

Collecting and Storing Water for the Small Homestead

When water supplies for the small homestead are discussed, the main issue rapidly becomes “what is a sustainable water supply for the homestead?”

What is “sustainability” and how does this concept apply to water storage and water use?

The words “sustainable” and “sustainability” are now buzzwords that are becoming over-used and losing their meaning.

In our context, sustainability means to meet the essential needs of the present without compromising the ability of people in the future to meet their own needs. A sustainable practice must endure in value and worth. It should be comprehensive and embrace all areas of our life. It should not be easily lost or damaged.

The three main areas we are concerned with are:

- (1) Environmental sustainability—use and stewardship of natural resources, conservation, renewable energy and agriculture
- (2) Economic sustainability—provide for the needs of the family for food, water, income or products
- (3) Social sustainability—sustain the needs and values of the family and community that are beyond the material and physical

Sustainability in our water resources concern three main topics:

- (1) Identifying and utilizing our self-sufficient water resources
- (2) Providing self-sufficient storage of water
- (3) Maintaining self-sufficient treatment of water

How important is a sustainable water supply to you?

Imagine for a moment that you are leading your family into the wilderness back in the mid to late 1800’s. You head west into Texas. The land is lush with vegetation. Crops grow without all the effort necessary back East. Cattle and livestock grow fat with ease. You must have found a new Eden. Visions of wealth and security dance in your head.

You have built your home, a barn and grown a thriving plantation— you have planted cotton and corn as full as your land would hold. Ah! Such peace, such safety! It is too wonderful to be real.

It isn’t real. A disaster is about to strike. Do you know what it is?

Drought --the curse of homesteaders.

All this is not just an imaginative story. This happened to real people with real hopes and dreams. They moved into Texas during an unusual rainy period in the mid 1800's. The weather returned to the normal patterns and even a drought around 1885. The rainfall amounts in some areas went down into the low 20 inches per year or worse. Fortunes were lost and people barely escaped.

Now, imagine yourself leading your family into this scenario. You have built houses, barns and planted crops. Suddenly the rain stops and the water is gone. What can you do? There is no utility to turn to for water.

Do you think it is far-fetched to consider this in today's world? Ask the people in West Texas about it. Whole lakes are gone now— lakes that were the only source of city water supplies. Aquifers are shrinking dangerously low. Wells are running dry. The population of Texas is growing at a rapid rate.

A rural water company we know about was told by the aquifer authority that they will not be allowed to drill any more wells and they may not increase the amount that their current wells can pump. The rate is capped now. Since they are in a rapid growth phase, they went to the local lake water authorities and requested to contract for additional water.

“Our lake water is not for sale, sorry.”

What are they going to do? I don't know either. They had better start learning about conservation and alternative, sustainable water resources.

This is a very real, very pressing problem. Large suburban areas in Australia have been abandoned due to water running out and the pipes are dry. Hopes, dreams and fortunes—all broken and lost.

Perhaps you have led your family into a type of “wilderness” and the “climate” is changing. Maybe that is why you are in this class.

Perhaps it is time to ask yourself some questions.

1. What priority does water sustainability have to our homestead?
2. What am I planning for?
 - a) Total self-sufficiency off the grid and utilities?
 - b) Better stewardship with resources?

Determining the needs of the homestead

This starts with current water use tracking. Here are some ways to do the assessment:

1. Water bills to see the overall picture
2. Using the water meter to track actual water use each day
3. Keep a water log of use
4. Using established charts for water use prepared by others for estimates

Once you see your needs you need to practice water budgeting.

There are three major user groups for water budgeting:

1. **People**-this is the most important user group and the last to suffer extreme measures of curtailment.
2. **Gardens and lawns**-this is by far the largest use. It will be the first to be curtailed if water is scarce.
3. **Animals**-this is the second group to be curtailed in extreme circumstances.

Recognizing the supply and storage options available to you

It is necessary to assess the actual resources of your homestead. This can't be wishful thinking, but cold, hard facts.

What kinds of water supplies are available to the homestead?

1. **Rainwater**—this is a tried and true resource for centuries. It is necessary to know:
 - a) The actual rainfall amounts in your location
 - b) The potential yield from your catchment surfaces
2. **Wells**
 - a) Shallow wells—not very high capacity and subject to contamination
 - b) Deep wells—expensive to drill and expensive to pump
3. **Springs, streams and ponds**—these are the most dangerous sources of water. You must answer some questions about surface water:
 - a) Is it legal to use in your area?
 - b) What is the water quality?
 - c) What is the capacity? Does it stop or slow along with rainfall?

