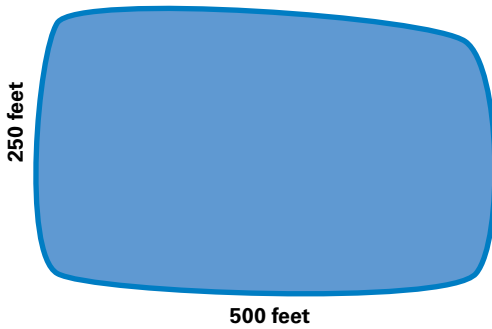
Area of rectangle = length \times width

Area of circle = radius² \times 3.14 (π)

radius = $\frac{\text{diameter}}{2}$

1 acre = 43,560 square feet

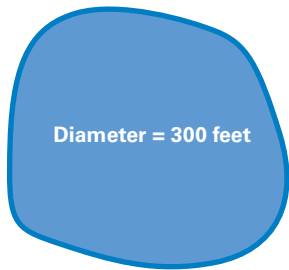
1 acre-foot = 1 acre of water 1 foot deep



Rectangular pond

Area = 500 feet \times 250 feet = 125,000 square feet

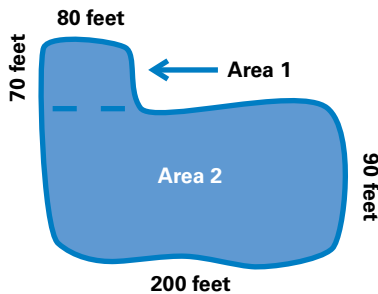
Acreage = $\frac{125,000}{43,560} = 2.9$ acres



Circular pond

Area = 150² feet \times 3.14 = 70,650 square feet

Acreage = $\frac{70,650}{43,560} = 1.6$ acres



Irregular shaped pond

Area 1 = 80 feet \times 70 feet = 5,600 square feet

Area 2 = 200 feet \times 90 feet = 18,000 square feet

Area of pond = 5,600 feet + 18,000 feet = 23,600 square feet

Acreage = $\frac{23,600}{43,560} = 0.5$ acres

PM 1352d February 2009

Calculating depth and water volume



Pond with uniform slope on bottom

Maximum pond depth = 15 feet

Depth = $\frac{1}{2}$ (maximum depth)

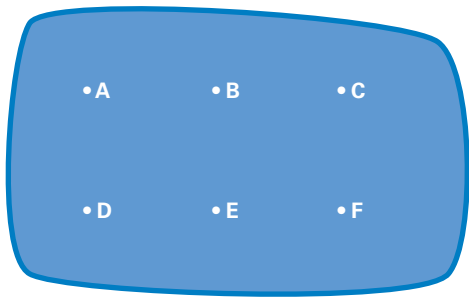
$$= \frac{15}{2} = 7.5 \text{ feet}$$

If surface area of pond is 3 acres,

water volume = 3 acres \times 7.5 feet = 22.5 acre-feet.

Pond with irregular bottom

1. Measure depth at several uniformly spaced points.
2. Add these values together and divide by number of depth readings.



Example: Depth in feet

A	=	6
B	=	10
C	=	8
D	=	5
E	=	3
F	=	6
		38

$$\text{Average depth} = \frac{38 \text{ feet}}{6} = 6.3 \text{ feet}$$

Useful Conversions

1 liter of water

= 1 kilogram
= 2.205 pounds

1 milliliter or cubic centimeter of water

= 1 gram
= 0.0353 ounce

1 gallon of water

= 8.34 pounds
= 3.785 kilograms

1 cubic foot of water

= 62.36 pounds
= 28.29 kilograms

1 fluid ounce

= 1.043 ounces
= 29.57 grams

1 acre

= 43,560 square feet
= 208.7 \times 208.7 feet
= circle diameter 235.5 feet

1 acre-foot

= 1 surface acre 1 foot deep
= 43,560 cubic feet
= 2,718,144 pounds
= 1,233.49 cubic meters
= 325,851 gallons

1 cubic foot per second

= 448.83 gallons per minute
= 26,930 gallons per hour
= 646,320 gallons per day
= 1.699 cubic meters per minute
= 101.93 cubic meters per hour
= 2,446 cubic meters per day

1 part per million (ppm)

= 1,226 grams per acre-foot
= 0.0283 gram per cubic foot
= 2.718 pounds per acre-foot
= 0.0038 gram per gallon
= 0.0000623 pound per cubic foot

1 percent solution

= 38 grams per gallon
= 1.3 ounces per gallon
= 0.622 pound per cubic foot of water

General dilution formula: (desired concentration \times desired volume) / (concentration of stock solution) = volume of stock solution to be diluted to desired volume

