BASINS OF RELATIONS

A Citizen's Guide to
Protecting and Restoring Our Watersheds

WATER INSTITUTE

OCCIDENTAL ARTS & ECOLOGY CENTER

Basins of Relations

A Citizen's Guide to
Protecting and Restoring Our Watersheds

Fourth Edition (2026)
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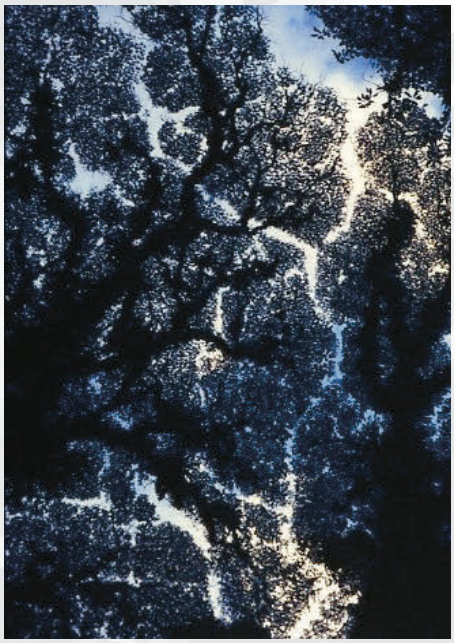
By Brock Dolman and Kate Lundquist

Illustrations by Jim Coleman and Marcus Badgley

Thank you for picking up this publication and taking some of your precious time to learn more about water, watersheds, Conservation Hydrology, and how you can take action to ensure that we and all species enjoy pure and ample water for generations to come.



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OAEC's WATER Institute develops innovative science-based solutions for communities and the environment to address the legacy of hydrologically destructive land-use practices and policies on California's watersheds and the urgent need to address the impacts of climate change on the water cycle. For more information visit www.oaec.org/water.

The Occidental Arts & Ecology Center (OAEC) is an 80-acre research, demonstration, education, advocacy, and community-organizing center in West Sonoma County, California, that develops strategies for regional-scale community resilience and the restoration of biological and cultural diversity. For more information visit www.oaec.org.

WELCOME TO PLANET WATER

The presence of copious water on our blue and white planet is the fundamental expression of life's diversity and beauty. Water ripples out and within to touch every aspect of our lives. Now and in the future, nothing is or will be more valuable than pristine watersheds with abundant, pure water supplies.

The ceaseless flowing and dynamic processes of water—the evaporation, condensation, transpiration, precipitation, and infiltration that together comprise the water cycle—are truly amazing. Covering more than 70% of Earth's surface, water can be solid ice that floats on its liquid self. It can evaporate into the atmosphere as a vaporous distilled gas and then return to Earth, purified, as either solid snow or liquid rain. Without water, there would likely be no life on Planet Earth. From this perspective, it might be more fitting to refer to our home as "Planet Water," as biologist Lynn Margulis suggested.

Ninety-seven percent of the world's water is held in the salty oceans and is thus undrinkable. Another 2% of global water is locked up in ice caps and glaciers. This leaves only 1% of the world's water available as fresh water in lakes, rivers, and groundwater for shared use by humans and all other fresh-water-dependent beings. As sea levels rise due to global warming, the melting polar ice caps and glaciers are increasing the percentage of water in the saline ocean. As we drain wetlands, clear-cut forests, plow soils, and pave our watersheds, we further reduce our available 1% of fresh water. Additionally, our widespread polluting of aquifers, rivers, lakes, and air dramatically reduces the quality of this critically limited fresh water.

We must learn how to equitably and sustainably share the small amount of available global fresh water for all agricultural, residential, manufacturing, energy, and personal needs, as well as the biological needs of all other terrestrial and aquatic life-forms. Jacques Cousteau reminds us not to "forget that the water cycle and the life cycle are one." Every drop of water is precious!

"We forget that the water cycle and the life cycle are one."

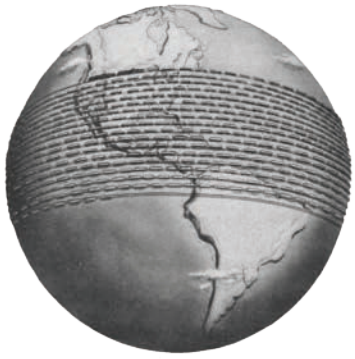
— Jacques Cousteau

Doomed to Repeat History?

Ours is not the first civilization to face such a self-created water crisis. Myriad historical accounts and widespread archaeological evidence indicate that, over time, most centralized city-based societies have consistently destroyed the capacity of their water and land to support extended human settlement. The fall of numerous great civilizations is directly linked to their watershed mismanagement.

Throughout history, the removal of native vegetation through deforestation, overgrazing, and plow agriculture has typically resulted in dramatic depletion and degradation of fertile topsoil and fresh water. Once you lose your soil and pollute your pure water, you have lost two of the most important resources necessary for the survival of any society.

Our modern civilization is not immune to this type of behavior. J. Russell Smith states in *Tree Crops: A Permanent Agriculture* that "in 1950 the U.S. Soil Conservation Service reported that the soil washed out and blown out of the fields of the United States each year would load a modern freight train long enough to stretch around the world 18 times. If it ran 20 miles an hour continuously, it would take it nearly three years to pass your station."



A runaway train of soil loss
The amount of annual soil loss on U.S. farms, according to a 1950 report referenced in J. Russell Smith's book Tree Crops.

Ruins of One of the Hundred Dead Cities of Syria
Between 610–638 A.D., this thriving city was invaded several times, and the inhabitants, who over centuries had developed and practiced soil and water conservation measures, were driven off. With these techniques no longer in use, 3–6 feet of soil eroded away, and the city and surrounds became an uninhabitable man-made desert.

— Adapted from W. C. Lowdermilk's Conquest of the Land Through 7,000 Years, *1939, Natural Resources Conservation Science*

"Those who cannot remember the past are condemned to repeat it."

— George Santayana, philosopher

Future Thirst

Some will argue that water has never limited human growth and development, that humans have tenaciously applied their technological ingenuity to move water great distances and pump it from deep below the surface to fuel burgeoning growth. The attitude has been that if you simply bring the water, the people will come. In the past few centuries, however, this command-and-control attitude towards water has begun to show signs of deepening failure.

Globally, 2 billion people (26% of the population) do not have safe drinking water, and 3.6 billion (46%) lack access to safely managed sanitation, according to a 2023 UNESCO report. In 2023, the Global Commission on the Economics of Water reported that global demand for fresh water will outstrip supply by 40% by 2030. A 2021 report, "Water Insecurity Threatening Global Economic Growth, Political Stability," concludes that global water use is likely to increase by 20–50% above current levels by 2050.

"Just as water is the foundation of life, it must also be the foundation of design of the built environment."

— Betsy Damon, founder of Keepers of the Waters

The much-heralded agricultural "Green Revolution" of the 1960s and 70s, was primarily dependent on a silent "blue revolution" of irrigation for thirsty and purportedly high-yielding petrochemical monocrops. Groundwater mining for irrigation, powered by fossil fuel, allowed the Green Revolution to proceed. In the short term there has been an increase in food production, yet in the long term this industrial agricultural model overdraws and pollutes ground and surface water and leads to dying rivers and coastal areas. Researchers have documented that the number of "dead zones" caused by nitrate fertilizer pollution in coastal river mouths worldwide has doubled every decade from the 1960s until the early 2000s and increased from 150 dead zones in 2004 to more than 500 today.

The growth of data centers to support the needs of artificial intelligence has put an unfathomable strain on water and power resources. According to the International Energy Agency, U.S. data centers consumed 183 terawatt-hours (TWh) of electricity in 2024, or the equivalent of 16,960,000 households annually. This is projected to grow by 133% to 426 TWh in 2030. The 2024 United States Data Center Energy Usage Report estimates that national data center water use will grow from 17.5 trillion gallons in 2023 to 72.5 trillion gallons in 2028. Communities need to start organizing now to protect their precious fresh water and energy resources from this unchecked ecological threat.

Our societal addiction to the combustion of carbon-based fossil fuels for energy is now unequivocally understood to cause global climate change due to excessive accumulation of greenhouse gases in the atmosphere. These gases thicken the atmosphere's capacity to retain solar energy, leading to an increase in the planet's average surface temperatures. Water uses solid, liquid, and gaseous phase changes as its primary mechanism for attempting to regulate its human-induced "fever." Water is manifesting some of the most dramatic expressions of climate change, with melting polar ice and glaciers, arctic amplification, rising sea levels, coastal inundation, ocean acidification, marine heat waves and associated die-offs due to hypoxic zones, slowing of the Gulf Stream, stronger hurricanes, and increased floods and droughts.

