GOLDEN TOGETHER

Policy Paper #5, JULY 2024

Water Abundance

Prepared by Golden Together, A Movement to Restore the California Dream

Foreword

‘Water, water everywhere, nor any drop to drink.” The famous couplet from Coleridge’s Rime of the Ancient Mariner captures the extraordinary, self-imposed disaster California is now experiencing when it comes to water.

Nature provides us with the great bounty of almost unlimited amounts of water every year, including millions of acre feet deposited every winter as snow in the Sierra Nevada. And yet at the same time we lurch in and out of “drought”, water prices rise to extortionate levels, citizens are told to avoid having showers and other “unnecessary” water use, and around a million of our fellow Californians do not have access to reliable, clean drinking water. Perhaps most shamefully of all, one of our great industries - agriculture - which feeds not only the rest of America but the world, is being systematically and deliberately assaulted and crushed by wrong-headed government policies designed to ration water.

How is this progress? It is not. It is a conscious policy of ideologically-driven scarcity that is crushing communities and businesses, and it is long past time for change: time for a new approach based on positive, common sense ideas and a mindset of growth and water abundance.

Californians now have an opportunity to participate in a project that is massive both in its scale and in its promise: to modernize and transform our water infrastructure in a way that fundamentally improves standard of living and the health of our environment.

We have the opportunity to invest in a series of projects that will guarantee a future of abundant water, instead of what we have now - man-made water scarcity. These projects will need to be on a scale comparable to California’s first State Water Project, initiated in 1957 and largely completed by the early 1970s. With what we’ve learned since then, these new projects can be implemented in a way that minimizes environmental impact - in fact yields benefits to the environment. In doing so, we can set an example to an increasingly water-stressed world.

In this report we present detailed information on the water project categories that are available to us as we invest in water abundance, including surface storage, aquifer storage, floodwater diversions, urban runoff harvesting, wastewater recycling, and desalination. We advocate a wholehearted embrace of the emerging discipline of “Slow Water”, a more natural approach to water storage and distribution. In some cases we identify specific noteworthy project proposals, such as the concept of ‘Fish Friendly Delta Diversions’, a tremendously innovative idea that has the potential to safely deliver an extraordinary amount of water for a surprisingly low investment.

In all cases, wherever possible, we estimate how much investment will be required in exchange for how much new water would be supplied each year.

Overall, we conclude that a capital investment of $150 billion is required, to be provided by private and public sector funds without any overall increase in public spending or taxes. This investment would develop new water supply infrastructure capable of meeting all our needs (delivering 10-15 million acre feet per year). But it would also upgrade and repair our degraded or obsolete water infrastructure which currently represents such a dangerous vulnerability to extreme storms and earthquakes, and also disproportionately harms low income communities.

Our recommendations not only include suggested mechanisms to secure funding of the required magnitude, but specific legislative and regulatory reforms and revisions that are essential if we are to have any chance of investing this money in a cost-effective and timely manner.
In preparation of this report I would like to thank Kristi Diener, Steven Greenhut, Marc Joffe, Jennifer Hernandez, Valerie Kincaid, Martin Ludlow, Mike Ming, Lisa Ohlund, Aytom Salomon, Steve Sheldon, Geoff Vanden Heuvel, Gene Voiland, Wayne Western, Don Wright, and the California Policy Center's Edward Ring, who is lead author on this and all our policy papers.

California is a state of incredible wealth with an unparalleled culture of innovation. Accepting scarcity - of water, or, for that matter, anything else - is contrary to who we are and squanders our capabilities. We can achieve water abundance, and in the process we will improve our quality of life, lower our cost of living, improve the environment, deliver sustainability to our ecosystems, fairness to all our communities, and set an example to the world. Let's do it!

Steve Hilton
Founder, Golden Together
California, July 2024

Keypoints

- California is now home to nearly 40 million people but is utilizing a water infrastructure that was designed for 20 million people.

