

The Ready Life *presents...*



THE SPRING-FED WATER SYSTEM GUIDE

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The Most Independent Water System on Earth

A spring is one of the only water sources that can keep producing water when the grid goes down.

Cold, clean water flows out of the ground 24/7—year after year—and when you develop that spring correctly, you can build a system that’s incredibly dependable in emergencies. In some setups, gravity alone can supply the house. In others (like ours), a simple pump moves the spring water where it needs to go. Either way, the spring itself gives you something rare: a water source you can build long-term resilience around.

We live with spring water every day on our mountain homestead in Idaho, and we love it—clean, fresh, and delicious. And we’ve seen spring systems work on dozens of properties over the years.

A properly developed spring, protected and stored the right way, can deliver:

- Reliable water through outages
- Fewer mechanical weak points than most systems
- Household pressure (gravity or pumped)
- Strong supply
- Exceptionally pure water

That’s why we consider spring water one of the best homestead water sources available—and this workbook will show you how to develop it the right way.

How This Workbook Is Organized

We’ll take you through the complete journey—from finding a spring on your property all the way to pressurizing your house and testing your water for safety. Here’s the progression:

- **Part 1: Finding Springs** – how to read the land and locate water sources
- **Part 2: Assessing Your Spring** – flow measurement, reliability, and contamination risk
- **Part 3: Developing Your Spring** – step-by-step headworks process
- **Part 4: Cisterns** – types, sizing, and installation for maximum storage
- **Part 5: The Ultimate Setup** – gravity-fed systems and the pressure formula
- **Part 6: Pumping Options** – when gravity isn’t enough
- **Part 7: Water Quality** – testing, treatment, and long-term protection
- **Part 8: Your Next Step** – a 24-hour commitment to move forward

PART 1

FINDING SPRINGS

Learning to read the land before you pick up a shovel

Springs don't announce themselves with a sign. But they do leave clues—if you know what to look for. Once you know the signs, you'll start seeing potential everywhere.

Step 1: Read the Vegetation

Plants can be a great indicator of water. Vegetation that requires consistent moisture will cluster wherever water is moving through the ground, even if you can't see it on the surface. In a dry forest or open hillside, a patch of lush green growth can signal the presence of water—because it shouldn't be there without a water source.

What to look for:

- Ferns – these are a classic spring indicator, especially in forested areas
- Cattail-type grasses or tall moisture-loving plants in a dry landscape
- Deciduous plants clustered within coniferous forest (they need more water)
- Any patch of vegetation that's noticeably different or lusher than its surroundings
- A sudden stop of vegetation – sometimes the contrast is as telling as the lush spot

Walk your property during the dry season. That's the ideal time—if a spring is still pushing water during a dry spell, it's likely a reliable year-round source. During wet weather, everything looks green. It's hard to distinguish what's spring-fed from what's rain-soaked.

NOTE: Heavy clay can give a false positive indication, since it holds on to moisture. As a result, you could have ferns or other plants in dry summers without a spring.

My Spring Search Observation Checklist

While walking your property, check off any of these signs you observe:

- Patch of unusually lush or different vegetation on a hillside
- Ferns or moisture-loving plants in a dry area
- Wet, spongy, or muddy ground on a slope
- Small rivulet or trickle flowing from hillside without obvious cause
- Standing water in a low spot with no obvious rain-fed explanation
- Old pipe, metal box, or construction remnants near a wet area (someone found it before you)
- Road cut exposing wet bank or weeping hillside
- Sound of water underground or near a bank
- Animals consistently gathering in one area on a hillside

Step 2: Check Road Cuts and Skid Trails

One of the most reliable places to find a spring is where a road or old logging trail cuts into a hillside. When you slice into a slope, you often expose the clay or rock layer that was holding water underground—and suddenly it starts weeping out of the bank.

Walk your driveway or any old roads on your property, especially where they cut into a hill. Look into the bank for wet spots, water staining, or small trickles running down the dirt face.

We've discovered several springs exactly this way, including one we found completely by accident while digging a hole to bury a cistern on an old logging skidded trail. Water started pouring out of a clay seam that we had no idea was there.

The Clay Layer Principle

The most common type of spring on rural property is a contact spring—where moving groundwater hits an impervious layer (usually clay or rock) and is forced to the surface.

The geology is simple: water moving down through permeable material (sand, gravel, decomposed granite) hits something it can't penetrate, and it comes out sideways. When you see clay exposed on a hillside—especially where it meets sandy or gravelly layers above—that's your signal to start digging.

Step 3: Follow the Water to Its Source

When you find a wet spot, trickle, or soggy patch, don't just look at it—follow it uphill. Here's a useful tip: check road ditches along the dry season. If you see standing water in a ditch where it hasn't rained—there's a spring feeding it from somewhere uphill. Follow it.

The goal is to trace it back to the precise point where it's emerging from the ground. This is where you'll develop your spring.

Start by clearing away brush and weeds in the wet area so you can see the ground clearly. Then follow the line of dampness or small flow uphill, keeping your eyes on the soil. The water will lead you back to its source.

Step 4: Document What You Find

Mark every potential spring site you locate. If you find something during the dry season, mark it—because it'll be harder to identify when everything's green and wet. Some low-flow springs are better developed when it's wetter and the flow is stronger, making it easier to pinpoint the source. But you want to evaluate it at the driest time of year to know if it's reliable.

| | |
|-------------------------------------|-------|
| Location on property | _____ |
| Vegetation indicators | _____ |
| Estimated flow (observation) | _____ |
| Elevation vs. home site | _____ |
| Season/month observed | _____ |
| Reliability (year-round?) | _____ |

Notes:

PART 2

ASSESSING YOUR SPRING

Flow, reliability, and contamination risk before you invest a shovel of work

Finding a wet spot is exciting. But not every wet spot is worth developing. Before you invest real time and money into a spring, you need to answer three critical questions: How much water is there? Is it reliable? And is it safe?

Step 1: Measure Your Flow

Flow is everything. A small trickle running 24/7 adds up to surprising amounts of water over time. But there's a minimum you need to sustain your household, and you need to know where your spring falls.