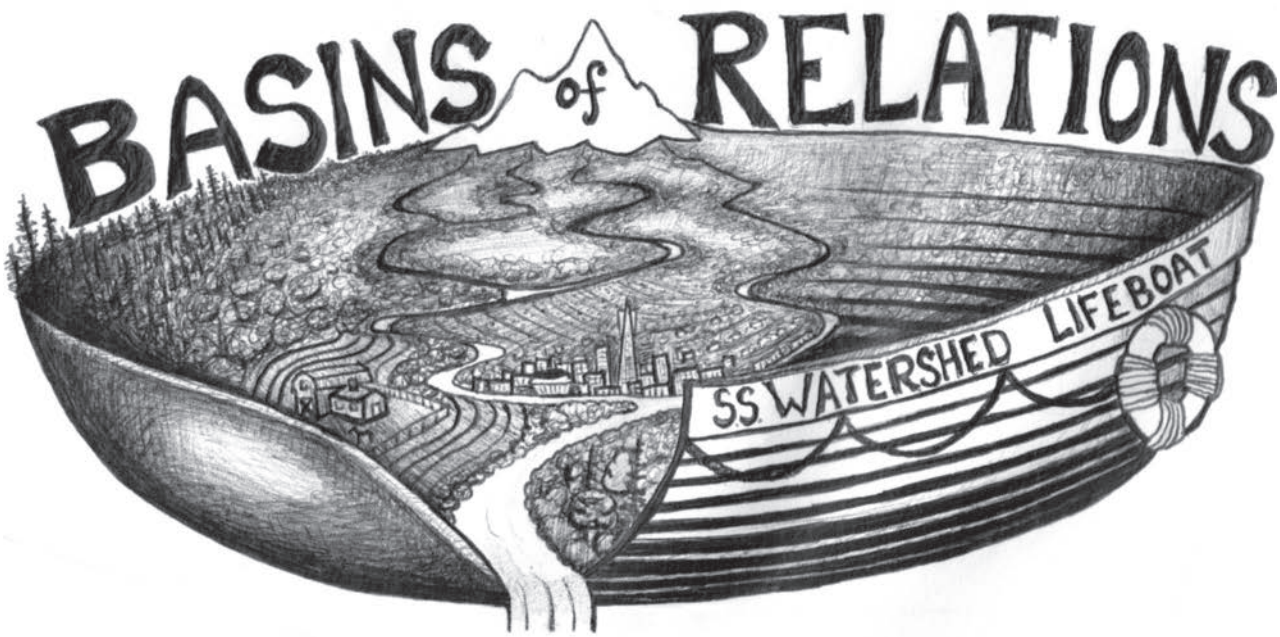
As we confront the reality of burgeoning overconsumption and pollution of finite natural resources, this resulting "polycrisis" is significantly degrading the capacity of global ecosystems to support humans and other life-forms. Imminent resource depletion, often expressed as "peak oil" and "peak water," have deep implications for "peak" food, population, and biodiversity. Responding to this confluence of self-induced catastrophes is the greatest challenge humanity faces. While the advent of hydraulic fracking and tar sand extraction has temporarily increased the supply of fossil fuels, this has come at a huge cost of increased greenhouse gas emissions and permanently contaminated surface water and groundwater.

Besides the impacts of extraction, the production, use, and disposal of the petrochemicals and plastics created by those fossil fuels also poison our air, soil, bodies, and water. They make their way into every corner of every ecosystem, food chain, and waterway. We are only just beginning to understand the scale of disruption that the presence of microplastics will effect with the toxins they carry.

The difference between peak oil and peak water is that—while the total amount of water and oil on the planet is finite—water, unlike oil, cycles infinitely through our lives. Keeping oil in the ground and regenerating the water cycle are central to our survival. Cheap energy is a sinking ship; it would be prudent to treat our watersheds as lifeboats and use sound ecological principles to prepare for the ensuing storm of changes.

WATERSHEDS: OUR BASINS OF RELATIONS

A watershed encompasses all the land surface that collects and drains water down to a single exit point. The continual cycle of erosive water flowing over the uplifted, weathered land sculpts all landscapes into distinct, cradle-like entities known as watersheds, sometimes also called basins, drainages, or catchments. A watershed includes all the surface area that drains into a waterway. The waterway comprises roughly 10% of the surface area, and the remaining 90% is what is often called "uplands." While often overlooked, these uplands play an important role in how watersheds function.



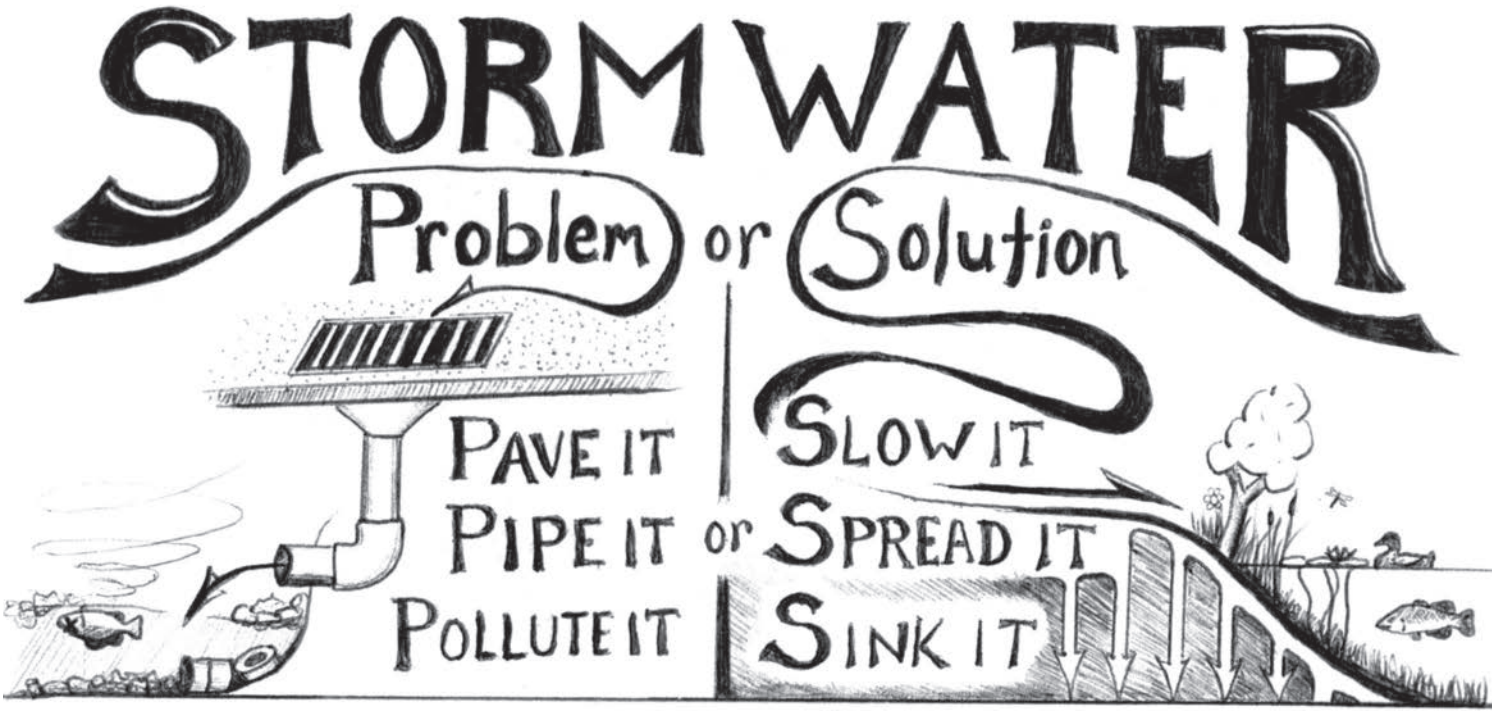
Everyone on the planet lives in a watershed somewhere. Everything we do for work, play, school, shopping, farming, recreation, and so on occurs in a watershed. Watersheds can be large, like the Mississippi basin, the third largest in the world, which drains water from 41% of the lower 48 U.S. states into the Gulf of Mexico. Or watersheds can be as small as all the land in your neighborhood where water flows from your yard, roof, driveway, and streets to the storm drain and out to your local creek or lake.

Watersheds at all scales are evolved living entities. Their state of health provides a comprehensive benchmark for judging the wisdom of our past and future land and water use. Watersheds literally underlie all human endeavors and form the foundation for all future human aspirations and survival. Watersheds topographically define community, and the health of your watershed depends on collaborative relations between neighbors in your shared basin

CONSERVATION HYDROLOGY

At the WATER Institute, we call our philosophical and practical responses to the water challenges and opportunities before us "Conservation Hydrology." Conservation Hydrology utilizes the disciplines of ecology, population biology, biogeography, economics, anthropology, philosophy, land use planning, and history to guide community-based watershed literacy and action. Conservation Hydrology advocates that human development decisions must move from a "dehydration model" to a "rehydration model." To achieve this goal, we must retrofit our built environment using new development patterns based on the following principles.