- The impact of climate change, conservation steps already taken, and today's water requirements for people, agriculture, and the environment, mean that conservation alone is no longer a viable water management strategy in California.

- Shamefully, nearly one million Californians do not have access to safe and reliable drinking water supplies.

- A strategy of sustainable abundance will deliver affordability, resilience, and fairness, for water and for everything dependent on water including new homes and food production.

- Cost effective projects in agricultural and urban areas can embrace the emerging "Slow Water" Movement, creating percolation basins and corridors to reclaim water's natural, slow cycles that "aim to collaborate with water rather than try to control it."

- Investment in diverse categories of water supply infrastructure can deliver 10-15 million acre feet per year of reliable new water at an estimated cost of $75 billion.

- To achieve total water security, upgrades to existing infrastructure including levees, water treatment, and replacing toxic and leaking pipes will cost another $75 billion.

- Securing an investment of $150 billion is possible through a combination of guaranteed allocations from the state General Fund, regional initiatives, state and federal loan programs and grants, and private investment.

- We recommend allocating two percent of California's General Fund budget to help finance water projects. Since the General Fund has more than doubled in the past decade, this can be revenue neutral through cutting wasteful and ineffective programs.

- Maximizing return on investment in water supply and water quality infrastructure is not possible without fundamental revisions to the legislation and regulations that currently govern water management and the water project approval process.

Introduction

Californians today are living with water scarcity, and the water we do have access to is threatened. For example, millions of Southern Californians depend on water pumped out of the Sacramento-San Joaquin Delta into southbound aqueducts. One big earthquake could collapse some of the over 1,000 miles of aging levees that protect the Delta's below-sea-level islands, and salt water from the San Francisco Bay would pour into the Delta. If that happens, it would be years, if ever, before the fresh water status of the Delta would be restored.

While an earthquake that destroyed levees in the Delta would be a terrifying disaster, for most of the 21st century, Californians have not had enough water. Not only have we outgrown the infrastructure we rely upon to supply water to our farms and cities, but we now face a new threat. Climate change. Longer droughts. Hotter summers. Less rainfall. Extreme weather.

The problems caused by California's now undersized water infrastructure are compounded by water agency efforts to leave more water in the rivers to benefit fish populations. This has led to escalating restrictions on how much water can be stored and diverted for agricultural and urban use. Between 1967 and 2000, the State Water Project delivered 100 percent of its contracted allocations to farmers in all but seven years. Since 2000, permitted allocations to California's farmers only hit 100 percent once, in 2006, and have averaged under 50 percent more often than not. In response, farmers adopted drip irrigation, which conserves water but no longer replenishes aquifers the way flood irrigation does. To keep orchards alive and sustain row crops, California's farmers tapped those aquifers, overdrafting many to the point of near collapse. Without State Water Project allocations, and without access to groundwater, up to a million acres of California farmland are at risk of being taken out of production.

The consequences of water scarcity have not only affected our farm economy. According to a 2024 report released by the State Water Resources Control Board, we now have almost 400 municipal water systems serving nearly a million Californians that don't meet state requirements for safe and reliable drinking water supplies. The report also finds that two thirds of these failing systems serve communities of color, half of them also coping with poverty and pollution. On top of that, an estimated 1.8 million Californians now get their drinking water from systems considered at risk of failing. Many of these systems first became compromised because of groundwater overdrafting, a problem that would never have occurred if our water infrastructure had remained capable of harvesting and delivering abundant water to our farms and cities.

The policy response to water scarcity in California is invariably the same: conserve. Ration urban water consumption with flow restrictors, dual meters, and outdoor “xeriscapes.” Take millions of acres of farmland out of production. Leave higher percentages of water in the dwindling rivers as unimpaired flow. Demolish dams. Make do with less.

Neither climate change alone, nor this policy response, is the most accurate description of our challenge or the most sensible strategy to move forward. While few people would deny that our climate is changing, conservation alone is a dangerously flawed approach.

