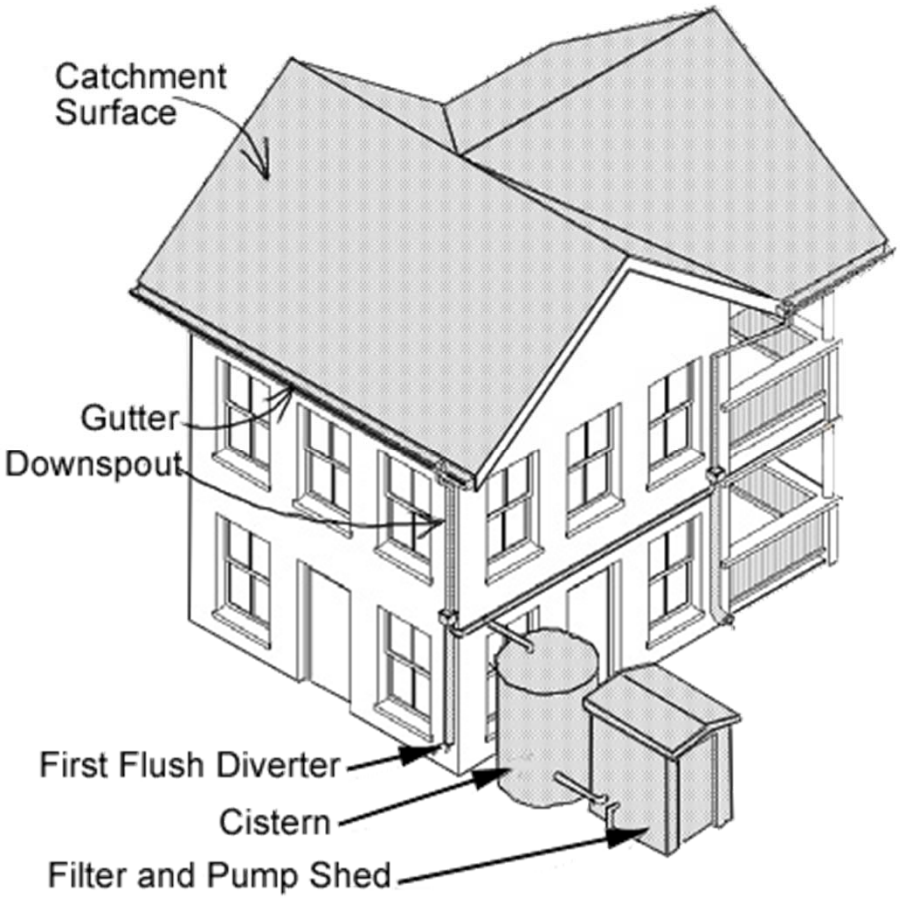
The Ploughshare
Institute for Sustainable Culture

www.sustainlife.org

Water for the Small Homestead



6500 gallon tank

How much water are you using?

Look at your water bill.

Meter Reading		Used	Charges
Present	Previous		
5433	5173	26000	118.00

This is a family of six.

How much water did six people use in 30 days?

(In their case, this includes the water for various animals—chickens, goats, sheep, cows and horses.)

How much water did six people use in 30 days?

26,000

26,000 gallons

How much is that per person, per day?

26,000 gallons

How much is that per person, per day?

144 gallons

26,000 gallons

144 gallons per person, per day

How much per day total?

26,000 gallons

144 gallons per person, per day

How much per day total?

867 gallons

If they are using 867 gallons each day, how many days will a 3000 gallon storage tank last?

If they are using 867 gallons each day, how many days will a 3000 gallon storage tank last?

3.5 days

26,000 gallons

How many 3000 gallon tanks are needed for one month supply of water?

26,000 gallons

How many 3000 gallon tanks are needed for one month supply of water?