SLOW IT, SPREAD IT, SINK IT, STORE IT, SHARE IT



Water is the ultimate resource. Thankfully, the Clean Water Act now recognizes the "pave and pipe paradigm" as disastrously flawed and hydro-illiterate. These outmoded engineering practices capture, concentrate, and convey water away from a site as quickly as possible. The old drain-age is now being replaced by a new retain-age.

The WATER Institute advocates a new paradigm of stormwater management based on "waterspread" restoration, with a call to slow it, spread it, sink it, store it, share it: Slow the water down. Spread the water out. Sink the water into the land. Store the water in the aquifer. Share the water with all of life.

"The old drain-age is now being replaced by a new retain-age."

— Brock Dolman, WATER Institute Co-Director, Occidental Arts & Ecology Center

Practical waterspread applications, such as bioswales, rain gardens, and gully stuffing, serve to biologically filter stormwater, enhancing water quality. These applications can also increase water quantity by optimizing groundwater recharge and reducing peak flood flows. If you live in a floodplain, these ideas may be more challenging to implement. You will need to evaluate the slope stability, soil porosity, storm event size, and runoff volumes of your site to determine which of these concepts are appropriate. When we learn to think like a watershed, we can implement development practices that will protect water quality and quantity.

FOUR R's OF CONSERVATION HYDROLOGY

Receive, Recharge, Retain, and Release

The goals of Conservation Hydrology can be expressed in terms of sound budget management. The four R's of a water budget are equivalent to income, deposit, savings, and expense. We want the water balance of our watersheds to run in the blue and not in the red. We want to ensure that our liquid assets continually produce a high-quality return on investment back into our Basins of Relations.

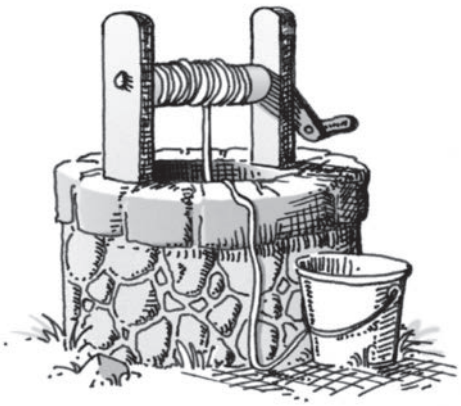
Receive = Income

- Watersheds only receive water as snowfall, rainfall, and fogfall. Precipitation is the only true source of income to resupply our community's water budget.
- Global climate changes are predicted to dramatically alter the frequency, intensity, and type of precipitation events that watersheds can expect to receive.
- Conservation Hydrology advocates for the adaptive management of watershed lands to optimize rehydration. We must implement and enforce land use patterns that enhance the receptive capacity of our watersheds in times of excess and in times of scarcity.

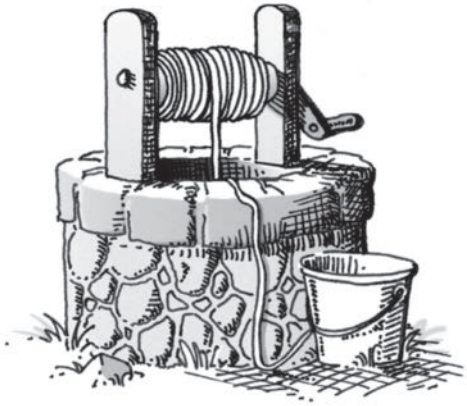
Contour Infiltration Ditch
In one rainy season, this simple ditch collected and infiltrated the same amount of water that residents of this property withdrew in one year from their well, thus ensuring a balanced groundwater budget.

Recharge = Deposit

- Recharge processes are critical for the water cycle. Infiltration is like a deposit slip recharging our water cycle. The capacity to make water deposits depends on the watershed's recharge potential. Precipitation received by our watershed must percolate and be absorbed, or else there is no replenishment of our water savings account.
- Hardening and paving over natural recharge areas, disconnecting rivers from their floodplains, deforesting native vegetation, and draining wetlands impair the recharge potential of our watersheds.
- To increase recharge, we must limit impervious surfaces and the wholesale conversion of native vegetation. We must implement stormwater techniques designed to slow it, spread it, sink it, store it, and share it as a deposit into the earth. We must protect open space in known groundwater recharge areas. If site conditions are not conducive to recharge, then we must ensure proper biofiltration of all surface waters prior to their discharge and deposit into rivers, wetlands, lakes, estuaries, and oceans.



Grandparents' Well



Parents' Well

Children's Well

Retain = Savings

- Retained, recharged precipitation is a savings account asset. Water storage is often the most challenging aspect of water supply management. Conservation Hydrology strategies should appropriately slow water down, increasing the residence time of water storage in our watersheds. This will optimize the amount of water available for use by living processes.

- We must avoid overdrafting and dewatering of our watersheds. Water should never be extracted from storage in amounts greater than what is annually received and recharged. All sources of water must be free of pollution by development, wastewater systems, agricultural runoff, petroleum extraction, and industrial effluent.

- We must develop water budgets for all watersheds to ensure that extractions do not exceed inputs. We must implement groundwater and surface water management programs. We must ensure that surface and groundwater quantity and quality protection programs are funded, monitored, and enforced. We must resist the privatization of water and establish the public ownership of water as a public trust resource.

Release = Expense

- Planet Water releases its signature element to the ocean, land, and atmosphere through many processes known as the water cycle. Through seasonally melting glaciers, groundwater springs, and seeps, water is returned to creeks and rivers. Solar evaporation and the evapotranspiration of plants help to form clouds and feed the cycle anew. The infinite nature of this cycle is to continually flow and be in flux as the expense of one stage produces income for the next.

- Human development practices (creating impervious surfaces, channelizing stormwater, etc.) tend to increase the rate and volume of stormwater's return to the ocean via excessive runoff and heightened flood discharges. This directly reduces the landscape's ability to retain water and diminishes the amount of water available for later release during the dry season when it is most needed.

- The implementation of watershed-scale Conservation Hydrology practices will protect reception and amplify recharge, thus optimizing retention. These are the critical steps that can ensure optimal amounts of cold water will be available for future release.

"Do you live in a water scarce area or a storage scarce area?"

— Brock Dolman, WATER Institute Co-Director, Occidental Arts & Ecology Center

THE ROLE OF KEYSTONE SPECIES IN WATERSHED HEALTH

Every watershed supports a wide variety of flora and fauna. Some species disproportionately benefit those living in their midst. Biologists call these "keystone species" because if they were to be removed the ecosystem would change drastically. Citizens wanting to contribute to the health of their watersheds are wise to identify who the keystone species are in their basin and learn about the benefits, or "ecosystem services," they provide. Supporting these contributors is a great way to help our watersheds thrive.

To better understand how we can steward these species, it is important to learn about their current status and what threats, if any, they are facing. Acting to ensure the health of these species and removing barriers that prevent them from playing their unique ecological roles are cost-effective ways to enhance watershed function and even accelerate restoration.

Across the Pacific Northwest and California, lamprey and salmon function as keystone species due to their "anadromous" life cycle. This means they are born in fresh water, migrate to the ocean to mature, and then return to fresh water to reproduce and die. In a cycle called the "anadromous nutrient pump," their carcasses provide an important source of marine-derived nutrients that contribute to the health and productivity of those who eat them and the watersheds where they live. Invertebrates, birds, and mammals eat and then distribute these minerals across the watershed. Without salmon and lamprey, many inland forests and their inhabitants would become deficient in these critical nutrients that are more abundant in marine ecosystems.

Lamprey and salmon require clear, cold, and copious fresh water to thrive. These important fish are struggling to survive in California and the Pacific Northwest. We need to do everything we can to protect the ones we have left and restore our watersheds to support their recovery into the future.

Chinook Carcass in Dry Creek, Sonoma County, California
A salmon returned from the ocean, reproduced, and died, making its marine nutrients available to this freshwater ecosystem.

A NATIVE KEYSTONE species that helps bring salmon and lamprey back is the North American beaver (*Castor canadensis*). Once abundant across the continent, beaver were hunted to near extinction in the 1800s because their fur was used for making hats and coats. They warrant protection as they are making a slow comeback.

Beaver are wetland engineers who physically modify the environment more than any other non-human organism in the Northern Hemisphere. The dam complexes, bank burrows, canals, and food caches they build have physical and biological effects on the watershed, changing how water flows across the landscape and creating habitat for many rare, threatened, and endangered species.

The dams beaver build spread and slow the flow of water across the landscape, reconnecting this water with the floodplain and encouraging it to rehydrate riparian corridors and their associated meadows and wetlands. When beaver dams spread the water out, creating wetter habitat, they also promote subterranean recharge and the release of water later in the season to enhance base flows. These benefits are especially important now that we are losing snow pack more quickly and droughts are more frequent, intense, and persistent.