The simplest measurement method:

1. Find a 1-gallon container
2. Hold it under the spring's flow (or a temporary collection pipe)
3. Time how long it takes to fill
4. Calculate gallons per minute from that measurement

Flow Measurement Calculator

Container size used: _____

Time to fill (seconds): _____

Gallons per minute (GPM): $60 \div \text{fill time in seconds} = \text{_____ GPM}$

Daily production: _____ GPM $\times 1,440 \text{ minutes} = \text{_____ gallons per day}$

| Flow Rate | Daily Production | Best For |
|-----------|------------------|---|
| 0.25 GPM | 360 gal/day | Domestic use for 1-2 people (tight, but possible) |
| 0.5 GPM | 720 gal/day | Comfortable domestic use for small family |
| 1.0 GPM | 1,440 gal/day | Great for family use + light irrigation |
| 1.3+ GPM | 1,800+ gal/day | Excellent – covers most homestead needs |
| 2.0+ GPM | 2,800+ gal/day | Outstanding – domestic + significant irrigation |

Real Talk on “Enough” Water

We’ve known families who live comfortably on a quarter gallon per minute for their indoor needs. It requires a good cistern and mindful usage—but it can work. Domestic water consumption (cooking, drinking, bathing) runs roughly 50-100 gallons per person per day. The big consumers are outdoor uses—irrigation, animals, washing vehicles. So if your spring is on the lower end, you can still make it work for the house. Just be honest about what you want to do outside.

My Household Water Needs Calculator

People in household: _____ × 75 gal/person/day = _____ gallons/day (indoor estimate)

Add irrigation/outdoor use: _____ gallons/day

Total daily need: _____ gallons/day

My spring produces: _____ gallons/day

Surplus or deficit: _____ gallons/day

Step 2: Test Reliability – Check It in the Dry Season

A spring that runs beautifully in April may be a mud puddle by August. “Wet weather springs” are common—they appear after rain and disappear during dry spells. You do not want to build your water system around one of these.

The rule: always evaluate a spring during the driest part of your year. If it’s still running—even at a reduced rate—you likely have a reliable source. If it’s dry, keep looking.

Additional reliability checks:

- Ask neighbors or local old-timers who have lived on adjacent land. They often know which springs are year-round and which dry up.
- Look for any historical development—old pipe, concrete boxes, metal hardware. If someone invested in it before you, they probably saw it run consistently.
- Watch your spring through the seasons during your first year before committing to a full development project.
- Remember: the effect of weather on spring flow is often delayed. The effects of dry weather may not show up in your water output for months, as it moves through the ground.

Seasonal Flow Record

Track your spring flow across different seasons before you invest heavily in development. Use the table below.

| Month / Season | Flow Rate (GPM) | Weather Conditions | Notes |
|-----------------------|-----------------|--------------------|-------|
| Spring (March-May) | | | |
| Early Summer (June) | | | |
| Dry Season (July-Aug) | | | |
| Fall (Sept-Oct) | | | |
| Winter (Nov-Feb) | | | |

Step 3: Assess Contamination Risk

Springs are generally cleaner than surface water—the ground acts as a natural filter before the water reaches you. But “cleaner than a creek” doesn’t mean “safe to drink without evaluation.” Before you start drinking your spring water, you need to test it to make sure it’s safe to drink.

Contamination risk factors to assess:

- Is there agricultural land, feedlots, or livestock operations uphill from the spring?
- Are there septic systems or outhouses within 100 feet of the spring?
- Does surface water (rain runoff, snowmelt) drain toward the spring area?
- Is the spring box or headworks exposed to animals, debris, or surface water infiltration?
- Is the water discolored after rain events (a sign of surface contamination entering the flow)?
- Are there any industrial or mining operations in the watershed above the spring?

The more of these you check, the more critical it is to properly protect and test your spring. A well-developed spring with proper covering and a clean gravel bed is dramatically safer than an exposed one.

Step 4: Don't Cut the Trees

Here's something that many people don't realize: the large trees around a spring are part of what makes it produce water. They shade the recharge area, reduce evaporation, and their root systems help water percolate slowly into the ground rather than running off the surface.

Clear-cutting the hillside above your spring in the name of "cleaning up the property" can significantly reduce – or even eliminate – your spring flow over time. We've heard of springs that ran for decades and then dried up within a few years after the timber was harvested from the surrounding hillside.

Protect the Recharge Zone

Treat the area uphill from your spring like a buffer zone. No heavy equipment. No logging. No land clearing. Minimal foot traffic. Keep the vegetation intact. A thriving spring needs a healthy watershed feeding it from above.

What you CAN do near the spring itself:

- Clear invasive brush or weeds around the springhead to reduce debris and contamination
- Manage undergrowth to improve access for maintenance
- Create a clean working area around the collection point
- Keep larger trees intact wherever possible, especially uphill
- Cut down small scrubby deciduous trees that send down feeder roots right on top of your spring, potentially consuming some of your water

PART 3

DEVELOPING YOUR SPRING

Step-by-step: from wet hillside to flowing pipe

Spring development is part art, part science. Every spring is a little different—the geology varies, the flow characteristics vary, the terrain varies. But the core principles are consistent. We and others have used this method to develop numerous springs, and it's not failed us.

Before you start digging, gather your materials and have a plan. Nothing is worse than being mid-project with clay in your hair and water rising around your feet, only to realize you forgot the pipe cement.

Step 1: Gather Your Materials

For a typical small hillside spring development, you'll need:

- 1-inch PVC pipe (collection pipe, cut to fit your basin width)
- 1-inch PVC or food grade flex pipe (outlet run to cistern or distribution point)
- PVC fittings: end cap, 90-degree elbows, couplers, barbed fitting + hose clamps for flex hose
- PVC primer/cleaner and cement (glue)
- 1/4-inch drill bit for collection holes
- Hacksaw or PVC hand saw
- Clean washed 3/4-inch gravel (free of organic material)
- Clay (native or bentonite) for sealing the dam
- And liner or heavy plastic sheeting
- 1" Bulkhead fittings (for tank installations) and hole saw for hole in bulkhead
- [Carolina Water Tank water collection system](#) (or food grade 55 gal drum for DIY)
- [Carolina Water Tank spring box](#) (to collect sediment before the cistern)
- Shovel, hand trowel, 5-gallon buckets
- Rubber gloves and boots (you will get wet and muddy)

Step 2: Clear and Expose the Spring

Start by clearing all vegetation from the wet area. Cut weeds, pull roots, clean out any accumulated debris. You need to see the ground clearly to trace the flow.