8.67 tanks

A Water Usage Log

Date	Time	Recorded Rain Fall	Meter Reading	Usage Gallons	Notes
8/1/2012	11:00 AM		36395	444	Used water for concrete for fence holes. Watered the chili peppers.
8/2/2012	10:00 AM		36587	192	
8/3/2012	10:00 AM		36861	274	
8/4/2012	10:00 AM		37123	275	
8/5/2012	10:00 AM		37489	276	
8/6/2012	10:00 AM		37552	277	
8/7/2012	10:00 AM		37705	278	
8/8/2012	10:00 AM		37902	279	
8/9/2012	9:00 AM	0.25	38069	280	
8/10/2012	9:30 AM		38277	281	
8/11/2012	12:00 PM		38652	282	
8/12/2012	9:30 AM		38863	283	
8/13/2012	10:00 AM		38901	284	
8/14/2012	10:00 AM		39165	285	

A Sustainable Homestead

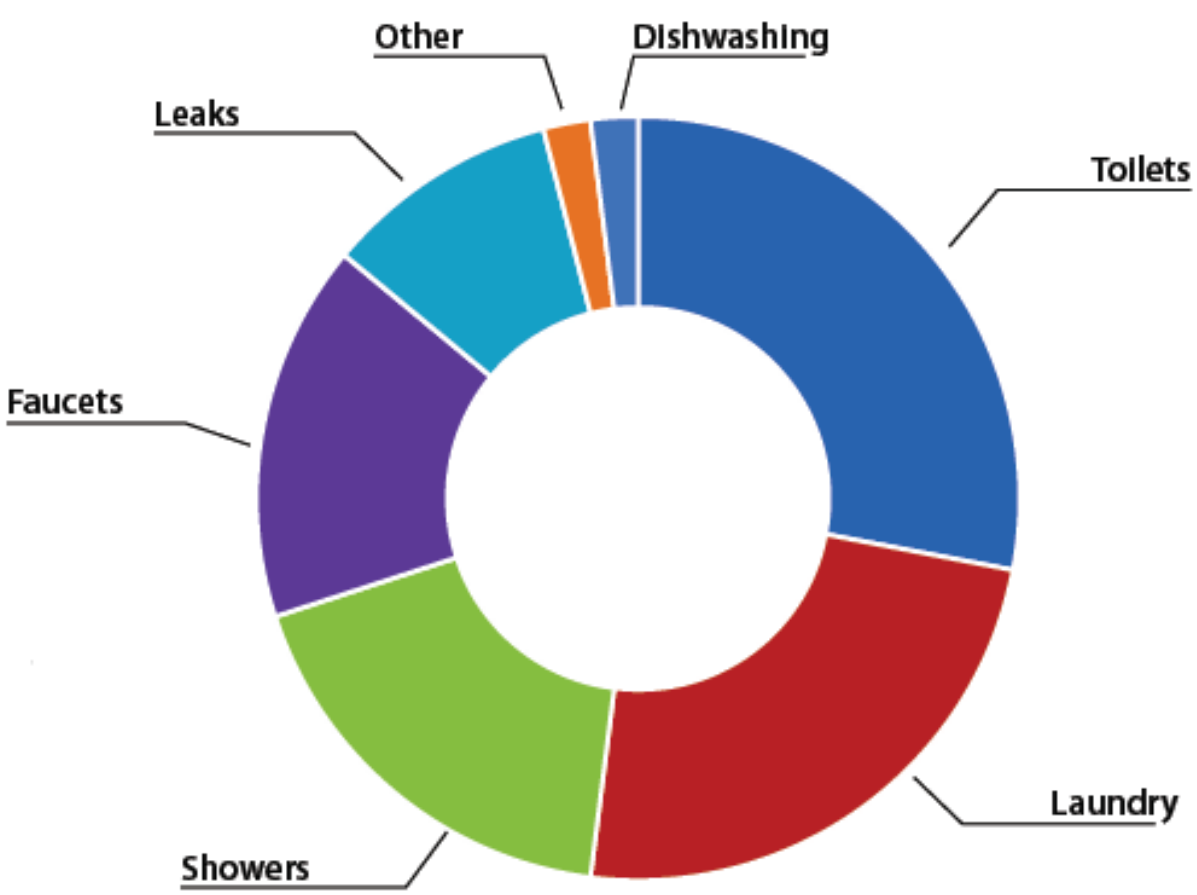
This family changed their usage to 25 gallons per person per day—25% of the national average. Below is the last water bill, after they have reduced their usage and developed their own sustainable water supply.