In addition to increasing the presence of water, beaver dams have the ability to enhance water quality by trapping sediment, excess nutrients, and even contaminants. One or several dams on a creek or river can act as a buffer in high flows, reducing the intensity of floods. These engineering feats slow and redirect floodwaters across adjacent floodplains, encouraging riparian vegetation, which also works to accumulate sediment and hold existing soils in place. These beaver complexes can help sequester carbon by keeping the area saturated and increasing plant growth. In turn, these wetted areas are less prone to burn and can slow an active wildfire while providing critical refuge to plants and wildlife during and after the fire.

Beaver in Tulocay Creek, Napa County, California
This beaver is eating a willow shoot.

Beaver modifications to the landscape create important habitat for a wide variety of plants, insects, amphibians, reptiles, birds, and mammals. Bank burrows, lodges, canals, food caches, and dams provide cover for aquatic species. These wetlands are teeming with life and provide food and water for many threatened and endangered species such as California red-legged frog, coho salmon, and the willow flycatcher.

While some landowners get frustrated with beaver modifications, there are many inexpensive solutions for mitigating potential damage. When you weigh the benefits, you soon learn that stewarding beaver can be a cost-effective way to increase biodiversity, enhance water quality and quantity, and restore riparian and wetland ecosystems.

RESTORING KEYSTONE PROCESSES

Build Like a Beaver Training with the California Process Based Restoration Network in 2023
OAEC's Kate Lundquist (right) works with Maidu Summit Consortium members and other trainees to build a postless beaver dam analog at the Tásmam Koyóm.

Just as keystone species provide important ecosystem-wide benefits, elemental flows and transfers of energy contribute to the health of our planet. Stretching the keystone metaphor further, we refer to these flows as "keystone processes." As Dr. Art Sussman elegantly describes, "Earth's operating system" is fundamentally based on the fact that "matter cycles, energy flows, and life webs." When functioning properly, keystone processes are those that amplify ecosystem resilience and its capacity to create conditions conducive to life. Another way of thinking about it is to see keystone species as nouns and keystone processes as verbs. A salmon alone is a noun, a singular thing. But the process of the salmon providing nutrients to the watershed when it dies represents a verb, an action. This transfer of marine-derived nutrients is a keystone process that feeds our watersheds.

Our watersheds have many keystone processes at play, chief among them the water cycle. Humans have a massive impact on the water cycle and whether watersheds are able to receive, recharge, retain, and release fresh water. We can leverage this cycle by employing numerous interventions at individual parcel and watershed scales. Instream structures such as beaver dam analogs (the noun in this case) allow restoration practitioners to take advantage of flows (the verb) and as Zeedyk and Clothier suggest, "let the water do the work." Restoration designs depend on comprehensive assessment of the topography, vegetation type, climate conditions, and restoration goals for the site.

When functioning correctly, the fire cycle is another crucial keystone process that contributes to more resilient landscapes. While we often associate fire with destruction, it's essential to understand that many landscapes, plants, and animals are adapted to and depend on high-frequency, low-intensity burns and benefit from the nutrients fires release. In many places, indigenous peoples carried out cultural burns more frequently than we do now. However, European settlers banned

indigenous peoples from utilizing this vital management tool. Colonial fire suppression reduced the cultural practice of using "good" fire on the landscape. This resulted in overstocked forests that are now prone to landscape-scale, catastrophic megafires.

The keystone process of building and sustaining living soil is critical to planetary health. Living soil cycles nutrients, sequesters carbon, increases water-holding and cleansing capacities, and supports millions of life-forms. Modern land management practices often treat soil as dead dirt, overlooking the vast, life-sustaining ecosystems underground. Conventional agriculture imposes synthetic fertilizers and pesticides and, through practices like discing and plowing, leaves the soil bare, destroying its structure and undermining the food web that depends on it. These practices release carbon into the atmosphere, cause erosion, and deliver sediment to waterways. Sediment is one of the most significant sources of pollution to waters in the United States and globally.

Fuels to Flows Training in the Uplands
OAEC trains North Bay Jobs with Justice to restore a gully below a road culvert.

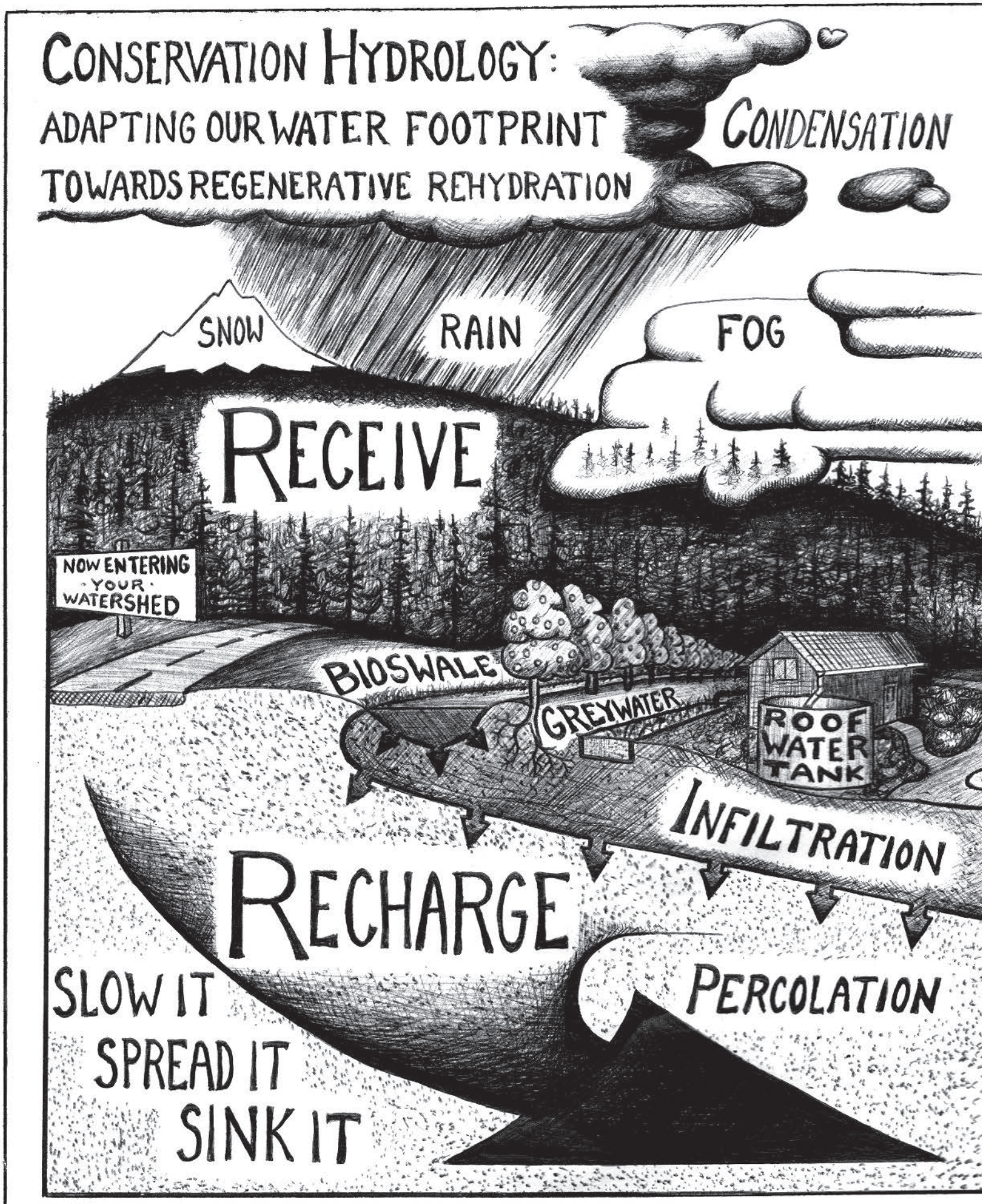
Regenerative soil management practices, on the other hand, include minimizing soil disturbance, no-till cover cropping, compost, planned grazing, and other life-enriching techniques. The rewilding of living soils through the intentional introduction of beneficial bacteria, fungi, and invertebrates can rebuild soil structure and restore the many functions it carries out.

To better integrate keystone processes into our land management and restoration practices, we utilize a methodology called "process-based restoration" (PBR). PBR is a holistic approach to restoring ecological function to degraded watersheds by harnessing keystone processes such as water infiltration, sediment transport, carbon sequestration, nutrient cycling, and fire resiliency. Process-based restoration considers the functions, needs, and source problems across the entire watershed from ridge to river to reef. This design methodology invites us to carefully consider how we can work with the space, time, energy, and materials of the site to support restoration goals in uplands, rivers, wetlands, floodplains, and estuaries. A stewardship mindset guides PBR practices. They are adaptive over time to environmental feedback with the goal of encouraging a self-sustaining, dynamic ecosystem.