If we are destined to experience more extreme weather, then we must diversify our sources of water supplies, and we must invest in water infrastructure that can capture and store the millions of acre feet that inundate the state during very wet years, so there is plenty of water saved and available during the ensuing dry years. And if summers are getting hotter, then we should have the means to store more water not only to sustain our farms and cities, but to release into our threatened aquatic ecosystems to preserve them.

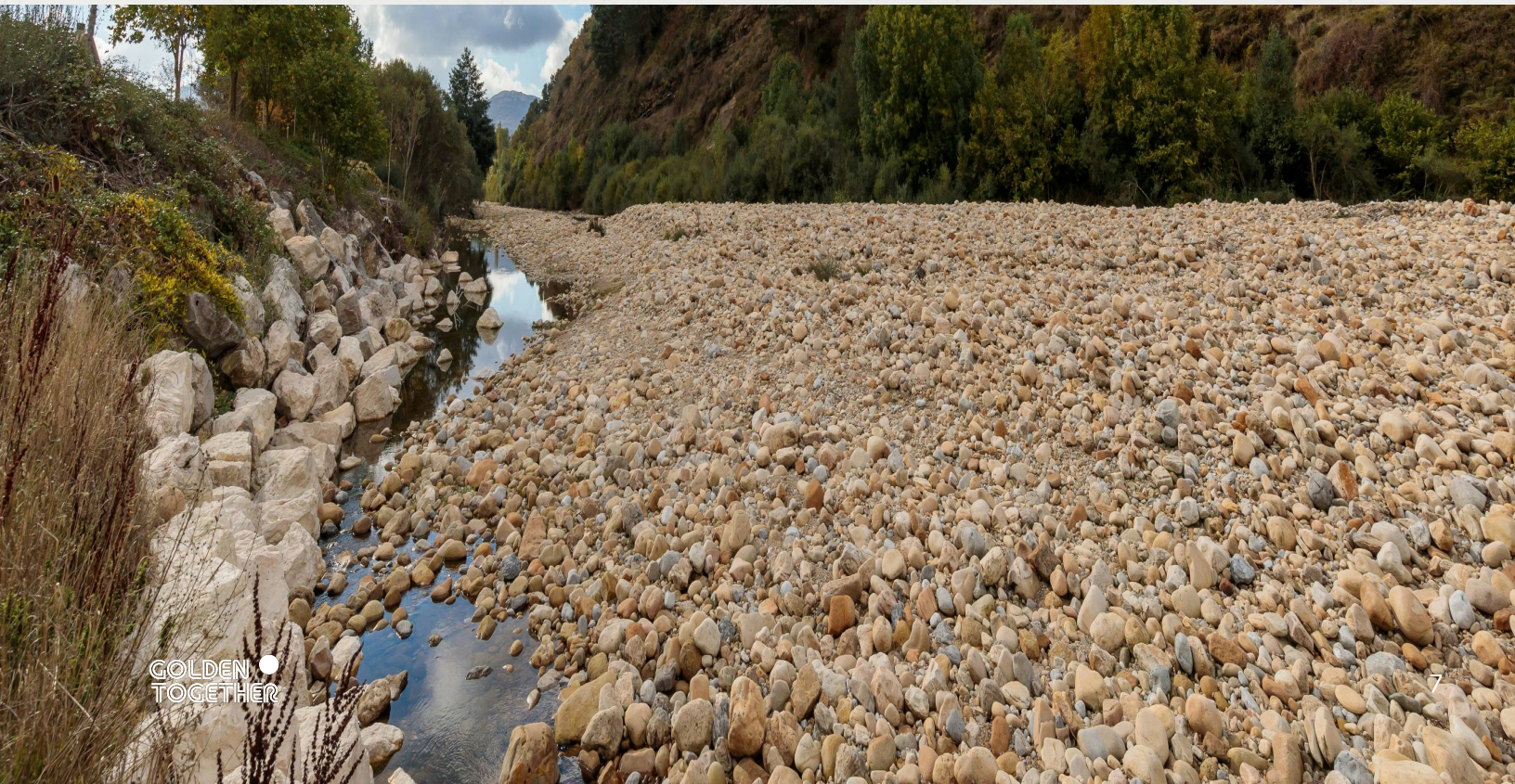
In short, climate change means we should be even more focused on making investments in water supply and storage, not less. Creating the capacity to have a perennial, reliable and affordable supply of abundant water is a hedge against climate change, not a denial of its existence. Conservation alone leaves farms, cities, and ecosystems alike all vulnerable to disruptions with fatal consequences. By contrast, designing surplus supply into our water systems will help us develop the resiliency to withstand anything that climate change, or any other serious crisis, may someday throw at us.