Then follow the water uphill to its source. Look for the exact point where water emerges from the ground. In rocky areas, water often comes through seams in the rock. In clay areas, it seeps through layers of sand or gravel. Your goal is to dig back to as close to that source as possible.

Important: as you dig, you may open water pockets that create impressive flow temporarily. Don't be fooled. Wait for those pockets to drain, then watch the true continuous flow. That's what you actually have.

Spring vs. Drainage Water

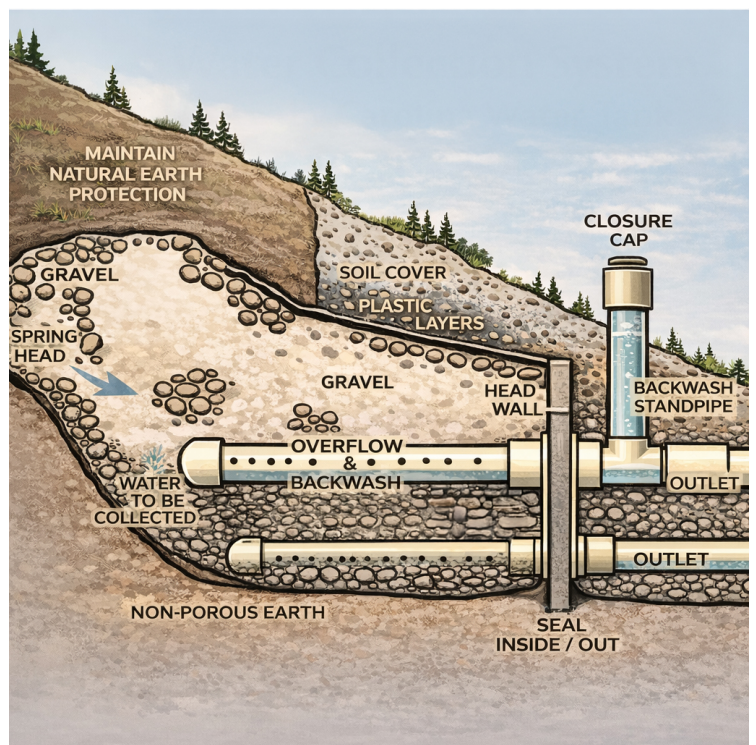
Here's how to tell true spring flow from surface drainage: spring water is clear. Drainage water is cloudy or muddy, especially after rain. Look for a clear stream emerging from the bank and entering the cloudy surface water—follow that clear stream back to its source. That's your spring.

Step 3: Dig and form the Basin

Once you've located the source, excavate a bowl-shaped basin. The size depends on your spring, but typically 18-24 inches wide and 12-18 inches deep gives you enough room to work. If the layout is such that you cannot dig a basin, you may need to build up a larger dam on the downhill side in order to create a basin. Your goal is to create a containment area where water can collect and rise to the outlet pipe level.

Key principles while digging:

- Don't break through the clay layer. The clay is your natural dam.
- Slope the basin slightly so water drains to the collection pipe area.
- If you find clean clay while digging, save it. You'll use it for sealing.
- Be careful working under overhanging banks—they can cave in.
- Remove all silt, roots, and organic material from the basin floor.



Step 4: Install Headwall & Prepare the Collection Pipe

The headwall dam can be constructed with clay or using a plastic spring collection system, such as this one. Our favorite commercially available option is the [Carolina Tanks Water Collection System](#). We have even built our own from a food grade 55 gal drum (demonstrated in [The Ready Life Academy](#)). The collection pipe sits in the gravel bed and gathers water from all sides. Here's how to prepare it:

1. **CLAY:** Build up the clay dam around your collection pipe
PLASTIC HEADWALL: Use a hole saw to size for the 1" bulkhead fitting in the approximate place needed (usually a couple inches off the bottom). Trim the headwall to roughly the shape of the ground where it will sit, then tap the top of it into the ground with a hammer until it is thoroughly seated.
2. Cut a 1-inch PVC pipe to span most of the basin depth. If it's not very deep, use a Tee to make the collection pipes span left and right next to the headwall.
3. Drill holes in the top half of the pipe – about every inch, in several rows – using a 1/4-inch bit. Leave the bottom of the pipe solid.
4. Cap the far end of the collection pipe. The near end goes into the bulkhead fitting on the headwall. The solid side with no holes faces down. If needed, you can add a Tee on the bulkhead fitting to run two collection pipes parallel to the headwall (if the back of the bowl isn't deep enough).
5. Secure connections inside the headwall with friction only—no glue needed. This allows for adjustment and it doesn't need to seal perfectly. Use teflon tape and pipe joint compound on bulkhead fitting connections and glue anything outside the headwall.

The drilled holes allow water to enter the pipe from above as it rises through the gravel. The solid bottom prevents sediment from entering. The outlet directs water into your distribution line which exits out the bulkhead fitting.

Step 5: Seal with Clay

Now you need to seal the bottom and sides of the headwall so water is captured and directed into your collection pipe rather than seeping away under or around it.

If you have native clay: pack it firmly around the outlet pipe where it passes through the front of the basin. Build up a dam of clay at least 6-8 inches tall against the front face. Tamp it well. If you don't have native clay: you can use bentonite clay (available at farm supply stores). Some have used concrete, or mortar, but we recommend using clay for best results. The goal is a watertight seal around the outlet pipe.

Step 6: Install the Gravel Bed

Gravel is the heart of the collection system. It filters the water, supports the pipe, and creates the storage volume for your spring.

- Use clean, washed 3/4-inch gravel – free of leaves, roots, or organic material that would decompose and contaminate the water.
- Carefully pour gravel around collection pipe and fill the entire bowl to top of headwall.
- Keep the outlet pipe end clear – this is where water exits the system.

Step 7: Cover with Plastic and Backfill

This step is critical for protecting the spring from surface contamination. Once the gravel and the pipe are in place:

1. Lay heavy plastic sheeting (6-mil minimum, thicker pond liner is much better) over the entire gravel area. We have used pond liner plastic (~25 mil) to cover our springs.
2. Push the plastic as far back toward the source as possible.
3. Ensure the plastic slopes downhill so any surface moisture that seeps through the soil runs away from the spring area, not into it.
4. Backfill with dirt, packing firmly. Avoid large rocks against the plastic.
5. If your excavated soil is rocky, bring in cleaner soil to protect the plastic layer.

