WATER STEWARDSHIP GUIDE

Conserving and Storing Water to Benefit Streamflows and Fish in North Coast Creeks and Rivers

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Artwork by Val McKee ©

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Introduction

As landowners and stewards of this remote region of the North Coast of California, how we use our natural resources is incredibly important to the health of the land, the rivers that flow through it, and the many other species that rely upon it for their survival.

The purpose of this guide is to provide water conservation techniques and instructions on how to pump, store, and use water in a way that meets your household's needs while also preserving streamflows and protecting fish in your neighborhood creeks and rivers.

The information that follows is derived from Sanctuary Forest's efforts to increase streamflows in the upper Mattole River, and from local permaculture specialist, Kyle Keegan, whose Fool's Farm demonstrates the many ways that food can be produced with little to no water.

Note: Nothing in this guide should supersede the specific requirements of any agency or permits you may already have. If you are storing or diverting water outside of the Mattole River Watershed, you may need permits that differ from those mentioned here.

Fish-Friendly Water Storage & Use

Water Conservation Strategies to Help Keep Your River Flowing

Practice water conservation techniques to reduce your water use, diversion impacts, and amount of storage needed.

1. Reduce pumping rates and coordinate pumping schedules with neighbors to be able to pump for longer into the dry season.
2. Install adequate storage to meet your household and irrigation needs in order to forbear from pumping during the dry season.

In the North Coast region, September and October are often the most critically dry months when streamflows are at their lowest and every gallon diverted or pumped may prove harmful to fish. In recent years we have seen a trend towards longer and hotter dry seasons resulting in extreme low flows as early as July and as late as November 15th.

As the impacts of climate change become more severe, longer hotter dry seasons and less frequent but more intense rain events may become the new normal. As a result it is essential for all of us to make every effort to forbear from dry season water diversions and leave the water in the creek when the fish need it the most.

4 Key Elements to Fish-Friendly Water Storage

1. Calculate your household's water budget: determine your dry season household use and irrigation needs, amount of water storage needed in order to forbear, and employ water conservation techniques or scale back your garden size if you cannot afford the necessary storage.
2. Fill and top your tank(s) in the late winter and early spring months to avoid having to divert during the dry season.
3. Limit pump rates to 10 gallons per minute or less, and use CDFW compliant fish screens to protect juvenile (small) fish.
4. Use water metering devices or other means to monitor your weekly water use to make sure you are within your water budget.

These guidelines, and other important steps you can take, are explained in the following sections. When we refer to the "low-flow season" realize that the calendar is not a perfect guide for when to stop pumping. The most important factor is the actual level of streamflows at the point where you are pumping.

Based on over 13 years of streamflow data collected in the Mattole watershed, Sanctuary Forest has found that on average, critical low flows occur from August 1 to November 15 in the Mattole headwaters mainstem. Smaller tributaries (less than 3 sq. mile drainage area) tend to experience lower flows earlier than mainstem reaches and for longer into the fall. To get more detailed information about streamflows and recommended no-pump periods, contact your local watershed group or the nearest Department of Fish and Wildlife office, or check the data on streamflows available through the U.S. Geological Survey website listed in the Appendix.

Calculating Your Water Budget

We recommend that every household store enough water to last the duration of an average dry season, approximately 3½ months (105 days). The following guidelines will help you calculate your total water needs for this period.

Note: Figures are based on average water usage data from the State Water Resources Control Board. Water conservation tips discussed later in this guide can help you reduce actual water use by 25-70% below these levels.

- Household water use: 55 gallons per day (gpd) per person
- Garden water use: 18.5 gpd per 100 square feet of garden
- Fire protection water reserve: 2,500 gallons

Sample Storage Calculation
(For a 3-Person Household with a 1,600 Sq. Ft. Garden):

- Household water need (Aug 1 – Nov 15): **17,325 gallons**
  (105 days × 3 people × 55 gpd)

- Garden water need (Aug 1 – Oct 15): **22,496 gallons**
  (76 days × 1,600 sq. ft. x 18.5 gpd per 100 sq. ft.; assumes that households will stop irrigating their gardens after October 15)
- Fire protection: **2,500 gallons**
- **Total household storage need: 42,321 gallons (for 3½ months)**

This amount represents the household's required storage for the full 3½-month dry season from August 1 through November 15. If you are unable to store enough water for this entire period, make sure that you have adequate storage to last through the two lowest-flow months of September and October—that is, at least 60 days-worth of water.