This principle - that we must upgrade our water system to produce abundance - is the foundational theme of this policy document. Following from this principle, our focus will be on specific projects - either completely new ones or upgrades of existing ones - that are necessary to achieve the goal of abundance. Consequently, the policies we recommend will be designed to create the legislative, legal, and financial means to realize these projects.

This expression of our priorities is not meant in any way to diminish the importance of reasonable measures to encourage water conservation. Nor are they intended to ignore the absolute necessity of protecting our ecosystems.

Our aim is to offer a set of water policy recommendations that balance the needs of people, our great industries, and the environment, that recognize the role that water conservation needs to play, but does so from a perspective that prioritizes a goal of abundance and resiliency through a massive new program of next generation water infrastructure projects.

We have learned a lot since the first water plan was initiated in California in 1957. There are ways to achieve water abundance today at the scale that was implemented then, but to do so while minimizing negative environmental impacts. These projects will inevitably have a footprint, but we believe it can be one that gives back as much as it takes from the environment.



What Happened - From Abundance to Scarcity

Supplying water to California's nearly 40 million people poses unique challenges. Most of the state's population resides in relatively arid coastal cities, mostly in the southern part of the state, but most of the rainfall and runoff happens in our mountainous north and east. California is also blessed with over 40,000 square miles of some of the most fertile farmland on earth, with the not insignificant caveat that roughly 10,000 square miles of California's most productive farm acreage requires irrigation.

To deal with the challenge of delivering adequate water to the state's growing population and growing farm economy, in May 1957, Harvey Banks, then director of the California Department of Water Resources, submitted "The California Water Plan" to the governor and state legislature. On page 14 of Part One of this comprehensive document, Table 3 depicts what Banks and his team determined to be the "Estimated Present and Probable Ultimate Mean Seasonal Water Requirements." The scale of their ultimate expectations reveals the magnitude of the challenge they had accepted.

At the time, the estimated statewide water requirements were 19.0 million acre-feet (MAF) per year for agriculture, which they estimated would ultimately peak at more than double that amount, 41.1 MAF per year. The total urban and miscellaneous use per year at the time was 2.0 MAF per year, which they estimated would eventually quintuple to 10.0 MAF per year. In all, California's mid-century water planners intended to build infrastructure capable of delivering to farms and cities 51.1 million acre-feet per year.

This is a fascinating statistic, because this ultimate goal, set over 65 years ago, would easily deliver water abundance for California's farms and cities today. The California Water Plan, which resulted in the State Water Project, called for a system of dams, reservoirs, aqueducts and pipelines that, overall, would capture water from California's northern rivers and transport it to farms and cities in the state's arid south. It wasn't the only project of its kind. The Federal Bureau of Reclamation had already been constructing the Central Valley Project, also designed to move water from Northern California rivers down to the state's southern farms and cities. And these massive engineering projects were undertaken in addition to regional projects already completed, such as the Hetch Hetchy Reservoir, completed in 1923 to deliver water 167 miles from the Tuolumne River in the Sierra mountains north of Yosemite to San Francisco, and the Los Angeles Aqueduct, completed in 1913 to deliver water 215 miles from the Owens River in the Eastern Sierra to Los Angeles.