Once backfilled and covered with growing grass, there will be no visible evidence of the spring development. The system is protected underground, continuously collecting and directing water through your outlet pipe. Once buried and not exposed to UV, quality plastic can last for decades.

Step 8: Spring Box & Prefabricated Collection Systems

For springs that flow from a single clean point (especially in rock), or for more permanent installations, a spring box is an excellent option. Spring boxes may be made of plastic or concrete. The basic design involves:

- A concrete or block box placed against the hillside at the spring source
- An open back against the hillside to allow water entry
- Gravel fill inside for filtration
- A sealed cover to prevent contamination
- An outlet pipe at the bottom and an overflow pipe near the top
- A diversion ditch above the spring box to redirect surface runoff away from the source

Prefabricated plastic spring collection boxes are also available. These can be particularly useful when working with steep banks where forming a traditional clay dam is difficult. They provide structure and allow you to seal the edges with clay while giving you a defined collection chamber.

Step 9: Measure Flow and Let It Flush

After development is complete, let the spring run for at least 24-48 hours before measuring final flow. The water will be murky at first from all the disturbance. It will clear up significantly over the first few days.

Measuring final flow:

1. Use a container with a known volume (1 cup, 1 quart, or 1 gallon).
2. Time how long it takes to fill the container.
3. Convert your result to seconds per gallon:
 - If you used 1 quart, multiply the time by 4.
 - If you used 1 cup, multiply the time by 16.
 - If you used a different size, multiply by (gallons ÷ your container size in gallons).

Let the spring run continuously for at least 5-7 days before drinking the water. Ideally, wait several weeks and get a water test completed before relying on it for consumption.

The Ready Life Academy

Inside The Ready Life Academy, we have complete video walkthroughs of spring development. Watching real projects unfold is the best way to prepare for your own. Plus, if you have specific questions about your situation, you can bring them straight to our weekly live coaching calls. Every spring is different and comes with its own challenges and surprises, so there's no substitute for getting advice from someone who's been in the mud and figured it out.

PART 4

CISTERNS

How to size, choose, and install your water reservoir.

Here's the thing about springs. Most of them are not "gushers." When your family is showering and cooking dinner, most springs can only produce a fraction of the demand, and the system falls short.

On the other hand, your spring doesn't care what time of day it is or whether you need water right now. It just flows. Continuously. Day and night. And this is why storage is so important. It enables you to collect water during times of low use, so you have a large quantity to get you through times of high use. Storage can enable a large family to live with a small water source. For example, even 1/2 gal per minute (GPM) adds up to 720 gal per day (GPD), which is a sizable amount.

The slower your water source and the more water you use, the larger your water storage should be. If your tank is full and overflowing every night at 1 AM, you are losing many potential gallons of water that could have been stored. For slow water sources, my goal would be for the storage to be large enough that it never overflows during times of year when there's high usage (i.e. irrigation). You want to capture every drop of water, if possible.

Step 1: How Much Storage Do You Need?

The answer depends on three things: how much water you use, how much your spring produces, and how much buffer you want for dry spells or heavy use days.

Storage Sizing Calculator

Daily water consumption: _____ people × 75 gal = _____ gallons/day

Spring daily production: _____ GPM × 1,440 = _____ gallons/day

Daily surplus to store: _____ gallons/day

Desired buffer (days): _____

Recommended cistern size: _____ days × _____ gal/day = _____ gallons

NOTE: The above is only for domestic use calculations and does not take into account irrigation, which can use significantly more. Be sure to factor in more for that.

Our Rule of Thumb

If your spring is borderline on production—enough on average but not always enough on peak days—size your cistern for at least 2-3 days of total consumption. If you have a good spring with margin to spare, 1-1.5 days of storage is usually sufficient for daily operations. For irrigation-heavy homesteads, more is always better. We went with 1,700 gallons specifically so we can handle heavy irrigation days and still keep household water steady.

Step 2: Above Ground vs. Underground

Location matters. Here's a straight comparison:

| Factor | Underground | Above Ground |
|--------------|---|---|
| Freezing | No freeze risk if buried below frost line | Requires significant insulation. In sustained cold, needs heat. |
| Algae | Virtually none (no UV) | Ongoing issue without UV treatment |
| Temperature | Cool & stable year-round | Fluctuates with air temp |
| Installation | More labor, requires excavation | Simpler to install |
| Durability | Excellent when protected | More UV/weather exposure |
| Appearance | Hidden, unobtrusive | Visible on property |
| Cost | Higher (installation) | Lower upfront |
| Access | Requires riser/manhole | Easier direct access |

Our strong recommendation: bury your cistern if at all possible. The benefits compound over time—no freezing, less algae, no temperature swings, and less maintenance. A buried food-grade plastic tank can last 30+ years when properly installed. If you're in a mild climate or on a tight budget, above-ground tanks are a legitimate option. Just plan for freeze protection in cold months and use UV-resistant tanks, insulation, and an ozone generator to slow algae growth.

Step 3: Plastic vs. Concrete

These are the two most common materials for cisterns. Here's what you need to know about the pros and cons of each:

Plastic Cisterns (HDPE – High-Density Polyethylene)

- Must be food-grade (HDPE) – verify before purchasing
- Lighter weight – easier to move and position
- Generally less expensive than concrete
- Good longevity when buried (protected from UV)
- Available in a wide range of sizes (250 to 2,500+ gallons)
- Can be buried with a riser/extension for access at ground level
- Our choice for our 1,700-gallon system – cost-effective and proven over decades

Concrete Cisterns

- Extremely durable – can last 50+ years
- Better thermal mass – more naturally insulating above ground
- Very heavy – requires heavy equipment for installation
- More expensive in most cases
- Excellent for large, permanent installations
- Common in older homestead and farmstead water systems
- Preferred if you are trying to avoid exposure to plastics and have the budget

Riser Extensions

If you're burying your cistern, a riser extension is essential. It allows you to bury the tank 1-2 feet underground so you can get below the freezing level while still having the manhole and access point at or near ground level. The riser connects to the tank with a rubber gasket seal—make sure this seal is watertight, or you'll end up with silt and surface water contaminating your cistern during rain events (we learned this lesson the hard way with our new cistern). In fact, I would add silicon to the gasket to ensure it seals.