Optimizing Quality of Stored Water

The quality of water from long-term storage in tanks is primarily dependent on the source of the water, the storage tank, temperature, and light. If the tank is made of food-grade materials and the guidelines below are followed, water from long-term storage should be of equal quality to water stored short-term. To ensure high quality drinking water, use both a drinking water filter and UV purification cartridge to remove common bacteria and other organisms.

Incoming water quality is critical for long-term water storage. It is important to fill the tank when the water source is clear. Filtering the incoming water is best; otherwise, be sure to use a pre-settling tank that allows the clear water to be pumped from the top while the sediment collects at the bottom.

Cool storage temperatures are also important for water quality. Note that large tanks keep water cooler than small tanks. Exposure to light is also a critical factor for water quality. Direct sunlight encourages algal growth and water quality deterioration, and should be excluded from the tank interior when possible. Consider siting the tank away from full sun exposure if possible, or covering tanks with shade cloth. Protection from the sun will help to keep the water cool and for poly tanks will also help to protect the plastic from UV degradation.

Depending on the type of tank you use, there may be other steps you should take to optimize the quality of your stored water. Be sure to obtain a tank owner's manual from the tank retailer or manufacturer.

When to Fill and Top Your Tanks

As a general rule, **fill your tanks no later than May 1** each season to ensure minimal impacts to streamflows and optimal water quality. Pumping in June and July should be limited to topping your tank to ensure that you have enough water stored to forbear from pumping starting August 1. For small tributaries, the "stop-pump" date may come much sooner, and filling and topping may be limited to December-April.

Forbear August 1-November 15

If your storage capacity is not sufficient to last this entire period, then continue to top your tanks (at a reduced pumping rate) through August, but *stop pumping entirely during September and October—these are the two most critical low-flow months in most years.*

Prevent Water Loss from Overfilling

Overfilling your tank can result in significant water losses. One hour of overflow at an average pump rate of 10 gallons per minute results in 600 gallons wasted; an overnight overflow would lose 4,800 gallons. This is incredibly wasteful. Two recommended methods to protect against overflow losses are the installation of an automatic shut-off valve that turns your pump off when the tank is full, and overflow piping that returns water to the point of diversion.

Maximum Pumping Rates

To protect fish habitat and prevent direct harm to juvenile fish, both individual and cumulative pumping rates should never exceed 10% of the streamflows of the water source, and in general pump rates should never go above 11 gallons per minute (gpm), which is adequate to fill tanks in an efficient manner. In the headwaters of the Mattole River mainstem (as in many other smaller rivers or creeks), it may be necessary to reduce pump rates further when flows are particularly low—even before the "no-pump season" which begins August 1 in the Mattole headwaters mainstem program.

It is therefore very important to know the pump rate of your system. Pump rates can easily be reduced by installing a bypass valve or flow control "Dole" valve. It is also critical to consider the cumulative impacts of multiple pumps drawing from one stream or river reach. If you know that others are pumping from the watercourse you draw from, the best way to reduce your impacts is to coordinate pumping schedules so you don't all take water at the same time. Either your local watershed group or the nearest CDFW office may be able to help you develop a pumping schedule that protects your stream.

Calculating pump rates that exceed 10% of the streamflow can seem like an abstract concept. Here are some tips to help: If pools are disconnected or flow is reduced to a trickle, then flows are less than 100 gallons per minute. Thus a 10gpm pump would be exceeding 10% of the flow – STOP PUMPING. If the depth of the riffle crest (the connection from the bottom of one pool to the top of the next pool) is less than 2 inches, then flows are likely less than 100 gallons per minute – STOP PUMPING.

Pumping at a reduced rate is one of the most cost effective ways to reduce impacts on streamflows. In some streams and rivers, pumping may be allowed throughout the dry season if the pumping rates are low enough such that cumulative impacts do not exceed 10% of streamflow. Below is an example of the benefits of reduced pumping rates along with assigned pumping days.