As whole-systems thinkers, we can design our watershed restoration treatments to leverage several keystone processes at once. A great example of such an approach can be found at our 80-acre Occidental Arts & Ecology Center demonstration site. Since the 1860s, our uplands have suffered due to repeated clear-cuts and ongoing fire suppression. These uplands have since become overstocked with fuels, have lost precious water and soils through erosion and gully formation, and have contributed sediment downstream. These water quality and quantity impacts have affected salmon spawning and rearing habitat, resulting in fewer fish and thus fewer nutrients being delivered to these forests.

In response, we innovated a process-based restoration framework for the uplands called "Fuels to Flows." We remove excess fuel load through limbing and thinning. We then either place this slash, or "beneficial biomass," on hillslope contours or pack it into upland waterways. Once the landscape is well hydrated, we then carry out prescribed burns to further reduce fuels. The end result is that our uplands are now slowing surface water runoff, recharging shallow groundwater, sequestering carbon, and reducing sediment delivery to critical salmon habitat downstream. From a PBR lens, we like to say that by connecting our fire fears with our water woes, we can turn these fuels into flows.

Humans have an enormous impact on the environment, and if given the proper tools and knowledge about how to leverage keystone processes, we can function as a keystone species as well. How we live our lives can have a huge effect on the watershed. Every day, we have the opportunity as individuals and communities to make choices that can either harm or benefit the Earth's ecosystems. The next section of this publication will give you ideas for making the best choices that provide ecosystem services to those around you.


CONSERVATION HYDROLOGY:
ADAPTING OUR WATER FOOTPRINT
TOWARDS REGENERATIVE REHYDRATION
CONDENSATION
SNOW
RAIN
FOG
RECEIVE
NOW ENTERING YOUR WATERSHED
BIOSWALE
GREYWATER
ROOF WATER TANK
INFILTRATION
RECHARGE
PERCOLATION
SLOW IT
SPREAD IT
SINK IT


WATERSHED AWARENESS
DON'T LIVE WITHOUT IT!
RELEASE
TRANSPIRATION
EVAPORATION
RUN IN
RAIN GARDEN
UNDERFLOW
RETAIN
LET'S KEEP THE CREEK CLEAR, COLD AND COPIOUS... DUDE

What You Can Do: Working on Water Solutions at Different Scales

Watershed issues provide us with many avenues to become involved at multiple levels and over multiple time scales. Some solutions are small and only require making different choices as an individual or family. These can be done today in your home or yard. Other solutions are more complex, requiring behavioral changes in neighborhoods, communities, or cities, with broad-based participation over some years. In order to catalyze changes in water security for future generations, we must implement a whole class of democratic opportunities for social policy change at the county, state, and national levels.

This section offers ideas for how to strategically increase your participation with water security at the home, community, and national levels. For a more exhaustive listing of resources and updated web links, please visit our website at oaec.org/water.

YOU CAN CONSERVE WATER: CHOOSE NOT TO USE!

Practicing water conservation by reducing our demands for water is one of our most powerful acts, individually and collectively. Water conservation has a cascade of positive effects and can influence the overall quantity and quality of available fresh water. Every gallon of water you choose not to use equals one gallon not taken from your river or aquifer. It means the system does not need that gallon's worth of electricity to pump it, nor the chemicals to make it potable. It means that one gallon is not being degraded into "waste" water, which would require additional electricity to pump it again, treat it, and dispose of it in our environment. Choosing not to use water saves water quantity and quality. It saves energy and money. It helps reduce demands on our watersheds. And it helps to mitigate climate change-induced water stresses by reducing the collective water footprint of humankind.

INDOOR WATER CONSERVATION

PROBLEM: Wasteful Fixtures and Appliances

SOLUTION: Retrofit with Efficient Appliances

Numerous studies and reports have conclusively demonstrated that the most cost-effective and water-conservative action you can take over time is to retrofit your home with modern water- and energy-saving fixtures and appliances. Municipalities all over the country offer programs to subsidize or provide low-flow or dual-flush toilets, low-flow shower heads, and water/energy-efficient washing machines, water heaters, dishwashers, etc.

RESOURCES: saveourwater.com; watercalculator.org; watersavingtips.org/act/indoor-water-tips; greywateraction.org/publications/#WWH

PROBLEM: Household Chemicals

SOLUTION: Cease Use and Choose Alternatives

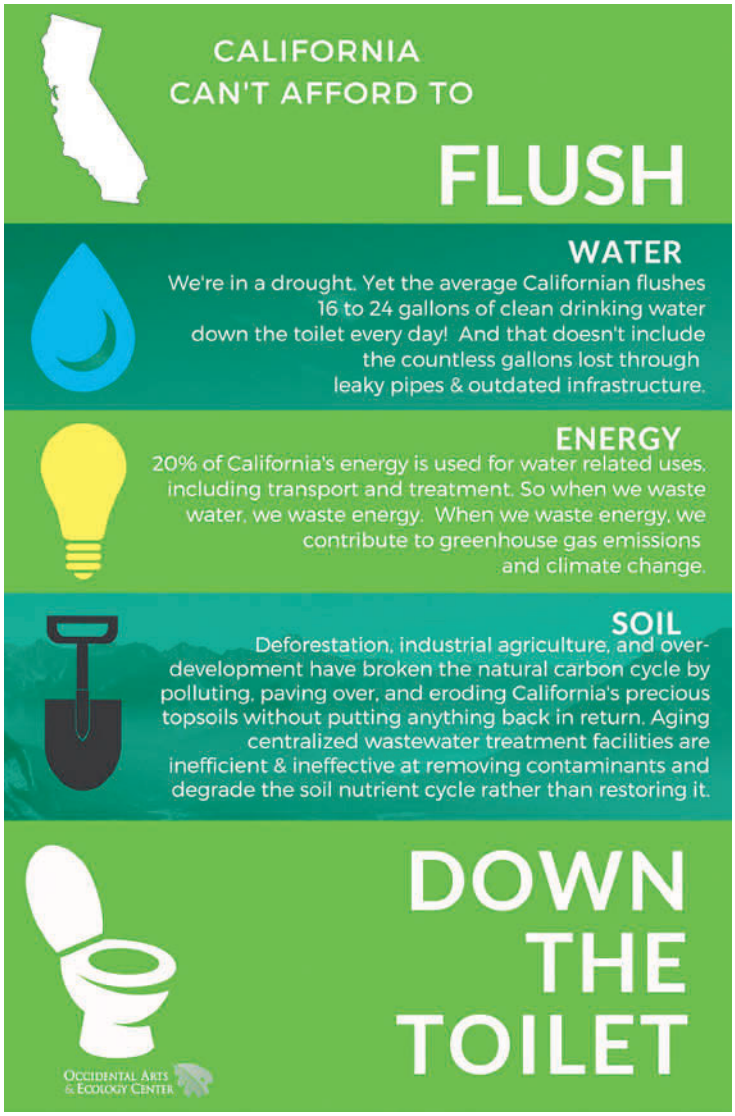
Excessive use of indoor household chemicals—such as pesticide sprays, cleaners, chlorine bleach, oil paints, and solvents—is known to contaminate surface and groundwater, pollute indoor air quality, and harm wildlife. Dramatically reduce or entirely cease use of these toxic products. Many effective less toxic and nontoxic products are available and are healthier for you, your family, and the watershed.

RESOURCES: ewg.org/guides/cleaners;toxicfreefuture.org/healthy-choices-category/your-home/; homesteadingfamily.com/homemade-cleaning-recipes; azurestandard.com/shop/category/household-family/cleaning-supplies/28080

PROBLEM: Flush Toilets Waste Potable Water and Keep Carbon from Returning to the Soil

SOLUTION: Use Waterless Composting Toilets and Urine Diversion Systems

Waterless composting toilets can save billions of gallons of water annually and help cities comply with mandatory conservation measures for drought. These toilets safely process pathogens and ensure public health. They can improve water quality by decreasing pollution of drinking water. Waterless composting toilets and/or urine diversion systems are great replacements for failing septic systems and outdated wastewater infrastructure; they help meet greenhouse gas reduction goals by reducing energy used for water transport and treatment. These affordable, natural alternatives to chemical portable toilets build topsoil through nutrient capture and application of clean compost to living soil ecosystems. These systems sequester carbon and help mitigate climate change.



RESOURCES: greywateraction.org/composting-toilets; phys.org/news/2026-01-recycling-urine-combat-climate-crisis.html; richearthinstitute.org; greywateraction.org/publications/#WWH

"Water is the most critical resource issue of our lifetime and of our children's lifetime. The health of our waters is the principal measure of how we live on the land."