Meter Reading		Used	Charges
Present	Previous		
626	626	0	13.00

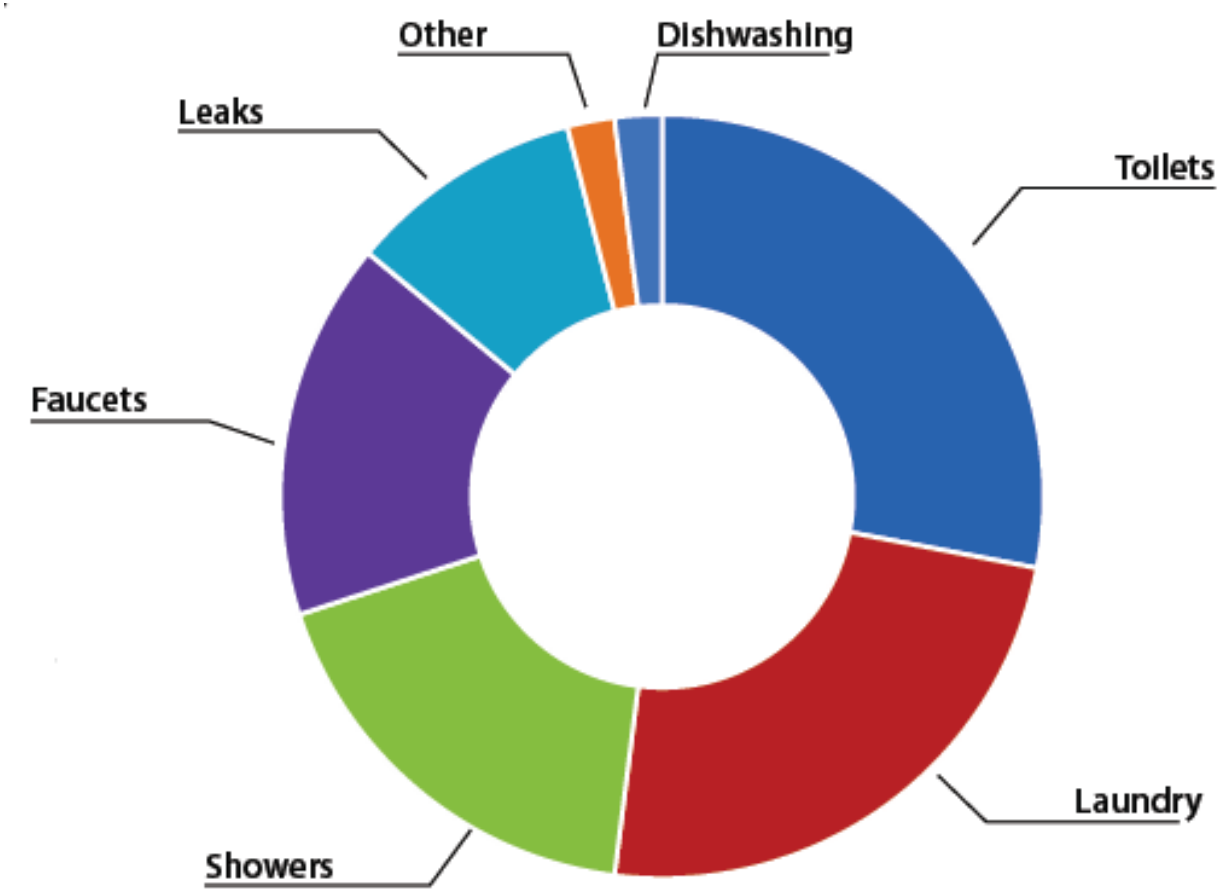
Saving money is not a sufficient reason to strive for sustainability in the homestead water supply

They only saved $105.00 per month or potentially $1260.00 per year

Water use in the Average North American Home



What uses the most water?



Toilets Use the Most Water

Toilets

* Average person flushes 5-8 times per day
* Toilets before 1980 use 4.5 gallons per flush
* Toilets between 1980 and 1992 use 3.5 gallons per flush
* Toilets after 1992 use 1.6 gallons per flush
* A family of six could save 104.4 gallons per day by replacing an old toilet with a water-saving toilet

Changes This Family Made

Water this family saved

* Switched to 1.6 gal/flush toilet—saved 119 gallons per day
* Switched to 1.5 gpm shower heads and used “Navy” shower–saved 111 gallons per day
* Reduced the number of washing loads with a new efficient washer—saved 52 gallons per day
* Switched to 1.5 gpm faucets—saved 189 gallons per day
* Total: **471 gallons per day** (78.5 gallons per person)
* **70% reduction** in water usage
* Now this family can plan and implement a sustainable water system