Standard Forbearance Threshold (Stop Pump Threshold):

50 landowners @ 10 gpm = 500 gpm impact
Forbearance threshold = 5,000 gpm (11 cfs)

Collaboration Forbearance Threshold:

50 landowners @ 5 gpm = 250 gpm impact
Alternating pumping days = 125 gpm impact
Forbearance Threshold = 1250 gpm (2.8 cfs) with 75% reduction of cumulative impacts and forbearance season shortened by 1-3 months

Note: The reduced pumping rate of 5 gpm @ 3 days/week provides 21,600 gallons/week which covers water use of 3,086 gal/day (adequate for most businesses and small farms and 7 times greater than average family water use).

Installing and Maintaining Fish Screens on Pumps

All pumps need to be equipped with intake screens to prevent damage to small fish. The screen openings must be small enough so that small fish can't get sucked into the pump. Additionally, the total screened area needs to be large enough so that the suction pressure against the screen is almost non-existent. If the screened area is too small, juvenile fish will be impinged against the screen and injured. The following specifications are summarized from the 2000 Department of Fish and Game criteria for California streams with juvenile coho, steelhead, and Chinook.

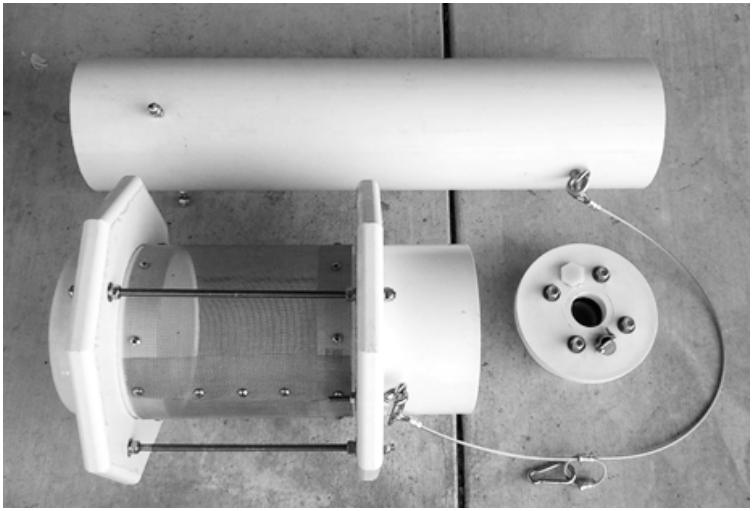
Specifications for pump screens:

Screen mesh openings must not exceed **3/32 of an inch** for woven wire or perforated plate screens.

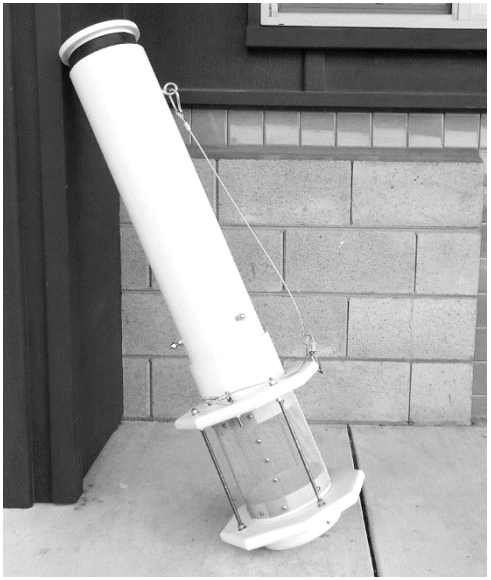
- Screen mesh must have a minimum of **27% open area**.
- For an **11 gpm pump**, the total unobstructed screen area must be at least **42 square inches**.

Pump intake screens can be purchased ready-made from Pacific Ag Systems (*see Appendix*). These screens are sized to match your pump and are guaranteed to provide fisheries protection. They are made out of 20-gage stainless perforated plate and are very durable. Pump screens can also be fabricated inexpensively using a screen support structure such as PVC and a stainless steel screen mesh covering. When making your own screen, make sure the screen mesh is securely fastened to the support structures and that no gaps greater than 3/32 inch exist in the mesh or the points of attachment. Pump screen components for submersible pumps are manufactured by Sure-Flo and available through irrigation supply dealers. These components can be purchased separately and include pump support plugs, motor support pads and submersible pump strainers that bolt onto 4, 6, or 8 inch PVC Pipe. Sanctuary Forest fabricates CDFW compliant fish screens at a small scale, these are available for sale on a limited basis.