The original California Water Plan was never completed, as environmentalist concerns became more prominent in the 1970s. Several major projects were scrapped, including a canal to divert water from the Klamath River in the far north, the Auburn Dam in the mountains east of Sacramento (which would have created a reservoir with 2.3 MAF of storage capacity), and the Peripheral Canal, designed to move southbound water around the Sacramento-San Joaquin Delta to supply Southern California users.

California today has more than 1,300 reservoirs with a combined storage capacity of nearly 50 million acre feet. This total includes all reservoirs, whether they are operated by federal, state, or regional agencies. While that may sound an impressive total, storage does not equate to supply. The yield of a reservoir, that is, how much of the water behind the dam can be released downstream in an average year, is typically only around 30 percent of its total storage capacity. The 1957 State Water Plan alone called for an eventual total surface storage capacity of 77 million acre feet (Water Plan, ref. page 212), and this total did not include Federal Bureau of Reclamation projects, or regional projects.

Of what has been built, the largest reservoirs are Lake Oroville, a vital part of the State Water Project, with a storage capacity of 3.4 MAF, and Lake Shasta, part of the Central Valley Project, with a storage capacity of 4.5 MAF. But California's commitment to a steady expansion of total reservoir capacity ended in 1979, with the construction of the New Melones Reservoir, with a capacity of 2.4 MAF. Since then, only one additional major reservoir has been built, Diamond Valley Lake. This 810,000 acre foot off-stream reservoir, completed in 2000, was built by the Metropolitan Water District of Southern California. Apart from that one exception, Californians have not invested in significant new surface storage in nearly 50 years.

There is plenty of runoff that could be captured. According to data compiled by the California Department of Water Resources, over the 10-year period from 2011 through 2020, 180 million acre-feet of rain fell each year in California on average. This rain either evaporates, percolates, or eventually makes its way to the ocean. But a significant amount is diverted for either urban, agricultural, or environmental use.

According to the California Dept. of Water Resources, for the years 2011 through 2020, diversions for urban, agricultural, and environmental purposes averaged 75.8 million acre-feet (MAF) per year. While that may seem like an abundant amount, uses of water diversions for environmental purposes now constitutes the largest share of these diversions.

Moreover, recent, mandatory cutbacks to groundwater withdrawals, potential loss of water from the Colorado River, and an open-ended commitment to increasing the allocations of water for environmental purposes, guarantees that our current, roughly 75 MAF per year of water supply is unlikely to increase even with the currently planned (and very modest) additions to California's water supply infrastructure.

What is most likely if policies aren't changed is a substantial net loss in California's total water supply. Depending on the climate in the future, which is a huge and unpredictable variable, we could be facing a loss between 5 and 10 MAF of water available for California's farms and cities in the coming years.

Urban water use in California accounts for a relatively small percentage of the current 75.8 MAF per year total supply. Just over 10 percent of California's water, about 7.9 MAF per year, serves towns and cities. The remaining 90 percent is split nearly evenly - on average about 33.4 MAF per year for agricultural irrigation and 34.5 MAF per year for 'environmental' use. Data from the Department of Water Resources also shows the sources of the 75.8 million acre-feet per year of average annual water diversions. Analyzing this data quickly reveals the vulnerability of California's current water supply.

To begin with, even in recent years California still imports 4 MAF per year from the Colorado River, relying on runoff that is stored in Lake Mead and Lake Powell. Despite modest increases over the past two years, both of these massive reservoirs remain at some of the lowest levels since they were first built. Maybe this is a consequence of prolonged drought in the Southwest, or maybe it is simply because over the past few decades the burgeoning cities of Las Vegas and Phoenix have asserted their water rights and we're now taking more water out of the Colorado River than it has ever been able to historically deliver. Either way, in the years to come, it is prudent to plan for further reduction in the amount of Colorado River water that will be delivered to California's farms and cities.