— Luna Leopold, (1915–2006), hydrologist and professor, UC Berkeley

PROBLEM: Pharmaceuticals and Personal Care Products

SOLUTION: Choose Alternatives and Dispose of Properly

A critical area of national concern is the dramatic rise of "emerging compounds," or endocrine-disrupting chemicals in our waters. These pollutants primarily originate through our ingestion of pharmaceuticals and beverages and our use of body care products. We unwittingly pass these products through to our wastewater treatment plants, which are not designed to treat these chemicals. Because wastewater discharge/disposal processes deliver treated wastewater to our rivers, bays, and oceans, these new, toxic cocktails are being found at high concentrations in waterways. They have an alarming effect on wildlife. Never flush unused prescriptions or harsh chemicals down the drain or toilet. Most localities have toxic materials roundups, and some towns offer programs for the legal disposal of unused prescriptions. Use safer and less toxic soaps, biodegradable liquid laundry soaps, non-chlorine bleach, shampoo, etc.

RESOURCES: toxicfreefuture.org/healthy-living/healthy-bodies; ewg.org/skindeep; storyofstuff.org/movies/story-of-cosmetics; blog.thinkdirtyapp.com; calrecycle.ca.gov/epr/pharmasharps; productstewardship.us/products/pharmaceuticals; ewg.org/the-toxic-twelve-chemicals-and-contaminants-in-cosmetics

Single-Use Plastics Wash Ashore and Litter an Entire Beach
Plastic pollution affects watersheds worldwide.

PROBLEM: Single-Use Plastics and Packaging

SOLUTION: Avoid and Advocate

Single-use plastic is ubiquitous, and plastic producers are on pace to triple current volumes by 2050. Microplastics have been found in the deepest ocean trenches; in the snow in the highest mountains; in the tissues of all marine life from plankton to whales; and in the brains, breast milk, testicles, and placentas of humans.

Researchers have identified well over 16,000 chemicals in plastics. Twenty-six percent of those chemicals are known to be hazardous, and 66% have no hazard data available at all.

We are only just beginning to understand the impacts of plastic, but we know enough to recognize that urgent action is needed. Reducing plastic production and use is the only real solution. Try your best to avoid plastics when you can, especially for food packaging and clothing (such as polyester). Individual purchasing choices make a difference for your health and the environment, but we also need collective action to slow, then stop, the production of single-use plastic and to ensure equitable access to safer choices like reuse systems. Use your voice to push for systemic change, especially at the state and local level!

RESOURCES: breakfreefromplastic.org; greenpeace.org/usa/fighting-plastic-pollution; oceanconservancy.org/work/plastics; fibershed.org/programs/education-advocacy

Choose to Reuse
Refillable water bottles like these from OAEC reduce single-use plastics.

PROBLEM: Dependence on Off-Site Sources of Water

SOLUTION: Harvest Roofwater

Another opportunity to augment your water budget is to think of your roof as an "above-ground well." You can harvest significant amounts of water from your roof. One way to estimate this is to consider that for every inch of rainfall on 100 square feet of roof surface, your "above-ground well" yields approximately 55 gallons of water. Safe roofing materials, storage tank size and type, location, conveyance, filtration, and overall costs require careful consideration for this technology to work well. Yet, in most climates, it is actually possible to capture and store most of the potable water you need from the high-quality rain that falls directly on your roof for free.

Roofwater Harvesting System
This system provides enough water for the needs of a family of four. See www.rwh.in for details.

RESOURCES: arcsa.org; www.harvestingrainwater.com; oasisdesign.net/water/rainharvesting; oaec.org/publications/roof-water-harvesting-for-a-low-impact-water-supply; bluebarrelsystems.com/faq; oaec.org/publications/low-cost-roofwater-system

El Cerrito City Hall, California
This landscape combines xeriscaping with a stormwater harvesting rain garden planted with California native plants.

PROBLEM: Lawns and Thirsty Landscapes

SOLUTION: Reduce Lawn Size and Choose Drought-Tolerant Xeriscapes

During the dry season, over 50% of the potable water used by the typical California home is for outdoor use, primarily irrigation for landscapes. Reducing landscape water demand provides a critical opportunity for home water conservation. The best place to start is with reducing the total area of lawn in your landscape. Just the right amount of lawn is great for small-scale lounging and play areas, but as a general ground cover, lawns are highly wasteful. Lawn care requires exorbitant amounts of irrigation water, energy, surface water-polluting nitrogen fertilizers and herbicides, air- and sound-polluting equipment, and significant maintenance time and money. Instead, select winter rain- and summer drought-adapted and native plants for your beautiful new water-saving, edible, butterfly and hummingbird-friendly xeriscape. Choose and maintain a highly efficient drip irrigation system for those plants that need some supplemental irrigation.

RESOURCES: calscape.org/save-water; calrecycle.ca.gov/organics/landscaping; stopwaste.org/at-home/home-and-community-gardening; ebmud.com/water/conservation-and-rebates/rebates/lawn-conversion-rebate; bewaterwise.com/turf-replacement-program.html; www.surfrider.org/programs/ocean-friendly-gardens; foodnotlawns.com; resilientlandscapescoalition.org

PROBLEM: Pesticides, Herbicides, and Fertilizers

SOLUTION: Cease Use and Choose Safer Alternatives

Excessive misuse of toxic fertilizers, herbicides, and pesticides is known to cause harm to human and watershed health. Reduce or eliminate the use of these toxic garden products. To help ensure the safety of your family and watershed, choose from the many products that allow your landscape to be maintained organically.

RESOURCES: pesticide.org; beyondpesticides.org; panna.org; xerces.org/pesticides/waters

Storm Drain Signage
These signs help citizens make the connection between stormwater runoff and the health of bodies of water.

PROBLEM: Irrigation with Potable Water

SOLUTION: On-Site Residential Gray Water

Use of residential gray water generated on-site is legal in California, although each county and city has its own permitting process. Whether you use a laundry-to- landscape or a branched drain—systems developed by Art Ludwig, on-site gray water irrigation reduces the demand on potable water for irrigation. It also reduces the overall amount of wastewater and the electricity needed to pump it away for centralized treatment and then pump it back to you as recycled wastewater via a purple pipe.

RESOURCES: oasisdesign.net/greywater; greywateraction.org; oaec.org/publications/legal-graywater-design-for-small-scale-applications-in-california

PROBLEM: Dehydrated Landscapes

SOLUTION: Build Rain Gardens and Bioswales

Think of your home and yard as your own watershed. Numerous opportunities exist in your landscape to design and implement stormwater harvesting systems—known as rain gardens, bioswales, contour infiltration ditches, natural drainage networks, and so forth. The use of these structures will allow you to offset the impact of impervious surfaces on your land. After your roof water cistern, the next best place to store water is in the soil. If your soils are not appropriate for infiltration, a biofiltration design will ensure that the water leaving your yard will not be a source of pollution or contribute to flood flows. The stormwater harvesting structures should be designed to store winter rain in the soils so that it is available in the dry season as sub-surface irrigation for your native, wildlife-friendly, edible landscape. In the long term it will be ideal to not only live and eat within your edible landscape, but also to live and drink within your potable landscape.

RESOURCES: raingardennetwork.com; www.harvestingrainwater.com; goodreads.com/book/show/13579993

Glencoe Rain Garden, Portland, Oregon
This vegetated infiltration basin works to store, recharge, and filter street runoff of stormwater pollutants.

"Water links us to our neighbor in a way more profound and complex than any other."
— *John Thorson, author,* Tribal Water Rights

YOU CAN ORGANIZE YOUR BASIN OF RELATIONS

We are perched on the tipping point of a "watershed moment." From the global scale to the local scale, we are faced with a multitude of issues and decisions that will determine the future our children will inherit. The time is now for our communities to come together, setting in motion the plans and processes to ensure that our watersheds remain healthy in perpetuity. Viewing your watershed as a shared Basin of Relations allows you and your neighbors to truly define the boundaries of your community and organize around meaningful, lasting local social security. Each process, like every watershed and its associated community, is unique. Oftentimes you will find that certain local, city, county, state, and federal jurisdictions are ready and waiting to collaborate with these efforts. In the absence of support from the local community, it is often impossible to achieve measurable objectives and resource management goals, especially in areas where the majority of the land is in private ownership.

PROBLEM: Disconnected Watershed Communities

SOLUTION: Form a Watershed Group

Nationally, one of the great unrecognized environmental movements is the dramatic growth of community-based watershed health groups. Riverkeeper organizations, friends of creeks groups, and watershed councils are springing up all over the country. Some are homespun at the kitchen table, and some are top-down, large-scale, and include all levels of bureaucracy with a multi-partner approach. Quite possibly one of these already exists in your area. If not, then you can initiate a dialogue in your community about starting such an effort.