Clean pump screens regularly to avoid clogging. When pump screens become partly blocked by debris, the suction pressure on the remaining screen will be higher, potentially injuring juvenile fish. Check and clean your screens at the beginning of the pumping season, and then as needed to keep free of debris. If the screens are fabricated with wire mesh, replacement of the mesh will be required every year for bronze mesh and every two years for stainless steel mesh.



An example of a fish screen, disassembled – fabricated by Sanctuary Forest.



An assembled fish screen

Water Conservation: Making Your Stored Water Last

Reduce Your Use

When it comes to weighing costs, reducing your personal and homestead water consumption through water conservation techniques is the easiest, cheapest, and most effective way to address water shortages and leave more water in the river for fish and wildlife. You can reduce water use by up to 50% during the dry season by following these tips:

Household Conservation and Leak-Proofing

Reduce household water use by using efficient fixtures and turning the water off except when actually rinsing dishes, showering, brushing teeth, etc. Replacing older, standard water fixtures and appliances with newer, more water-efficient versions can make a tremendous difference in reducing your daily household water use, as the following table shows:

Fixture	Old-Style (Standard)	New (Water-Efficient)	Water Savings
Toilets	5-7 gallons/flush	1.6 gal/flush	~5 gal/flush
Sink Faucets	3 gal/minute	2 gal/minute (with aerator)	1 gal/minute
Showerheads	3-4 gal/minute	2.7 gal/minute	~1 gal/minute
Washing Machine	40 gal/load (top-loader)	20 gal/load (front-loader)	20 gal/load

Monitor Weekly Water Use

Establishing a water budget is essential to ensure that your stored water will last through the low-flow season. A water budget takes total water storage capacity (excluding fire reserve) and divides it by the number of weeks of forbearance. Depending on your needs for irrigation or other special uses, the allocation may be the same for each week, or may vary during the forbearance season. By measuring your weekly usage you can ensure that you're staying "within budget"—and make adjustments if you are not. Water budgets are also a great way to catch any leaks in the system. By tracking weekly use, you can easily see if water use is exceeding your budget and address them accordingly.

The easiest way to measure usage is to install a water meter on the outlet of your tank, and record usage on a weekly log. The water used per week is then easily calculated from the log and can be compared with the water allocation to make sure that water use is on budget.

**A sample water log is shown in the Appendix.*

Leak-Proofing Pipes & Tanks

An accidental leak or severed line can drain precious stored water from a tank—fast! Several over-draft designs exist that can help prevent water from being lost from water storage tanks.

If only using a single, large-capacity water tank, consider integrating a smaller tank into your system that can be filled by the larger tank either manually, or with a timer. Also, instead of utilizing one large tank, multiple smaller tanks can be grouped together and then used individually as needed.

Other creative designs of over-draft protection exist that involve partitioning the out flow of water into several valved PVC fittings that are manually opened when needed. These systems must be thoroughly insulated to prevent from freezing in winter.

Check For and Repair Leaks:

Even the smallest drip of water can add up to large losses over time. (Approximately one drip per second can waste over 3,000 gallons of water per year.) To prevent leaks, bury water lines to prevent fittings expanding in the sun, freezing in the winter, or from lines being chewed by bears or other wildlife. Be sure to mark all water junctions and connections with flagging when burying new lines. During the dry season walk water-line zones and check for wet spots, or green areas.

Water Loss Emergency

The sudden loss of a large portion of stored water in the midst of the low-flow season is a serious problem for any household. But deciding to pump from the stream or river in order to refill the tank at that point would be potentially devastating for fish survival. In that circumstance, the most responsible choice you can make is to obtain the water you need to get through the dry season from a retail water supplier. Find out who supplies potable water in your community, and where they get their water from.

The Drought-Resilient Garden

Water storage systems are often costly to install and are only as effective as the people using the water. The following water conservation techniques are meant to assist with efficient use of water outside of the home. Effective utilization of these techniques can drastically reduce the amount of water needed in the garden and on the farm and reduce the amount of water storage needed.