Groundwater extraction, which peaked at 23 MAF in 2014, is also under threat. Withdrawing water from aquifers faster than they can be replenished with percolating runoff has caused wells to dry up, led to ground subsidence, and in some cases, is causing underground aquifers to collapse and degrade to the point where they no longer can be refilled. To restore aquifers as a sustainable source of water storage and supply, not only will annual groundwater withdrawals need to drop significantly, but until the water levels in the aquifers are restored, total annual withdrawals will need to be less than the annual amount of natural recharge.

As if that isn't enough, the remaining sources of water depend on California's rivers, which in most cases rely on California's Sierra snowpack. Because most of California's reservoirs are in-stream, their first priority is to prevent flooding. For this reason, they cannot be used to store water from early season storms, such as the deluge that fell in December 2021. If those storms are allowed to fill these reservoirs, should a late-season storm hit the state, there would be no reservoir capacity left to buffer the runoff and prevent flooding. But in those years when a significant snowpack fails to develop, and no late-season rainstorms inundate the state, summer arrives and the reservoirs are empty.

All of these factors combine to indicate a worst-case scenario that is potentially catastrophic. It raises the question why the only significant statewide policy priority has been conservation. Without Colorado River water, unimpeded access to groundwater, or a viable snowpack, the "conservation" solution is disastrously inadequate.

As it is, California's Department of Water Resources is in the final rulemaking phase of new regulations they have called "Making Conservation a Way of Life." Under these new rules, every household will be limited to 40 gallons per person per day, outdoor watering will be restricted, and an estimated million acres of farmland will be taken out of production. Is that the future Californians are prepared to accept? Because that is the course Californians are on today.

There is an alternative. We propose investment in new water supply projects sufficient to offer Californians reliable sources of abundant water in all categories of use. Our current and future cities can have access to at least 10 MAF per year of water, avoiding rationing and enabling nurturing outdoor landscaping. Instead of the imminent threat of drastic cuts to their water supply, our incredibly productive farmers can continue to consume approximately 35 MAF per year in order to thrive economically and help feed the nation and the world. And with smart investments in an all-of-the-above approach to increasing our water supply capacity, we can ensure that water is available for environmental purposes that will equal the farming allocation, that is, 35 MAF per year even in dry years. Our goal, therefore, is to develop a capacity to provide Californians with 80 MAF per year of water through a combination of reservoir storage and release, Delta diversions, sustainable groundwater recharge and withdrawal, wastewater reuse, harvesting storm runoff out of our rivers into aquifer storage, harvesting urban runoff, and desalination. Opportunities in all of these categories are plentiful.

Runoff from the storms like the ones that blasted through California in the very wet 2021-22 and 2022-23 rainfall seasons can be diverted into percolation basins and into off-stream reservoirs. Indoor urban water, nearly 3 million acre-feet per year, can be treated to higher standards and reused over and over.

So why isn't the Sites Reservoir, an off-stream reservoir that is a twin to the already existing San Luis Reservoir (built in the 1960s) already completed? Its construction was approved by voters in 2014. Why aren't two or three more massive off-stream reservoirs already built and operating in California?

For that matter, why isn't urban water recycling already underway in every urban county in California? Only one major metropolitan area, Orange County, recycles 100 percent of its wastewater. Los Angeles County is on track to complete a major wastewater recycling plant, but progress is slow. Why aren't these desperately needed projects being constructed in every major coastal city in California?

Much of the opposition to more water supply projects is based on concern for the environment. Even offstream reservoirs disrupt the valleys where they're situated, and filling them up, even during flood events, requires pumping water out of rivers with fragile ecosystems that benefit from "unimpaired flow." These concerns have informed policies that have not only prevented new water supply projects from being built, but prevent optimal use of the projects we've already got.