Step 4: Common Plastic Tank Sizes and Costs

| Tank Size | Approx. Price Range | Notes |
|---------------------|---------------------|--|
| 250-500 gallons | \$500-\$1,000 | Good for supplemental storage; manageable to move |
| 750-1,000 gallons | \$750-\$1,200 | Solid primary cistern for small household |
| 1,500-1,700 gallons | \$1,500-\$2,500 | Our sweet spot – excellent capacity for most families |
| Low-profile tanks | \$3,000-\$5,000+ | Only 28" backfill allowed; expensive but useful in specific situations |

Note: prices vary significantly by region. Get local quotes. Used food-grade tanks (previously held food-grade liquids) can be found at a fraction of new cost—search local farm supply, Craigslist, or Facebook Marketplace. Be sure to sanitize.

Step 5: Critical Installation Details

A cistern is only as good as its installation. These details matter:

- Overflow pipe: install and route it well away from the cistern manhole so overflow doesn't puddle around the seal
- Manhole seal: silicone the riser-to-tank connection to prevent leaks and contamination
- French drain: if the soil is saturated, surround the manhole area with perforated drain pipe and gravel to carry away any surface water before it can enter through the seal
- Inlet pipe: sized and positioned so the spring can drain freely into the tank without back-pressure
- Float switch: if using a well or pump to fill the cistern, use a float switch to stop the pump when the tank is full
- Check for frost: bury all pipes below your local frost line (typically 18-36 inches, deeper in colder climates)

Step 6: Dual Cistern Setups

If your spring is robust enough, or if you have heavy irrigation needs, consider a dual-cistern setup. This can mean two separate tanks plumbed together, or one tank for household use and another for irrigation—so you never accidentally drain your drinking water reserve by leaving a sprinkler on.

Benefits of dual cisterns:

- Dramatically increased capacity
- Separate storage for household vs. irrigation avoids conflicts
- One tank can be maintained (cleaned/inspected) while the other stays in service
- Built-in redundancy if one tank develops a problem

Disadvantages

- May require two pumps and pressure tanks (depending on how you set it up)
- Additional cost

My planned cistern size:

Location (above ground / buried):

Material (plastic / concrete):

Approximate cost:

PART 5

THE ULTIMATE SETUP

Gravity-fed water – no electricity, no pump, no failure points

This is the ultimate setup. And it meets all five criteria for a truly independent water system: no electricity, nothing mechanical, good pressure, plenty of quantity, and pure water.

It requires one thing above everything else: a spring that’s positioned high enough above your home to let gravity do all the work.

Step 1: Understanding the Gravity Principle

Water is heavy—about 8.3 pounds per gallon. When it’s in a pipe running downhill, that weight creates pressure. The math is simple and predictable:

The Pressure Formula

For every 1 vertical foot of drop, you gain 0.43 PSI (pounds per square inch) of pressure. Normal household water pressure: 30-60 PSI. To achieve 30 PSI of pressure: $30 \div 0.43 =$ approximately 70 vertical feet of drop. Minimum useful flow (without pump): your cistern must be above the house. Even 20 feet of drop gives you 8.6 PSI. Not enough for some appliances, but you can wash your hands, flush the toilet, and take a bath.

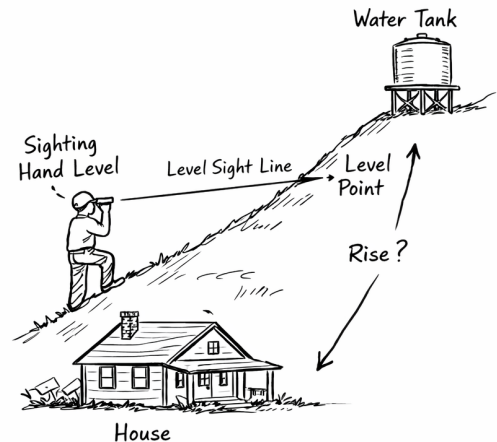
To measure vertical feet of drop, start at your home and use a sighting hand level to work your way up to the cistern site. Count the number of times it takes to reach the cistern site. And measure the distance from the ground to your eye level. Multiply these two.

Height to your eye level: _____
Number of sightings from house to tank: _____
_____ (height) x _____ (sightings) = _____ (feet of rise)

My Gravity Pressure Calculator

Estimated vertical feet from cistern to house:

Estimated pressure: _____ feet x 0.43 = _____ PSI
Is this above 30 PSI? YES / NO



The ideal setup: your cistern is at least 70-120 vertical feet above your home. This gives you normal household pressure—enough for showers, dishwashing, toilets, and light irrigation—without any pump, any electricity, or any moving parts.

If your cistern is less than 60 feet above the house, see Part 6 (Pumping Options) for how to boost pressure with a small, low-power pump.

Step 2: Three Scenarios for Spring Water Systems

| Scenario | Setup | What You Need |
|--|---|---|
| Spring high above home (60+ ft vertical) | IDEAL: Gravity-fed, no pump | Spring + cistern + pipe + downhill gravity |
| Spring above home (under 60 ft vertical) | GOOD: Gravity flow + booster pump | Cistern + small booster pump + off-grid power |
| Spring at or below home elevation | WORKABLE: Cistern + submersible well pump | Cistern + submersible pump + solar/off-grid power |

Step 3: The Complete Gravity System Diagram

The full system flows like this:

1. Spring emerges from hillside and is collected in a developed springhead
2. Water flows (gravity) through buried collection pipe to the cistern, positioned partway down the hill
3. Cistern collects and stores water around the clock
4. Outlet pipe runs from the cistern further downhill to the home
5. Elevation difference between cistern and home creates sufficient water pressure
6. Water enters the home’s plumbing and serves all fixtures normally
7. Overflow pipe on the cistern safely routes excess water away

The Key Requirement

The cistern must be LOWER than the spring (so water flows into it), and HIGHER than the house (so water flows out of it with pressure). If the spring isn’t high enough to feed a cistern that’s also above the house, you need to make a tradeoff—either a pump, or accepting lower pressure.

Step 4: Pipe Selection for the Distribution Line

From your cistern to your home, use buried pipe rated for the pressure your system will produce. For most gravity systems, schedule 40 PVC is appropriate, but flexible rolls of black poly pipe (of sufficient PSI rating) can be cheaper and easier to install.

Important pipe considerations:

- Bury all lines below your local frost depth to prevent freezing
- Use flexible polyethylene (poly pipe) for runs with lots of bends or terrain variations—it's much easier to work with than rigid PVC in uneven terrain and has fewer joints to fail
- Include a drain valve at the lowest point of the system for winterization, if needed
- Size your pipe correctly: 3/4-inch poly may be fine for some small systems, but for longer runs, 1" can reduce friction loss. Even 1.25" could be advisable for high flow scenarios.