Soil Health is Water Security

Rich, living soil forms the foundation of the drought resilient garden. Research has shown that increasing humus levels in soil 1-2% can reduce water needs by up to 75% - humus has the ability to store up to 4-6 times its weight in water. Avoiding

soil disturbance and incorporating compost, earthworm castings, mushroom compost, or leaf mold into garden soils (approximately 2 gallons of compost, per 50 gallons of soil); as well as keeping the soil armored with mulch are practices that help protect and maintain your soil humus investment.

Cover cropping is also an excellent way to build and retain organic matter in the soil. Cover crops (fava beans, vetch, Austrian field peas, winter rye, bell beans, etc.) are best planted in the fall, and then mixed into the soil the following spring, 3-6 weeks prior to planting your next crop. Fall planted cover crops also capture and retain leftover fertilizers in the soil, preventing them from being lost to winter rains.

Plant in the Ground

In most cases, growing in native soil uses less water than growing in containers. Exceptions to this include growing food in an area where surrounding tree roots compete with water, or in sandy, or rocky soils.

Sheet-Mulching (Lasagna Gardening):

Sheet-mulching is a way to establish new garden beds (or revitalize old beds) by layering a diversity of organic materials (cardboard, straw, compost, manure, leaves, etc.) on top of existing soils. This is done in the fall, allowing the materials to break down (biodegrade) over the winter; the area is then planted the following spring. (This method works best in meadow soils and may not work well in forested areas where tree roots compete.) For an in-depth description of how to sheet-mulch check out: http://www.patternliteracy.com/books/gaias-garden/how-to-the-ultimate-bomb-proof-sheet-mulch.

Seed Selection & Planting

Use Early Maturing Strains:

When planning your garden, try selecting early maturing varieties. Plants that ripen earlier in the season can produce a yield before the critical dry months of late September and early October. Also, smaller-fruited varieties of tomatoes, eggplants, etc., often require less water to produce than larger-fruited varieties.

Get an Early Start:

When growing in the ground, getting plants established at the right time can have an effect on their ability to withstand dry summer conditions. (This is not the case when growing in containers.) Planting early in the season while the soil is still moist (but not too wet) allows plants to develop deep root systems before hot weather arrives. Providing early season protection (row cover cloth or Reemay cloth, small hoop-frames, cut plastic milk jugs, etc.,) for warm season plants is often necessary when following this practice.

Direct Sow if Possible:

For many types of plants, seeds that are planted directly in the ground tend to establish stronger root systems than transplants. Newly planted seeds can be covered with Reemay, plastic, old milk jugs, etc., to help protect from birds and rodents while they are becoming established.

If purchasing or using transplants, avoid planting starts that are root-bound.

Moisture Retention Strategies:

Armor Your Soil with Mulch:

Mulch retains soil moisture, while insulating and protecting the living soil from heavy rains and temperature extremes. (Soil temperatures above 80° F can oxidize soil humus.) Armoring your soil also provides protection for beneficial soil organisms that are working together with your plants to help fight drought and disease. Mulch biodegrades over time, feeding the soil ecosystem, while increasing soil carbon.

Sources of mulch can include deciduous leaves, rotted wheat or oat straw, grass clippings, alfalfa, pond weeds, cattails, shredded cardboard, aged wood chips, etc. Also, by mulching paths you can help reduce the wicking of water from surrounding garden beds. (Large pieces of cardboard work great for this.) Remember to protect your soil investment during all four seasons.

Water Conservation in Containers:

Allowing pots to dry out too much between watering can cause the soil to repel water. Setting timers for long durations to rehydrate dry soil wastes both water and nutrients. Instead, try using drip irrigation with multi-cycle timers set for frequent, yet short durations, to keep soil evenly moist. (For example: 1-4 minutes 2-4 times a day, depending on the size of the container, time of year, and the size of plant.)

Cover soil in containers with mulch and place drip irrigation *under* the mulch to reduce evaporation. Trays or saucers can also be placed under smaller pots to capture lost water. Cover the south and west sides of containers with fabric, burlap, cardboard, etc., to prevent the sun from overheating the soil.

Use Wind Breaks:

Hot summer winds can wick moisture right out of soils. If planting in a windy site, consider erecting temporary windbreaks, or plant permanent windbreaks for long-term protection.

Cut Back on Nitrogen:

Over-fertilizing, especially with nitrogen, leads to excessive growth of vegetation that requires more water. Over-fertilizing can also leave plants vulnerable to pests

and disease. Some signs of excess nitrogen fertilization are abnormally green (ultra-emerald colored) plants with weak or stretched out new growth; edges or veins of leaves may look burned, or are curled downward. Be especially careful when fertilizing with bat or bird guanos and concentrated liquid fertilizers.