For example, one of the most controversial and consequential examples of this is the regulatory framework that restricts how much water can be removed from the Sacramento-San Joaquin Delta using the massive pumping stations located at its southern end. The State Water Project's Banks Pumping Plant has a capacity to pump up to 20,000 acre feet per day into the California Aqueduct, and the nearby Central Valley Project's Jones Pumping Plant has a capacity to move nearly 10,000 acre feet per day into the Delta Mendota Canal.

If these pumps could operate at anywhere near their capacity, and if there were adequate storage resources, there would never be a shortage of water for San Joaquin Valley agriculture or Southern California's cities. In wet years, over 25 MAF flow through the Delta and out to the San Francisco Bay, and on average, about 10 million acre feet per year pass through the Delta beyond what is required for ecosystem health. But there are problems.

Over the past few decades, and especially over the past few years, the use of these pumps has been restricted even during winter flood events. During periods of high flow, the concern is primarily over the impact on migratory fish species that can get sucked into the pumps. During periods of moderate flow, added to that concern is the problem that these pumps move so much water that when they operate they can literally alter the natural outbound current of the Delta, sucking salt water in from the San Francisco Bay. Until these concerns are adequately addressed, the use of the Delta pumps will remain restricted, and this is one of the primary causes of water scarcity in California.

The influence of environmental activists on water policy, water projects, and water availability in California cannot be overstated. And it is indisputable that changes were required. The original California Water Plan made minimal provisions for ecosystem health. Water withdrawals and water projects were prioritized in whatever mode and at whatever scale was necessary to support the needs of farms and cities. While there is vigorous debate over how much California's water withdrawals are responsible for the decline in native fish species, there is general agreement that the impact has been profound and that changes had to be made. The environmental regulations designed to protect California's rivers and wetlands may have become extreme in some cases, but any balanced approach cannot deny their importance and fail to take them into account.

The good news is that there are sustainable ways to create water abundance. And in normal years, the presence of lawns and the luxury of lengthy showers is a sign not of waste, but of resilience. These luxuries signify necessary surpluses that guarantee sufficient water in those extraordinary times when the water supply is disrupted. Having redundant sources of water in California not only bestows the capacity to withstand a crippling multi-year drought but also to survive in the event of civil disruption or natural catastrophes that disable, for example, the Edmonston pumps that push millions of acre-feet of water every year from the State Water Project's California Aqueduct over the Tehachapi Mountains into Los Angeles.

Water is the foundation of civilization. It is absurd that Californians, living in the wealthiest and most innovative place on earth, cannot design abundance into our water infrastructure. With abundant water, California would offer a far higher quality of life in the form of fewer restrictions on residential consumption. Abundant water would also enable Californian to develop more housing, for which developers cannot obtain permits without first identifying a reliable water supply. It means that California can remain an agricultural superpower, with affordable food for in-state sales and export. It enables essential businesses that consume water to flourish.

Practical Paths to Water Abundance

When recommending solutions to water scarcity in California, if you start from the perspective that conservation is now at the point of diminishing returns, then the focus must turn to water supply projects. There have never been as many new ideas to create new water supply in California, but before evaluating the many options, two things should be considered.

First, a useful way to evaluate water supply projects is to look at the implementation cost compared to the projected annual yield of new water. From that perspective, one helpful benchmark is the cost of conservation, even though water saved is not the same thing as water supplied. As it is, an independent estimate of the cost to implement "Conservation as a Way of Life" is $7 billion. In exchange for that sizable investment, the projected savings are 400,000 acre feet per year. That equates to a cost-to-annual-yield of $17,500 per acre foot. Since these acre feet conserved also have a cost in terms of enforced rationing and a wringing of all surplus out of the system, damaging resilience, the financial cost is not the only negative factor. Water supply projects with higher cost-to-annual-yield estimates may still make sense, because they add to the diversity and resilience of the overall system. Nonetheless, $17,500 per acre foot is a useful figure for comparative purposes.