Step 5: Winterizing Your Spring System

In cold climates, a gravity spring system should be designed to withstand freezing conditions. Here's the checklist:

- All pipes buried below frost line
- Cistern buried deep enough that most of the water is below frost level
- Outlet pipe from cistern buried to avoid freezing
- House entry point protected from freeze. Possibly use heat tape for extreme conditions in a crawlspace.
- Drain valve installed for seasonal shutdown if needed

Notes:

PUMPING OPTIONS

When gravity alone isn't enough – you need another option.

Most homesteads won't have a spring sitting 100 feet above the house. And that's okay. There's a solution for every scenario—from a spring that's just barely below the home elevation to a spring that's considerably lower. The key is choosing the right tool for your situation.

Option 1: The Booster Pump—When you have some gravity but not enough

If your cistern is above your home but doesn't provide adequate pressure, a booster pump is your best friend. It draws water flowing down by gravity and boosts it to normal household pressure.

Why this works:

- The pump does almost no lifting work—gravity delivers the water, the pump just pressurizes it
- Very low power consumption—is easily run with a small solar system, directly on DC battery power
- If the pump or power fails, water still flows (just at lower pressure)
- No pump priming required since the water is already flowing toward it by gravity
- Sample Pump: [Dankoff Flowlight Booster Pump](#), but there are many other conventional pumps that could also work.

Option 2: Submersible Transfer Pump—When the spring is at or below home level

If your spring is at the same elevation as your home—or even lower—you'll need a transfer pump to move water from the cistern into a pressurized system. This is the least ideal scenario but absolutely workable with the right setup.

Typical system: a small submersible pump in the cistern feeds water through a pressure tank and into your home's plumbing on demand. The pressure tank maintains constant pressure so the pump doesn't cycle with every small draw. My favorite type of submersible pumps for this are the [Grundfos SQ Series of pumps](#), which are soft start, so they don't require a large generator or inverter to start them (most pumps surge to 3x their normal power usage while starting up).

Power requirements: a well-matched pump for a small household might use 1-2kW while running, but only runs for a few minutes at a time to recharge the pressure tank. A modestly-sized solar system can handle this easily.

Option 3: The Ram Pump—Ingenious, Electricity-free, and Underrated

If you have a plentiful water source with any fall on it (even 10 vertical feet), a hydraulic ram pump may be an option. Ram pumps use the energy created by gravity-fed water flow to pump a portion of that water to a much higher elevation—with no electricity and no fuel.

How it works: water flows down a “drive pipe” from the water source to the pump. When a valve in the pump suddenly closes, the momentum of the flowing water creates a pressure surge that forces a small amount of water up a delivery pipe to your cistern—sometimes 5 to 10 times the elevation of the original fall.

The tradeoff: a ram pump wastes most of the water it uses (it takes in a lot, pumps up a little). This makes it impractical for most springs, but ideal for a year-round creek or stream with abundant flow.

The big downside? Commercial ram pump makers have all but disappeared ([here are some of the last ones](#) that *may* be in operation). So you may need to do a DIY build or else buy someone else’s homemade build.

Ram Pump Rule of Thumb

For every 1 foot of fall on the drive pipe, a ram pump can typically lift water about 7-10 feet higher. So 10 feet of fall can lift water 70-100 feet—with no electricity, no fuel, and minimal maintenance. A well-built ram pump can run for decades without service.

Option 3: Gasoline-Powered Pumps

Gas pumps are a fast and efficient means of moving large amounts of water from a creek, river, lake, or spring cistern to a cistern near the house (where an electric submersible pump pressurizes the house). Because gas pumps can often pump up large hills, it could even be used to pump up to a cistern far above the home for gravity flow water.

Many cabin water systems (especially at seasonal cabins) have operated successfully with gas pumps, since there is minimal setup (no electricity needed at the pump), only a pipe needed. Gas pumps can be mounted above the water source to avoid flooding and can usually suction 10-15 feet uphill before pushing the water 100’ or more uphill (depending

on the pump). Only a small amount of gas is required to pump surprisingly large amounts of water.

The big downside? The pump is dependent on gas. Make sure to have a sizable amount stored with ideal conditions (see our [Long Term Fuel Storage Guide](#)). Also, in northern climates, you may need to drain the pump and line in between use, unless everything is buried.

Pump Comparison Chart

| Pump Type | Electricity Required | Best For | Key Tradeoff |
|------------------|----------------------|--|--|
| Booster pump | Yes (low power) | Spring cistern w/ some elevation + solar power setup | Needs power, more involved installation |
| Submersible pump | Yes (moderate) | Spring at/below home level | Needs power + pressure tank |
| Ram pump | None | Creek/stream with flow & fall | Wastes most water, hard to find rams anymore |
| Gas pump | No (uses fuel) | Remote source, temporary | Ongoing fuel cost/supply |

★ Inside The Ready Life Academy, you'll get expert help with choosing the right pump and designing your water system. Just post in the community or join our weekly coaching calls to get help from real humans who care and can customize advice for your specific property.

PART 7

PROTECTING WATER QUALITY

Testing, sanitation, and keeping your spring water safe for life

Here's the good news about spring water: before it reaches the surface, it's been filtered through layers of rock and soil. A well-protected spring with proper development is often remarkably clean—in some cases, cleaner than municipal tap water.

Here's the honest reality: "cleaner" isn't the same as "safe." And you can't make that determination by looking at the water or tasting it. You have to test it.

Step 1: Test Before You Drink

This is non-negotiable. No matter how clean the water looks, no matter how good it tastes, test before you start relying on it as a drinking water source.

What to test for:

- Total coliform + E. coli
- Nitrate + nitrite
- pH
- TDS + turbidity
- Hardness (quality-of-life + appliance protection)
- Heavy metals (at least once)
- Total HPC is helpful also if you have large amounts of storage

With some tests, the only difference between Essentials and Advanced is the total HPC, which is useful for diagnosing if you are dealing with a lot of microbial activity in your storage system or plumbing (as opposed to outside contamination).

While it is ideal to do two tests (one from your tap in the house and one from the spring box), if you can only afford one test, run an Essentials test from the tap, since this is the water you're drinking. If that turns up a problem, you can run additional tests directly from the spring box and also can run an Advanced test from the cistern or tap to help diagnose where your issues are coming from.