Utilize Greywater:

Water from sinks, showers, and laundry can be used again to water landscaping and perennial edibles. Water can also be collected in basins when showering or washing dishes and then carried to nearby plants. Avoid soaps that have sodium or boron. Biocompatible soaps that biodegrade into plant nutrients work best. For more info, check out: http://greywateraction.org/content/about-greywater-reuse, and: http://www.oaecwater.org/sites/oaecwater.org/files/Legal%20Graywater%20Design%20For%20Small%20Scale%20Applications.pdf

Orchard Drought Resilience:

When planting new fruit trees, try selecting standard and semi-standard rootstocks. Standard "full-sized" rootstocks grow extensive root systems and are more drought tolerant than dwarf varieties. Some semi-dwarf/semi-standard rootstocks such as the (MM-111 apple) also have excellent drought resistance. Trees on standard rootstocks can be held to any desired size by summer pruning. Also, when planting, consider wide spacing to avoid water competition between trees.

Plant New Trees, Shrubs, or Vines in the Fall/Early Winter:

Planting in the fall or early winter gives new trees or shrubs the entire rainy season to establish roots before hot summer weather arrives. Avoid planting new trees or shrubs during the summer months.

Use Drip Irrigation:

Properly installed drip irrigation can reduce water consumption by up to 50%. But not all drip irrigation is this effective. Spray emitters can lose a high percentage of water to evaporation and soaker hoses can become clogged with sediment after a few seasons.

Currently, the most effective drip irrigation is "in-line emitter tubing," also called "soaker drip-line." These are made in 1/4" and 1/2" diameter sizes and have non-clogging emitters, especially when used with basic sediment filters. In-line emitter tubing comes pre-spaced, from 6" to 2' along the length of line.

Place drip irrigation under your mulch to reduce evaporation; keep source water lines protected from the sun (buried) to prevent plants from being watered with hot water.

Group Plants Together According to Their Water Needs:

Place plants that need extra water near each other and on separate irrigation systems than plants that need less water.

Water in the Early Morning and Only When Needed:

Whether hand watering, or using drip irrigation, the best time to reduce evaporation losses is in the early morning hours. (Watering in the evening provides similar results, but may also encourage fungal diseases.)

A plant's water needs can vary based on influences such as weather and day lengths. To help conserve water, try watering only when needed, vs. on a set schedule. Manual timers work well for this technique. Moisture meters can also be used to help gauge and monitor soil moisture levels and can be purchased at most garden stores.

Permitting

Fire Storage Requirements

Fire protection storage requirements may vary by county, but generally apply to rural residents in the North Coast region. In Humboldt County, homes in State Responsibility Areas for fire are required to maintain a reserve of 2,500 gallons at all times to fight fire. If this reserve is not kept in a separate tank, your larger tank must be plumbed in such a way that the 2,500 gallons will not be bled down by other usage. A 2.5-inch standard male fire hose adapter is required for access to this water.

Permits for Tanks and Water Storage

Humboldt County Installation Requirements: Permits and other requirements vary from county to county and within different zones in a given county. Consider contacting your county building department prior to project implementation to determine permit requirements for your location. In Humboldt County the following general requirements apply:

- **Grading permit**: Required if excavation for installation exceeds 50 cubic yards.

- **Tank permit**: Required for tanks whose capacity is more than 5,000 gallons. Water storage systems with multiple tanks of 5,000 gallons or less do not require building permits. A standard building permit cannot be obtained for a tank unless the tank meets California building code and is approved by a California engineer. An Alternative Owner-Builder (AOB) building permit is allowed for tanks that do not meet California building code if the landowner qualifies under the AOB ordinance. In order to obtain a tank building permit, the tank cannot be used to supply water to any unpermitted buildings.

- **Setback requirements**: Riparian setbacks are 100 feet from edge of stream or river bank. Property line setbacks are 30 feet. County road Right of Way can be estimated at 30 feet from the center of the road.