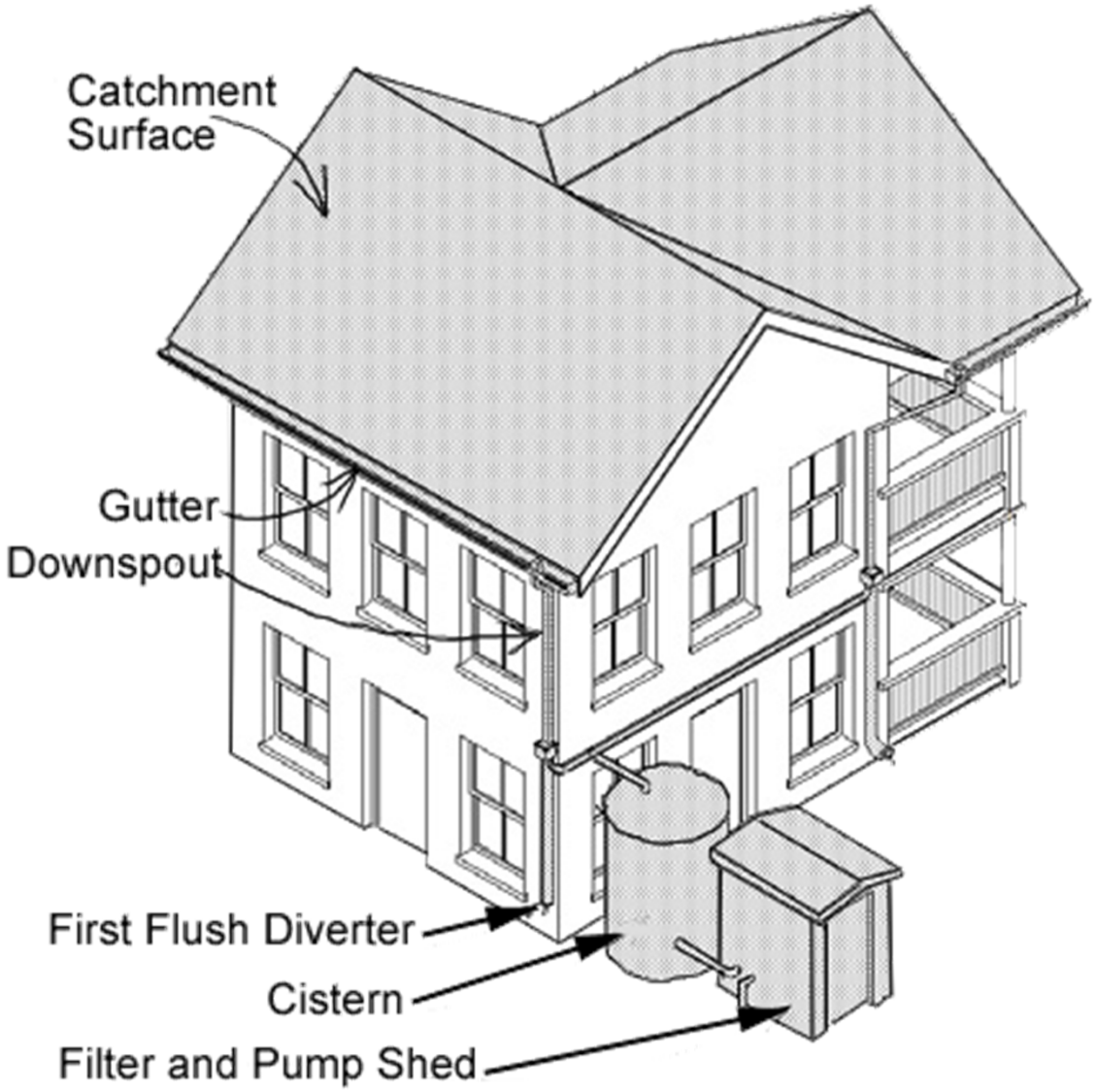
Water for the Small Homestead

What kinds of water supplies are available to the homestead?

Water for the Small Homestead

We are going to concentrate on rain water systems for the remainder of the class.