How to get your water tested:

- Local county health department (possibly lower cost for bare basic)
- [Essentials Mail-In Spring Water Test Bundle](#)
- [Advanced Mail-In Spring Water Test Bundle](#)
- On-site test strips are not a substitute for lab testing

Testing lab I will use:

Date of last test:

Results on file:

Step 2: Retesting

Spring water quality can change—seasonally, after heavy rainfall, or if something changes in the watershed above you. After your initial testing, an annual test would be ideal. But if you can't afford that, at least do one follow-up test after year 1 or any time the water changes in appearance, smell, or taste.

Step 3: Surface Contamination – How to Keep It Out

The biggest ongoing threat to a developed spring is surface water infiltration during rain events. Runoff from uphill areas can carry bacteria, sediment, and contaminants straight into your spring if the headworks aren't properly sealed.

Key protections:

- Proper plastic sheeting over the gravel basin, sloped to divert surface water away
- Diversion ditch above the spring box to route runoff around it
- Watertight seal on the cistern riser/manhole with French drain surrounding it
- Clean vegetation management around the spring (no decaying organic matter piling up on or near the headworks)
- Animal exclusion – keep livestock away from the spring area; fence it if necessary

Step 4: Cistern Sanitation

When you install a new cistern, or after any contamination event (flooding, silt infiltration, animal entry), you need to sanitize the tank before using the water.

Sanitation process:

1. Pump out and remove all sediment (if it was contaminated)
2. Clean walls with a mild bleach solution and scrub rags
3. Rinse thoroughly
4. Refill with spring water
5. For less contaminated water or maintenance treatment, use an ozone generator and let it run for at least 24 hours

An ozone generator is an excellent tool for ongoing cistern sanitation. Unlike chlorine, ozone leaves no residual taste or chemicals, and it's highly effective against bacteria, viruses, and algae. We use one on our own cistern periodically.

Step 5: Filtration/Purification for Added Safety

Even with a clean spring and proper development, adding filtration or purification before drinking is a reasonable extra layer of protection—especially for guests, sensitive individuals, or if you ever have any doubt about quality.

- Gravity filter (like a [Berkey](#)): excellent for countertop drinking water filtration with no power required
- Sediment pre-filter: a simple inline sediment filter on your main line can protect appliances and reduce turbidity
- Whole home UV purifier: for springs with higher bacterial risk, an inline UV purifier kills pathogens without chemicals. And it can purify water for the entire home. Just realize that you must have a reliable power source for this to work. Ensure you have a non-electric backup like a Berkey—"just in case." Also, UV purifiers need perfectly clear water to work, so you'll want a good pre-filter setup which means you will have consumables. NSF Class A is the highest level, but some less expensive models may approximate this performance by delivering the higher dose 40mJ/cm² of UV. [Here's an example](#) that is 13 GPM, but if your usage is 10 GPM or less, it achieves 40mJ/cm² of UV exposure.
- Reverse osmosis purifier: if you need the highest level of purity, need to reduce mineral content, and only need to purify a particular faucet, a reverse osmosis purifier could be an option. One advantage is that many of these systems are non-electric. But they do require at least 40-60 PSI of pressure and there can be more complexity and more to go wrong.

Don't Skip the Test Because the Water "Looks Clean"

The most dangerous contaminants in spring water—coliform bacteria, giardia, arsenic—may not have a smell or taste. Crystal-clear water can be contaminated. The only way to know is to test. Do it before you drink.

OTHER WATER SOURCES

Creeks, streams, and supplemental options when springs aren't available

If you don't have a spring on your property—or if your spring isn't producing enough for all your needs—there are other surface water sources worth understanding. We want to be honest with you about both their potential and their limitations.

Step 1: Creeks and Streams

A creek or stream on your property can be a tremendous asset—for irrigation, livestock watering, and as a backup water supply in emergencies. But we don't recommend relying on a creek as your primary drinking water source without significant treatment infrastructure.

The problem: surface water is exposed. Animals walk through it upstream. Agricultural runoff enters it. After a big rain, the turbidity spikes and bacterial counts can be significant. Giardia is a real concern in many parts of the country.

That doesn't mean it's worthless. It means you need to treat it properly:

- Filtration through a quality gravity filter ([Berkey](#) or equivalent) handles most biological contamination
- Whole-home UV purification with pre filters helps to cover the entire home
- Whole-house filtration with sediment, carbon, and UV is an excellent setup for creek-fed systems

The Best Use For Surface Water

We highly recommend only using surface water for irrigation. What this means is, a creek could enable you to do significant irrigation while your house is fed by a small spring that could never support irrigation.

Step 2: Rainwater Harvesting – As Supplemental Storage

Rainwater can be a valuable supplement to a low-flow spring or well. Capturing roof runoff into a large cistern gives you extra storage during wet seasons to carry you through dry spells.

What rainwater is good for:

- Supplementing a low-flow spring during heavy household use periods
- Irrigation storage independent of your household water supply
- Emergency backup if your primary source fails (rainwater may be your only feasible backup if in town on city water)

What rainwater is NOT reliable as:

- Your primary drinking water source (droughts happen everywhere)
- A replacement for a dependable ground-based water source
- Pure drinking water (be sure to purify and use an Ozone generator in the tank)

The Drought Problem

We've visited homesteads in areas where rainwater is the primary water source and people do live that way successfully. But it requires an enormous cistern capacity to bridge dry seasons, and there's no backup plan during a genuine long-term drought. If you're evaluating property and rainwater is the "primary" water source, push harder to find one with a well (or the potential for drilling a well), or a spring. Water is too critical to rely on weather alone.

However, if you are in town where wells and springs are not an option, rainwater may be your only possible independent water source. If relocating is not an option, then by all utilize your rainwater to gain a much greater level of independence. It would be advisable to bury your collection cistern if possible and make your whole system as invisible as possible (to satisfy HOAs and to prevent drawing undue attention during a crisis).

Notes:

MAINTENANCE AND TROUBLESHOOTING

Keeping your spring system healthy for the long haul

A properly developed spring with a good cistern is genuinely low-maintenance. We've had our spring system running for years with only occasional attention. But "low maintenance" doesn't mean "no maintenance." These are things to stay on top of.