Water Rights Permits

Water scarcity impacts to communities, fish, and wildlife has resulted in a greater need for protection of water resources and increased regulation by the governing agencies. The solution of storing water from the wet months for use during the dry months is supported by these agencies but the California water rights system was not designed to accommodate seasonal storage. The riparian water rights held by landowners who withdraw water from a source on their property allows only for direct diversion, and does not allow water storage for longer than 30 days. Instead, California law requires an appropriative water right for water collected from streams, lakes, springs and shallow wells that will be stored longer than 30 days.

Non-Jurisdictional Water:

Water that can be stored without an appropriative water right includes non-jurisdictional sources such as rainwater, well water, and springs. Storage of rainwater harvested from rooftops does not require a water right. All of the other non-jurisdictional water sources are more complex and likely require consultation with a water law attorney, consultant or agency to determine if they are exempt. In general, rainwater that is directly intercepted is exempt, while collection of hillslope run-off is not. Deep wells that are not connected to shallow groundwater are exempt. However, the well must be permitted by the county and the well logs must show that the water is being collected from below the "impervious layer" that separates shallow groundwater from isolated aquifers. Well water law is changing as needed to protect groundwater reserves and in the future, water rights will likely be required for all wells. Springs that do not flow off of the property are exempt but the determination of what that means varies between agencies.

State Water Board Permits

Three types of appropriative water right registrations that allow for water storage are described below. All of them require CDFW terms and conditions under which the water right registration can be exercised. Once a landowner enters into the process of applying for one of these water right registrations they will also need to notify CDFW of their water diversion and a CDFW 1602 agreement may be required in addition to the water right. Because of the complexity of the process, we recommend consultation with your local watershed group and/or agency prior to application. Both CDFW and SWRCB staff are happy to answer questions to help you determine the best permitting pathway for your situation (see contact info in the appendix)

Small Domestic Use Registration:

Most landowners qualify for small domestic registrations for domestic use not to exceed direct diversion of 4,500 gallons per day and diversion by storage of 10 acre-feet (3.2 million gallons) per annum. Domestic use means the use of water in homes including watering of domestic stock, irrigation not to exceed 1/2 acre and shall include impoundment for incidental aesthetic, recreational, or fish and wildlife purposes. A small domestic registration can include storage in tanks and/or ponds for the purposes above. Institutional and business water use requires a full appropriative right with a few exceptions (schools, resorts, motels, campgrounds, etc). Additionally, landowners that irrigate more than 1/2 acre exceed the maximum allowed diversion stated above and/or that grow commercial crops require a full appropriative right or a small irrigation use registration.

Livestock Stockpond Use Registration:

For ponds used for livestock, a livestock stockpond use registration can be obtained. A livestock stockpond is defined as a pond constructed for livestock watering use not to exceed direct diversion of 4,500 gallons per day or diversion by storage of 10 acre-feet per year, and includes storage for incidental aesthetic, recreational, or fish and wildlife purposes. Total storage amount may not exceed 10 acre-feet. Additionally, if both a small domestic registration and livestock stockpond registration are obtained, the combined total water use cannot exceed 10 acre-feet per annum.

Small Irrigation Use Registration:

Landowners intending to store water for more than 30 days for commercial irrigation of agriculture are required to obtain either a Small Irrigation Use (SIU) or a full appropriative water right. Currently, the SIU is available for landowners in coastal stream watersheds from the Mattole River south to San Francisco and coastal stream watersheds entering northern San Pablo Bay. The purpose of use must be Irrigation, Heat Control, or Frost Protection. The following uses may be included as uses incidental to the primary use: aesthetic, fire protection, recreational, and/or fish and wildlife preservation and enhancement. The place of use must be lands currently under cultivation. The allowable amounts are as follows: diversion to off-stream storage is not to exceed 20 acre-feet per year where the storage facility is either existing or proposed for construction within cultivated lands; diversion to on-stream storage reservoirs located on Class 3 streams not to exceed 20 acre-feet per year where the reservoir was constructed prior to January 1, 2012. CDFW Conditions or Clearance: The registration packet must include either of the following from the California Department of Fish and Wildlife: (1) conditions or (2) clearance that conditions are not needed.

Note: A SIU can be used along with a SDU and or a livestock stockpond use registration as long as the total combined water use does not exceed 20 acre-feet per annum. The application process requires submittal to CDFW to obtain conditions of clearance prior to submitting the application form and $250 fee to the SWRCB.