Rain Water for the Small Homestead



Typical Rainwater Catchment System

Rain Harvesting Table

	Inches of Rain								
Area-sq.ft.	**1**	**1.5**	**2**	**2.5**	**3**	**3.5**	**4**	**4.5**	**5**
100	62	93	125	156	187	218	249	280	312
200	125	187	249	312	374	436	498	561	623
300	187	280	374	467	561	654	748	841	935
400	249	374	498	623	748	872	997	1121	1246
500	312	467	623	779	935	1090	1246	1402	1558
600	374	561	748	935	1121	1308	1495	1682	1869
700	436	654	872	1090	1308	1526	1744	1962	2181
800	498	748	997	1246	1495	1744	1994	2243	2492
900	561	841	1121	1402	1682	1962	2243	2523	2804
1000	623	935	1246	1558	1869	2181	2492	2804	3115
1100	685	1028	1371	1713	2056	2399	2741	3084	3427
1200	748	1121	1495	1869	2243	2617	2990	3364	3738
1300	810	1215	1620	2025	2430	2835	3240	3645	4050
1400	872	1308	1744	2181	2617	3053	3489	3925	4361
1500	935	1402	1869	2336	2804	3271	3738	4205	4673
1600	997	1495	1994	2492	2990	3489	3987	4486	4984
1700	1059	1589	2118	2648	3177	3707	4236	4766	5296
1800	1121	1682	2243	2804	3364	3925	4486	5046	5607
1900	1184	1776	2367	2959	3551	4143	4735	5327	5919
2000	1246	1869	2492	3115	3738	4361	4984	5607	6230
2100	1308	1962	2617	3271	3925	4579	5233	5887	6542
2200	1371	2056	2741	3427	4112	4797	5482	6168	6853
2300	1433	2149	2866	3582	4299	5015	5732	6448	7165
2400	1495	2243	2990	3738	4486	5233	5981	6728	7476
2500	1558	2336	3115	3894	4673	5451	6230	7009	7788

Example of Rainfall for Waco, TX

Waco Rainfall Statistics

in inches

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Minimum	0.03	0.00	0.04	0.12	0.52	0.27	0.00	0.00	0.00	0.00	0.13	0.04
Maximum	5.92	7.69	5.56	13.37	15.00	12.06	8.58	8.91	7.29	10.51	7.03	9.72
Median	1.55	2.00	2.22	2.76	3.87	2.34	0.82	0.96	2.57	2.37	2.29	1.94
Average	1.83	2.28	2.25	3.30	4.49	2.98	1.82	1.76	3.02	3.12	2.40	2.31

Sum of Worst	1.15 inches	
Sum of Best	111.64 inches	
Sum of Median	25.69 inches	(most conservative measure to use)
Sum of Average	31.56 inches	

Median means the “middle” between the largest and the smallest

Rainfall Calculations

Each inch of rain on 1 sq.ft. of roof yields .623 gallons

If you have a 2000 square foot roof in Waco with a
25 inch Median annual rainfall, your roof will yield how many gallons?

Hint:
(move the decimal over 3 times and multiply by 2 to get the yield of the roof per inch of rain)

Rainfall Calculations

Each inch of rain on 1 sq.ft. of roof yields .623 gallons

25 inches annual rainfall on a 2000 sq. ft. roof yields

2000 x .623 = 1246 gallons per inch

25 inches x 1246 gallons = 31,150 gallons per year

Rainfall Calculations

Now apply a waste factor to the yield.

We are going to assume a metal roof for this calculation.
Metal roofs usually have a waste factor of .95 or 95% efficiency.

25 x 1246 = 31,150 gallons per year before the waste factor

31,150 x .95 (95%) = ??????? gallons per year available

Rainfall Calculations

Now apply a waste factor to the yield.

We are going to assume a metal roof for this calculation.
Metal roofs usually have a waste factor of .95 or 95% efficiency.

25 x 1246 = 31,150 gallons per year before the waste factor

31,150 x .95 (95%) = **29,592.5** gallons per year available

Water Storage Options

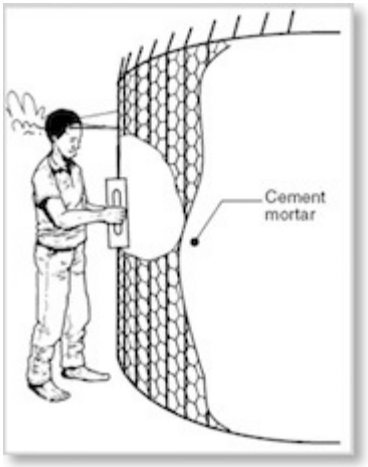
Ponds

Water Storage Options

Storage tanks

Water Storage Options

Ferro-Cement Tanks



Water Storage Options

Flexible tank made with fence and liner

Water Storage Options

Concrete Block

Water Pumping Options

Water Pumping Options

Water Pumping Options

Contact Information

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Accredited Professional (AP) by the

American Rainwater Catchment Systems Association

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The water purification seminar will be held here in the Green Barn at 1:00 PM Friday and Saturday