RESOURCES: epa.gov/nps/watershed-capacity-building; ucanr.edu/site/watersheds-los-angeles-and-ventura-counties/watershed-u;epa.gov/waterdata/hows-my-waterway

PROBLEM: Lack of Watershed Literacy and Ecological Literacy

SOLUTION: Work Within the Community to Offer Diverse Educational Opportunities

Educational programs are great ways to involve and build participation in a newly started watershed group. There are many ways to improve the state of knowledge about water in your community. Invite knowledgeable watershed people to publicly address your neighborhood association, social club, congregation, school, or tribal or city council. To help interpret the condition of your local area, organize watershed walks with community members who have specific knowledge. Host an event to stencil or install signs that remind neighbors to keep toxins out of storm drains. Make and publicly display maps of your watershed. Implement a watershed and creek road signage program to improve watershed literacy, as people are much more likely to relate more strongly to watersheds and creeks they can name. Increase your ecological literacy and learn who lives in your watershed by participating in the Christmas Bird Count or iNaturalist bioblitzes or by becoming a Master Naturalist.

RESOURCES: thewatershedproject.org; watereducation.org/project-wet; inaturalist.org; oaec.org/publications/beaver-in-california; audubon.org/conservation/science/christmas-bird-count; mavensnotebook.com; ucanr.edu/program/uc-environmental-stewards

Seasonal Watershed Signs, Occidental, California
The WATER Institute co-created these signs to inspire better watershed stewardship.

OAEC's First Basins of Relations Training in 1999 *– Students learn about salmon habitat restoration techniques.*

PROBLEM: Communities Are Vulnerable to Wildfire

SOLUTION: Work with Your Community to Implement Fire-Safe Practices

Learning to live in a fire-dependent ecosystem means adapting and preparing for fire in our homes and communities, especially those of us living at the wildland–urban interface (WUI). While we can't fireproof our living and working spaces, we can reduce risks by removing combustible materials around our buildings and making small changes that improve a structure's chance of surviving a wildfire and ember storm. Home hardening includes safety or infrastructure improvements within Zone 0—the 0–5 feet around and 10–20 feet above buildings. Defensible space involves cleaning up vegetation within 100 feet around buildings. This creates a buffer between structures and the surrounding area. There are many organizations who can help your community fund these efforts and organize yourselves to become better prepared for fires when they arise.

RESOURCES: saferwestcounty.org; firesafemarin.org; readyforwildfire.org/prepare-for-wildfire/hardening-your-home; readyforwildfire.org/prepare-for-wildfire/defensible-space;.youtube.com/watch?v=k3IndRBq7pE&list=PLXrLfMzDbA4WgkTZk6g_T7cCQSW_QgnY7; nfpa.org/education-and-research/wildfire/firewise-usa; cafiresafecouncil.org

PROBLEM: Wildlands Are Vulnerable to Wildfire

SOLUTION: Reduce Fuels While Restoring Habitat

The legacy scars of extractive land use and colonization in California have left our watersheds in dire hydrological condition and vulnerable to catastrophic wildfires. There is much to do to prepare areas within and beyond the WUI. Large-scale, statewide efforts to reduce fuel load from our wildlands generate millions of tons of woody "slash." Currently, the standard practice is to burn it, haul it away to processing facilities, or dispose of it through other fossil fuel–intensive means. There is a broad suite of holistic practices we can implement to reutilize this beneficial biomass on-site while achieving multiple restoration goals. Consider gully stuffing, habitat piles, chipping, prescribed burning, prescribed grazing, and other low-cost techniques to prepare wildlands for fire

OAEC Staff Carry Out a Prescribed Burn*—this burn was conducted after restoring the uplands with beneficial biomass generated from the thinning of fuels.*

while restoring ecological function, sequestering carbon, building soil, increasing water filtration and recharge, and creating habitat.

RESOURCES: oaec.org/our-work/wildlands/fuels-to-flows; calpba.org; allhandsecology.org/fire-forward; rangelands.ucdavis.edu/blog/expanding-prescribed grazing-wildfire-resilience-california

PROBLEM: Lack of Awareness for How Process Can Enhance Watershed Restoration Efforts

SOLUTION: Work with Restoration and Regulatory Communities to Increase Literacy and Implementation

There is much to be gained from integrating process-based restoration principles across the watershed from ridgeline to river mouth to reef. There is a growing movement of practitioners working toward greater integration of these practices to create conditions that allow keystone processes to do the work. These nature-based solutions are gaining momentum across the state through the strategic outreach, education, and field trainings provided by entities such as the California Process Based Restoration Network. Consider creating or joining existing process-based restoration networks to increase our collective capacity to design, implement, and monitor these important techniques.

RESOURCES: calpbr.org; lowtechpbr.restoration.usu.edu; riverscapes.net; academic.oup.com/bioscience/article/71/8/831/6307424

PROBLEM: Beaver Are Considered a Nuisance

SOLUTION: Share Beaver Stewardship Strategies with Landowners and Agencies

Many people are not aware of the ecosystem services beaver can provide. This lack of awareness often leads to mismanagement, to the detriment of sensitive species recovery and water supply security for humans and wildlife. There is a great need to share this information, especially with those communities living with beaver, the agencies that work in these areas, and the decision-makers who dictate how these beaver are managed. To ensure greater stewardship, educate yourself further about beaver; host a talk or screen a movie about beaver in your community; share the WATER Institute's beaver stewardship guidebook; let people know that beaver advocates are available to offer advice and site visits and to provide technical and financial resources to implement nonlethal strategies through the California Beaver Help Desk; convene meetings for partners to express their concerns and explore options for beaver coexistence; talk to decision-makers and resource agencies about how to coexist with beaver; work with the California Department of Fish and Wildlife's Beaver Restoration Program to support better beaver management; or start a beaver festival to celebrate the importance of this keystone species.

RESOURCES: oaec.org/beaver; oaec.org/publications/beaver-in-california; calbeaverhelp.org; wildlife.ca.gov/conservation/mammals/beaver; slobeaverbrigade.com; sierrawildlife.org; martinezbeavers.org; fairfieldbeavers.com; beaverinstitute.org; beaversnw.org; thebeaverbelievers.com; chelseagreen.com/product/eager

North American Beaver *(Castor canadensis)*

PROBLEM: Lack of Knowledge about Your Watershed's State of Health

SOLUTION: Prioritize Systematic and Standardized Watershed Assessments

Once a community has self-identified their intention to work collaboratively on behalf of their watershed and thus themselves, it is critical to understand the overall state of the health of the watershed. There are a number of watershed assessment approaches. The greater the community knowledge of their watershed, the more strategic they can be in targeting high-priority issues. Watershed assessments help ensure that investments of community time and money towards watershed restoration will yield the highest return possible.

RESOURCES: cwp.org; water.usgs.gov/wsc/assessment.html;epa.gov/nps/handbook-developing-watershed-plans-restore-and-protect-our-waters

PROBLEM: Municipal Use of Potable Water

SOLUTION: Localize and Augment Water Sources Through Conservation, Reuse, and Harvest

Irrigating with high-quality and precious potable water is a poor use of this energy-intensive, limited resource. Many cities rely on fresh water that comes from other watersheds or from limited groundwater. More and more municipalities are providing recycled or treated wastewater via purple pipe systems to prevent wasting our highest quality potable water for landscape irrigation. Find out if your municipality is recycling its water, and if not, talk to your city staff about what it would take to implement such a program. Work with your water district to develop a more localized water conservation, reuse, and augmentation program.

RESOURCES: cowa.org; whollyh2o.org; waterboards.ca.gov/water_issues/programs/#waterrecycling; waterboards.ca.gov/water_issues/programs/recycled_water; oaec.org/our-work/projects-and-partnerships/ca-decentralized-water-policy-council; localizingcaliforniawaters.org

Russian River First Flush
Water quality sampling equipment is used to monitor pollutant levels in the Russian River.

PROBLEM: Degraded Water Quality

SOLUTION: Support or Start Water-Quality Monitoring Programs

Citizen-based water-quality monitoring is an accessible and meaningful way to understand the health of your waterways. These surveys can pinpoint and prioritize pollution-source problems that should be addressed. If a standardized water quality or first flush program already exists in your watershed, then volunteer to participate. If no program exists, consider working with your neighbors and the appropriate technical/regulatory agencies to develop a water-quality monitoring program. If you desire to use the results of your monitoring to actualize restorative changes, it is critical that your sampling protocols are standardized for quality control and assurance. Water monitoring can be a great way to get outside and do something hands-on. There are a number of easily replicable models for water monitoring, and the process of implementation is often highly empowering for people. Organizing an afternoon creek cleanup program is another way to entice neighbors to participate in improving water quality.

RESOURCES: waterboards.ca.gov/water_issues/programs/swamp; epa.gov/nps/nonpoint-source-volunteer-monitoring; thewatershedproject.org/our-programs/healthy-watersheds/first-flush-monitoring; epa.gov/nps/watershed-approach

You Can Work for Systemic Policy Changes for Water Security

Considering the importance of water, it is essential to involve yourself in the politics of water resources. Do you know the members of your local, city, county, or regional water board? Or of your irrigation district, planning commission, board of supervisors, or city council? How about your state and federal legislators? How do they make decisions? Have you participated in the democratic process of helping them make decisions? Have you ever thought about running for a local office yourself?