CDFW Code 1602 Requirements

CDFW has authority to regulate any water withdrawal that may have an impact on fish or other aquatic life. According to the Code, anyone who undertakes an activity that might "substantially divert or obstruct the natural flow of any river, stream, or lake" is required to notify CDFW of this activity. Such notifications are particularly important in fish-bearing streams and tributary streams where low flows have been identified as a problem. If the Department determines (on a case-by-case basis) that your water diversion could have a "substantial" impact on the resource, a Lake or Streambed Alteration Agreement may be required. CDFW defines fish to include amphibians and other aquatic and terrestrial life. If your stream or spring has habitat for any aquatic life or is a tributary to such a stream, then an agreement may be necessary.

**See Appendix for a website providing more guidance on submitting a notification.*

Appendix I - Resources

In-line Emitter Tubing/Soaker Drip-line Sources
http://www.dripworks.com/category/one-fourth-inch-soaker-dripline

Quality Water Meter Retailer
National Meter and Automation Inc.: http://www.nmaai.com/

Homestead-Scale Permaculture Design Books:
Gaia's Garden, Toby Hemenway
Designing and Maintaining Your Edible Landscape Naturally, Robert Kourik

Greywater Resources:
Create an Oasis with Greywater, Art Ludwig/Oasis

Soil:
Three great books: *Teaming with Microbes, Teaming with Nutrients,* and *Teaming with Fungi,* Jeff Lowenfels & Wayne Lewis

Appendix II – Contact Information

Pump Screen Suppliers

Pacific Ag Systems, supplier of Pump-Rite Screens:
(888) 998-1983, Website: www.pump-rite.com

Sure-Flo, manufacturer of submersible pump screens components:
(734) 761-5110, Website: www.sure-flo.com

Englund Marine in Eureka, stainless steel screen mesh supplier:
(707) 444-9266

Public Agencies

Humboldt County Building Department
(707) 445-7245, http://www.humboldtgov.org/156/Planning-Building

Mendocino County Building Department
(707) 234-6650, http://www.co.mendocino.ca.us/planning/

California Department of Fish and Wildlife
For questions about CDFW water rights, permits and pump screens, contact:
Jane Arnold, Staff Environmental Scientist (Eureka)
(707) 441-5671, Jane.Arnold@wildlife.ca.gov
For information about filing a CDFW notification of diversion:
Visit https://www.wildlife.ca.gov/conservation/LSA

State Water Resources Control Board
The Division of Water Rights provides information on water rights and permits (including small domestic use appropriations), as well as water use standards for households, irrigation, livestock and dust control.
(916) 341-5250, Visit http://www.swrcb.ca.gov/waterrights/

U.S. Geological Survey – Water Resources
The U.S. Geological Survey National Water Information System provides online streamflow data for thousands of locations around the country.
1-888-ASK-USGS (1-888-275-8747), Visit
http://waterdata.usgs.gov/nwis/rt

Appendix III – Technical Information

Conversion Rates for Water Volume Calculations

1 cubic foot = 7.48 gallons
1 acre foot = 325,851 gallons

Calculating Pump Screen Area Requirements

Minimum Screen Area – SAMPLE CALCULATION:

Step 1: Convert your pumping rate from gallons/minute to cubic feet/second (using the conversion rate 1 gpm = 0.0022 cfs)

Step 2: Multiply your pumping rate (in cubic feet/sec) × 12.1 sec/feet to get square feet of screened area required.

Calculating Minimum Screen Area for an 11 GPM Pump

Step 1: 11 gpm × 0.0022 cfs /1 gpm = 0.024 cfs

Step 2: 0.024 cfs × 12.1 sec/feet = 0.29 sq. ft. (42 sq. inches) of screened area.

Sample Water Use Log Tables

Sample log using water meter readings:

(Storage = 50,000 gal allocated at 450 gal per day = 111 days or 15.9 wks)

Weeks of Forbearance Season	*Date*	*Water Meter Reading (Gallons)*	*Actual Water Used Per Week (Gallons)*	*Water Allocation Per Week*	*Difference (Allocation Minus Actual Use)*
Start date	Aug 1	25,000			
Week 1	Aug 8	28,000	3000	3150	150
Week 2	Aug 15	31,500	3500	3150	- 400
Continue Through End of Season					