Step 1: Annual Spring Inspection

Once a year (or after any major storm), inspect your springhead development:

- Check for any settling or collapse of the covering over the spring basin
- Look for signs of surface water infiltration (muddy water after rain, silt in the system)
- Ensure the area around the spring is free of decomposing debris (fallen trees, dead animals)
- Verify the outlet pipe is flowing freely and no roots or sediment have entered it
- Check the plastic sheeting isn't exposed or deteriorated at the edges
- Ensure any fencing or access control around the spring is intact

Step 2: Annual Cistern Inspection

- Inspect the manhole seal for leaks or cracking
- Check the overflow pipe is routing correctly and not blocked
- Visually inspect water quality (clarity, smell)
- Check float switches and pump operation if applicable
- Inspect all pipe connections visible above ground
- Check for excess sediment that needs to be cleaned out
- Test water annually

Step 3: Common Problems and Fixes

| Problem | Likely Cause | Fix |
|--------------------------------|--|---|
| Reduced flow | Seasonal variation; root intrusion; debris at springhead | Check season; inspect and clean springhead |
| Turbid/muddy water after rain | Surface water infiltration | Improve sealing; check plastic cover |
| Silt in cistern | Manhole leak; pipe entry not sealed | Reseal riser; add French drain |
| Spring drying up | Seasonal; trees cut nearby; drought; plant roots growing into your spring/ cistern | Check season; avoid cutting recharge area large trees |
| Bacterial contamination | Animal access; surface infiltration | Improve exclusion; sanitize cistern; retest |
| No flow despite spring running | Frozen pipe; blockage; pipe failure | Trace line; check frost depth; inspect connections |

Step 4: Emergency Backup Plan

Even a well-maintained spring can have issues—and you need a plan for when it does. What’s your backup if your spring stops flowing tomorrow?

Emergency water source backup:

Emergency storage on hand (gallons):

Filtration capability if needed:

Who to call for help with the spring:

Notes:

YOUR NEXT STEP

Turn what you've learned into action in the next 24 hours

You've been through a lot of information. Don't let it sit on the shelf. The whole point of this workbook is to give you a working plan—not just knowledge. So let's make a plan.

Where Are You Right Now?

Circle your current situation:

| Your Situation | Your Next Step |
|--|---|
| I don't know if I have a spring on my property | Walk your property during the next dry spell and look for the signs from Part 1 |
| I found a wet spot or possible spring | Trace it to its source; measure flow; evaluate elevation vs. home site |
| I have a spring but it's not developed | Gather materials; schedule your development project |
| I have a developed spring but no cistern | Size and order your cistern; plan installation while spring continues to flow |
| I have a spring + cistern but no good pressure | Evaluate elevation difference; decide on booster pump or gravity setup |
| System's running but water isn't tested | Schedule a water test THIS WEEK |
| My system is running well | Document everything; set up annual inspection calendar; help a neighbor |

My 24-Hour Commitment

Based on where you are right now, write your ONE specific next step below:

My next step is:

I will complete this by:

A Word About Getting Help

Spring development is one of those things where experience matters enormously. Every spring is different. The geology, the flow characteristics, the terrain, the contamination risk—they all vary. It's quite possible to spend weeks on a spring that an experienced person would have had flowing in a couple days. And we've seen people make expensive mistakes that an hour of advice would have prevented. Inside The Ready Life Academy, you get direct access to us—through the community forum and our weekly live coaching calls. Bring your photos, your measurements, your questions. We'll help you figure out the right approach for your specific situation. Because there's no one-size-fits-all answer in water development, and the difference between a great system and a frustrating one is often just good guidance. Join us inside [The Ready Life Academy](#)

Budget-Conscious Tips for Spring Development

Building a spring water system doesn't have to be expensive. Here are ways to keep costs down without compromising quality:

Spring Development Savings

- Use native clay from your excavation rather than purchasing bentonite. Native clay works just as well if it's clean and has no organic material in it.
- Source gravel locally from a gravel pit or landscape supply rather than buying bagged gravel from a hardware store. Clean washed 3/4-inch gravel is exactly what you need.
- PVC pipe and fittings are inexpensive. The 1-inch collection pipe and fittings for a typical spring headworks might cost \$20–40 total.
- Heavy plastic sheeting from a construction supply store works perfectly. You don't absolutely need a specialty pond liner.

Cistern Savings

- Shop used food-grade tanks. Many food processing operations sell used IBC totes (275–1,050 gallon caged plastic tanks) for \$50–\$150. These are excellent for above-ground storage as long as you clean and sanitize them thoroughly. But it's rare to find used underground tanks that you'd actually want to use for drinking water.
- Check farm supply stores, Craigslist, and Facebook Marketplace for used plastic tanks. A used 1,500-gallon tank in good condition might be available for a fraction of the new price.
- If buying new, get quotes from multiple suppliers. Prices vary significantly by region and supplier.

Pipe and System Savings

- Poly pipe is often less expensive than PVC for long runs and is easier to work with in uneven terrain—fewer fittings needed.
- Buy pipe in bulk rolls rather than individual sticks when you have long runs.
- Gravity systems eliminate the cost of pumps and the ongoing cost of electricity. If you can invest in getting the cistern high enough for gravity flow, the lifetime savings are substantial, not to mention the independence.
- If using a booster pump or jet pump to boost pressure from a low head gravity system, installing the pump in your basement could save installation costs over having to set up an underground pump station next to the cistern.

Testing Savings

- Start with an Essentials test at your tap. If everything checks out good, you may not need anything further. If there are problems, it may be worth running a second test directly from the spring box to determine if the issue is occurring in the storage and plumbing setup or whether it's contaminated straight from the spring. If the test from the spring box is good, consider an Advanced test from your tap to determine if you are dealing with lots of microbial activity in the storage and plumbing (total HPC tells this).
- Some county health departments may offer basic free or subsidized testing for private water systems.
- Mail-in test kits are often less expensive than local lab services while being equally accurate.



ABOUT THE AUTHORS

Nick & Lisa Meissner – We live deep in the mountains of Idaho with our young family, and we’ve learned this the hard way: it’s dangerous to depend on corporations or government systems for your basics—water, heat, food, and power.

As Christians, we also believe the days are coming when that dependence will be used to control who can buy, sell, and survive. That’s why we built *The Ready Life*: to help families become resilient and self-reliant, so you’re not at the mercy of “the system” when it falters—and so you’re strong enough to help others when they’re in need.