What are the available storage options?

1. Ponds as storage—extremely dangerous source of water
 - a) Existing ponds
 - b) Excavated pond or damming natural terrain
2. Storage tanks
 - a) Commercially available tanks
 - (1) Plastic
 - (2) Galvanized with liner
 - (3) Wooden
 - b) Custom built
 - (1) Ferro-cement
 - (2) Restraining wall and liner
 - (3) Cement block and sealed or lined

Once you have water stored you need to know your pumping or pressure options

1. Electric pumps
 - (1) Grid powered
 - (2) Solar powered
2. Wind powered
3. Hand powered
4. Alternative pumping methods
5. Gravity

Keeping the water safe

Once you have stored water, you must keep it safe to use for the purposes you intend. Please return for Part Two of this series, *Purifying Water Using Sustainable Methods* for more information on this topic.

Topics covered in the next seminar will include:

- Filtration
 - Mechanical filters
 - Activated charcoal filters
 - Reverse Osmosis
- Purification

- Sand filter
- Ceramic filter
- Ozonation and UV
- Purification by heating
 - ❖ Boiling
 - ❖ Distilling
 - ❖ Pasteurizing
- Purification by chemical means
 - ❖ Chlorination—not easy for a homeowner and not as safe as we have been led to believe
- Other treatment

Planning a system

1. Decide the methods of supply to best meet your water needs using the results of the assessment of your supply options. Plan a realistic supply scenario.
 2. Decide the methods and capacity of storage to employ and pick a reasonable method of storage that fits your situation. Don't be afraid to add storage in stages. Don't wait until you can do it all before you do something.
 3. Develop a strategy to implement the necessary parts of the system after researching the best methods to accomplish your goals. Put it on paper. Think of all the things that are good and bad about your plan before you start work on it.
- D. Budget time and finances to accomplish the goals. Do not allow yourself to over-build and over-spend because that will stop you from attaining your goals.
- E. Remember, it is preferable to work in stages to accomplish your goals
- Having some water in a working system is better than having nothing finished because you designed a very large and complex system that will take a long time to finish.

Resources

Important facts:

Rainfall yield for a roof surface.

- Remember to take the footprint of the roof. Do not add the angle into the total. Only take the measurement straight up from the ground.
- Yield is **.623 gallons of water per square foot of roof surface per inch of rain.**
a 1000 square foot roof will yield 623 gallons per inch of rain.
- Subtract the loss or waste from that total. This varies due to roofing material and quality of the guttering.

A **metal roof** normally has a waste factor of **90% to 95%**. Multiply the yield by .90 to .95

For example: 623 gallons x .90 = **560.7 gallons per inch of rain** after the waste factor.

Weight of water per gallon = 8.43 lbs. Example: 100 gallons weighs 843 lbs.

Ownership of water (In Texas, as of 2013—check with your jurisdiction):

- Water in a well or physical vessel belongs to the homeowner
- Water in a stream, pond or any surface water (even if dug and lined by the homeowner) belongs to the State of Texas.

Water treatment (called sanitation) in Texas:

- Surface water is the most dangerous source of water—**do not drink it without treatment!**
- Water supplies for individual homesteads is not regulated yet (more to come) unless it ties to a public water system.
- Any system that serves 25 or more families is considered a public water system and is regulated.
- Come to the water treatment seminar to learn more.

Example charts follow on the next page

Rain Harvesting Table

Area-sq.ft.	Inches of Rain								
	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
2600	1620	2430	3240	4050	4859	5669	6479	7289	8099
2700	1682	2523	3364	4205	5046	5887	6728	7569	8411
2800	1744	2617	3489	4361	5233	6105	6978	7850	8722
2900	1807	2710	3613	4517	5420	6323	7227	8130	9034
3000	1869	2804	3738	4673	5607	6542	7476	8411	9345
3100	1931	2897	3863	4828	5794	6760	7725	8691	9657
3200	1994	2990	3987	4984	5981	6978	7974	8971	9968
3300	2056	3084	4112	5140	6168	7196	8224	9252	10280
3400	2118	3177	4236	5296	6355	7414	8473	9532	10591
3500	2181	3271	4361	5451	6542	7632	8722	9812	10903
3600	2243	3364	4486	5607	6728	7850	8971	10093	11214
3700	2305	3458	4610	5763	6915	8068	9220	10373	11526
3800	2367	3551	4735	5919	7102	8286	9470	10653	11837
3900	2430	3645	4859	6074	7289	8504	9719	10934	12149
4000	2492	3738	4984	6230	7476	8722	9968	11214	12460

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	

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