Rotenone applications = 3 ppm

1 gallon of liquid rotenone per acre-foot = 3 ppm

Pounds to Add to Obtain Desired Concentration

ppm	Acre Feet									
	1	2	3	4	5	6	7	8	9	10
0.1	0.27	0.54	0.81	1.08	0.35	1.62	1.89	2.16	2.43	2.70
0.3	0.81	1.62	2.43	3.24	4.05	4.86	5.67	6.48	7.29	8.10
0.5	1.35	2.70	4.05	5.40	6.75	8.10	9.45	10.80	12.15	13.50
1.0	2.70	5.40	8.10	10.8	13.50	16.20	18.90	21.60	24.30	27.00
2.0	5.40	10.80	16.20	21.60	27.00	32.40	37.80	43.20	48.60	54.00
3.0	8.10	16.20	24.30	32.40	40.50	48.60	56.70	64.80	72.90	81.00
4.0	10.80	21.60	32.40	43.20	54.00	64.80	75.60	86.40	97.20	108.00
5.0	13.50	27.00	40.50	54.00	67.50	81.00	94.50	108.00	121.50	135.00
10.0	27.0	54.00	81.00	108.00	135.00	162.00	189.00	216.00	243.00	270.00
15.0	40.50	81.00	121.50	162.00	202.50	243.00	283.50	324.00	364.50	405.00
20.0	54.00	108.00	162.00	216.00	270.00	324.00	378.00	432.00	486.00	540.00
25.0	67.50	135.00	202.50	270.00	337.50	405.00	472.50	540.00	607.50	675.00

Grams to Add to Obtain Desired Concentration*

ppm	Cubic Feet									
	10	50	100	200	300	400	500	1000	2000	3000
0.5	0.14	0.7	1.4	2.8	4.2	5.7	7.1	14.2	28.3	42.5
1	0.28	1.4	2.8	5.7	8.5	11.3	14.2	28.3	56.6	84.9
2	0.57	2.8	5.7	11.3	17.0	22.6	28.3	56.6	113.2	169.8
3	0.85	4.2	8.5	17.0	25.5	34.0	42.5	84.9	169.8	254.7
4	1.1	5.7	11.3	22.6	34.0	45.3	56.6	113.2	226.4	339.6
5	1.4	7.1	14.2	28.3	42.5	56.6	70.8	141.5	283.0	424.5
10	2.8	14.2	28.3	56.6	84.9	113.2	141.5	283.0	566.0	849.0
15	4.2	21.2	42.5	84.9	127.4	169.8	212.3	424.5	849.0	1273.5
20	5.7	28.3	56.6	113.2	169.8	226.4	283.0	566.0	1132.0	1698.0
25	7.1	35.4	70.8	141.5	212.3	283.0	353.8	707.5	1415.0	2122.5
20.0	54.00	108.00	162.00	216.00	270.00	324.00	378.00	432.00	486.00	540.00
25.0	67.50	135.00	202.50	270.00	337.50	405.00	472.50	540.00	607.50	675.00

*0.0283 gram in 1 Cubic foot of water gives 1.0 ppm; 0.0038 gram in 1 gallon of water gives 1.0 ppm.

Conversion of Length Units

Unit	Inch	Foot	Yard	Millimeter	Centimeter	Meter
Inch	1	0.0833	0.0278	25.40	2.540	0.0254
Foot	12	1	0.3333	304.8	30.48	0.3048
Yard	36	3	1	914.4	91.44	0.9144
Millimeter	0.0394	0.0033	0.0011	1	0.1	0.001
Centimeter	0.3937	0.0328	0.0109	10	1	0.01
Meter	39.37	3.281	1.0936	1000	100	1

Conversion of Volume Units

Unit	Gallon	Quart	Pint	Fluid Ounce	Cubic Foot	Cubic Inch	Milliliter	Liter	Cubic Meter
Gallon	1	4	8	128	0.1337	231.0	3785.4	3.785	0.00378
Quart	0.25	1	2	32	0.0334	57.75	946.36	0.946	0.00095
Pint	0.125	0.5	1	16	0.0167	28.88	473.18	0.473	0.00047
Fluid Ounce	0.0078	0.0313	0.0625	1	0.00104	1.805	29.573	0.0296	0.00003
Cubic Foot	7.481	29.92	59.84	957.5	1	1728	28317	28.32	0.02832
Cubic Inch	0.0043	0.0173	0.0346	0.5541	0.0058	1	16.39	0.0164	0.00016
Milliliter	0.00026	0.00106	0.0021	0.0338	0.000035	0.060	1	0.001	0.000001
Liter	0.2642	1.057	2.1134	33.81	0.0353	61.02	1.000	1	0.001
Cubic Meter	346.2	1057	2113	33810	35.3	31000	1000000	1000	1

Conversion of Weight Units

Unit	Grain	Ounce	Pound	Milligram	Gram	Kilogram
Grain	1	0.0023	0.000143	64.8	0.0648	0.000065
Ounce	437.5	1	0.0625	28350	28.35	0.0284
Pound	7000	16	1	453.590	543.6	0.4536
Milligram	0.0154	0.00035	0.000002	1	0.001	0.000001
Gram	15.43	0.0353	0.0022	1000	1	0.001
Kilogram	15430	35.27	2.205	1000000	1000	1

Adapted in part from Management of Water Quality for Fish, by R.W. Rottmann and J. V. Shireman, Cooperative Extension Service, University of Florida, and originally prepared by Joseph Morris, Iowa State University Extension fisheries and aquaculture specialist.

Updated by Rich Clayton, Extension aquaculture specialist, Department of Natural Resource Ecology and Management.
(515)294-8616
rclayton@iastate.edu
www.nrem.iastate.edu/extension/fisheries/index.html

File: Wildlife 1

This institution is an equal opportunity provider. For the full non-discrimination statement or accommodation inquiries, go to www.extension.iastate.edu/diversity/ext.