Ultimately, lasting change will have to occur via the arenas of politics and democratic decision-making. We the People are responsible for sane water policies and laws through our legislative, executive, and judicial branches. Metaphorically, you could conceive of these three branches as social watersheds. At the confluence of these three watersheds, the health of the "mainstream" is only as good as the health of each contributing watershed branch. It is our collective responsibility to make sure each branch of our democratic structure crafts adequate supportive conditions to care for our collective water resource.

PROBLEM: Land Use Planning That Is Water-Illiterate

SOLUTION: Participation of Watershed Citizens in Land Use Planning at All Levels

The General Plan for a city or county is the "land use constitution" of that jurisdiction. It is therefore imperative that whenever your city or county updates your General Plan, watershed citizens must participate. The process of deciding and designating which land uses will be allowed where in the watershed is a critical point of participation. These decisions will determine the future development of your watershed. Support and promote legislation that would require all city and county General Plans to have a standalone Water Element, which consolidates all things water-related into one section of the plan. A short list of arenas to be considered includes water supply, wastewater disposal/reuse, surface and groundwater management, streamside setbacks, fisheries recovery, flood protection, import and export issues, dams and reservoirs, water conservation, development of water budgets, and watershed planning.

RESOURCES: treepeople.org/safe-clean-water; civicwell.org/civic-resources/gws-2024; civicwell.org/program-area/water; sierranevadaalliance.org/wp-content uploads/2019/12/PlanningforWaterWiseDevelopment.pdf; solano.com/products/water-and-land-use; lowimpactdevelopment.org; lci.ca.gov/planning/general-plan

PROBLEM: Industrial Agriculture Using and Polluting the Majority of Our Water

SOLUTION: Implement On-Farm Water Conservation and Protection Programs

In California, agriculture uses an estimated 60–80% of the state's developed water supply. We recognize the critical importance of agriculture as an economically viable producer of food. By the same token, agriculture must bear a proportionate level of responsibility to ensure that our water is used wisely and not degraded. It is critically important to participate with your elected representatives in framing the water-related language of our national Farm Bill. Many sectors of the agriculture community have effectively implemented creative approaches to water conservation and protection, yet much work still remains. Selection of dryland climate-appropriate crops is important. Advanced erosion-control practices, tailwater management, dramatic reduction in the use of toxic fertilizers and pesticides, and highly efficient irrigation technologies are all urgently needed.

RESOURCES: agwaterstewards.org; https://ucanr.edu/site/small-acreage-landowners/water-quality; nrcs.usda.gov/programs; aginnovations.org/project/california-roundtable-on-water-and-food-supply; calclimateag.org

PROBLEM: Groundwater Depletion and Degradation and Land Subsidence

SOLUTION: Enforce the Management and Protection of All Groundwater

Unlike many other western states, California had not historically regulated the withdrawal of groundwater, until it passed the California Sustainable Grounwater Management Act in 2014. This long-overdue act was passed in response to numerous groundwater basins experiencing overdraft resulting in serious decline in water tables and water quality and in some places, mass subsidence of land. The recognition that surface water and groundwater are not separate resources is critically important to the health of watersheds overall.

RESOURCES: water.ca.gov/groundwater; ppic.org/publication/groundwater-in-california; groundwater.org; pubs.usgs.gov/circ/circ1139/pdf/circ1139.pdf; groundwaterresourcehub.org/where-we-work/california/streamflow-is-groundwater

PROBLEM: Reduced Flows in Streams and Rivers Limiting Aquatic Life

SOLUTION: Implement Programs to Ensure Minimum Flows for All Waterways

We must require and support the enforcement of programs such as the Policy for Maintaining Instream Flows in Northern California Coastal Streams to protect the instream flow regimes of all waterways. The California State Water Resources Control Board must be more proactive in their application process for water rights, supporting a timely process for applicants. Yet we also must ensure that watersheds are not over-allocated to the detriment of healthy instream flows. Statewide, we need programs that create the conditions for water conservation, reuse, and augmentation. These must mandate environmental water reserves, keeping water in the environment and unavailable as a means to justify growth. We need to develop creative programs to store winter water and acquire seasonal water rights, with forbearance agreements to prevent excessive dry season withdrawals and to ensure adequate water supply. Exported water should be limited and not allowed to leave a watershed until all human and environmental needs are satisfied there. Urban areas need to ensure that their Urban Water Management Plans are written to protect water resources and instream flows.

RESOURCES: wildlife.ca.gov/Conservation/Watersheds/Instream-Flow; instreamflowcouncil.org; sanctuaryforest.org/programs/water-stewardship/tanks-forbearance-program; oaec.org/news/russian-river-coho-partnership-concludes-a-decade-long-collaboration; waterboards.ca.gov/waterrights/water_issues/programs/instream_flows; groundwaterresourcehub.org/where-we-work/california/streamflow-is-groundwater; water.ca.gov/Programs/Water-Use-And-Efficiency/Urban-Water-Use-Efficiency/Urban-Water-Management-Plans

PROBLEM: Corporate Privatization of Water

SOLUTION: Manage Watershed for Local Control and Protection of Water Resources

Increasingly, communities are becoming dependent on bottled water and multinational corporations that provide municipal water services. Water must be considered a human right. It is a shared, common wealth resource, not a corporate commodity to be sold to the highest bidder. Ironically, in many cases—as a result of watershed mismanagement and clever corporate marketing—communities distrust their local water supplies and become dependent on expensive filtered and bottled water instead of their own tap water. The best way to secure an economically sustainable source of pure water for your community will always be to properly protect and manage your watershed.

RESOURCES: foodandwaterwatch.org/insight/water-privatization-facts-and-figures; citizen.org/documents/top10-reasonstoopposewaterprivatization.pdf; c-win.org/privatization

RECOMMENDED BOOKS TO START YOUR NEW WATER LIBRARY

Fresh Water
E. C. Pielou, 1998.
University of Chicago Press, Chicago, IL.

Introduction to Water in California
David Carle, 2004.
University of California Press, Berkeley and Los Angeles, CA.

Rainwater Harvesting for Drylands: Volume 1 and 2
Brad Lancaster, 2006 and 2008.
Rainsource Press, Tucson, AZ.

Totem Salmon: Life Lessons from Another Species
Freeman House, 1999.
Beacon Press, Boston, MA.

Eager: The Surprising, Secret Life of Beavers and Why They Matter
Ben Goldfarb, 2018.
Chelsea Green Publishing, White River Junction, VT.

Water: A Natural History
Alice Outwater, 1997.
Basic Books, New York, NY.

Water in Plain Sight: Hope for a Thirsty World
Judith D. Schwartz, 2016.
St. Martin's Press, New York, NY.

Watersheds: A Practical Handbook for Healthy Water
Clive Dobson & Gregor Gilpin Beck, 1999.
Firefly Books, Buffalo, NY.

The Water-Wise Home: How to Conserve, Capture, and Reuse Water in Your Home and Landscape
Laura Allen, 2015.
Storey Press, North Adams, MA.

Low-Tech Process-Based Restoration of Riverscapes Design Manual
J. M. Wheaton, S. N. Bennett, N. Bouwes, J. D. Maestas, & S. M. Shahverdian, 2019.
Utah State University Restoration Consortium, Logan, UT.

"It makes better sense to reshape ourselves to fit a finite planet than to attempt to reshape the planet to fit our infinite wants."
— David Orr, author and professor, Oberlin College

IS YOUR WATER BUDGET BALANCED?

For a moment, consider water in budgetary terms. Successful businesses must account for income and expenses in order to ensure profitability. Yet how many cities or counties actually have balanced income and expense budgets for their water resources? In simple fiscal terms, most municipalities are operating deeply in the "red" with ecologically and socially damaging hydrological deficits. Typically the demand or expense side of their water budgets far exceeds their income streams. Impervious surfaces such as roads, parking lots, and compacted fields impede water's ability to make deposits that could recharge groundwater savings accounts.

Ever-increasing reliance on overdrafted groundwater accounts will leave our grandchildren with unrecoverable and undrinkable debts, as many of the world's watersheds verge on hydrological bankruptcy. Unlike corporations and people, our watersheds cannot file for bankruptcy and then just reorganize. Direct deposits of freshly distilled rain and snow are the annual allowance—the only real renewable income source on Planet Water.

Expenditure of our groundwater public trust reserves should be limited to the annual earned interest income of infiltration, with the principal left untapped. All life-forms are shareholders with a fixed interest in ensuring that our watershed economies remain viable and continue to operate in the blue.

Do you know where your watershed is tonight?

What watershed supplies your water? What watershed do you live in?

Are they the same? What do you use water for?

How safe do you believe your water supply to be?

Where do you get your drinking water?

How long have you been dependent on bottled water?

Would you like to restore your own local drinking water supply?

WATER INSTITUTE

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