Second, while no conversation regarding water supply project options should ignore the estimated costs, these costs are themselves subject to wide variation. Other states and nations can build the same projects for far less than Californians can, because they don't have California's regulatory environment, our protracted and expensive permit process involving multiple agencies, nor do they have California's litigation-friendly legal framework, or California's much higher than average costs for land, labor, and materials. For more on how California's general business environment is harming all projects, water infrastructure included, and what to do about it, turn to our recent policy paper "From Worst to Best: How California ended up with the worst business climate in America, and what it will take to turn things around."

The higher costs that face infrastructure development projects in California have the unfortunate consequence of creating a disincentive for private investment to fund water projects - or if they do fund projects, they rely heavily on government subsidies and high water prices to make projects financially viable. The inherently high capital costs of water infrastructure necessitate a government role in financing the projects, with the massive success of the State Water Project investments made in the 1950s and 1960s as an example. But if the regulatory environment were friendlier, the amounts invested could be much less and yield the same result.

The cost estimates we share in this analysis are based on the regulatory environment staying the same. In our recommendations section we share some critical regulatory reforms that would have the effect of lowering these cost estimates.

Harvesting Storm Runoff - The Delta Tunnel

In the debate over water policy in California, one of the least controversial premises is that if we could safely harvest a bigger fraction of the massive storm runoff that periodically surges through the Sacramento-San Joaquin Delta, we could probably eliminate water scarcity in the state forever. But that's a big if. How would the water be diverted without harming aquatic ecosystems and marine life, and where would the water be stored? There are several possible ways to answer this.

As we have seen, the current system of pumps at the southern end of the Delta are never going to be permitted to operate at full capacity. Even during winter storm surges they are considered too dangerous to endangered salmon and smelt, and during more moderate flows they have to be throttled down or they will alter the current of the Delta, pulling salt water in from the San Francisco Bay. To solve this problem, California's Department of Water Resources has been developing the "Delta Conveyance," a tunnel that will collect water from the Sacramento River north of the Delta and transport it all the way to the southern edge of the Delta where the water can be deposited in the California Aqueduct.

This 45 mile long tunnel will have the capacity to move up to 4 million acre feet per year from the Sacramento River safely under the fragile Delta ecosystem, delivering water to southbound aqueducts. That's not bad. However, the state's own estimate of the tunnel's eventual yield is only 500,000 acre feet per year, and this tunnel is officially estimated to cost $20 billion (recently increased from $16 billion). Does anyone honestly think it will be built at that price? The Sierra Club has come up with an estimate of $56 billion. That's probably more like it. But even at a $20 billion price tag, that is a cost-to-annual-yield of $40,000 per acre foot.

If the Delta Conveyance planning goes forward, which appears to be the case, proponents would be well advised to devote equal or greater time to countering the laws, regulations, agencies, and litigants who are going to make certain that tunnel never gets built, or if it ever does get built, never operates at anywhere near its capacity.

While the cost of the Delta Conveyance may be daunting, it is important to emphasize the role it would have if an earthquake or extreme flooding caused some of the Delta's aging levees to fail. Because the Delta Tunnel passes underneath and bypasses the Delta, its function would not be compromised by the salt water intrusion that would accompany failed levees. As such it is a vital hedge against such a disaster.

What are other ways to safely harvest millions of acre feet from the Delta during major storms? With up to 10 million acre feet of available water that could be harvested in wet years without harming the Delta, what other projects offer hope?

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Harvesting Storm Runoff - Fish Friendly Delta Diversions

Another way to transport water from the Delta to farms and cities in Southern California is via so-called Fish Friendly Delta Diversions. This proposal is so promising, offering such a cost-effective way to move so much water, that it ought to be a research priority at every water agency in the state.

The proposal calls for a channel to be cut in an island in the Delta, with a liner on the bottom and perforated pipes buried under rocks. The pipes would withdraw water using nothing but gravity, which would not alter the current and would not trap fish. Initial pilot studies indicate that a 200 acre channel could withdraw 15,000 acre feet per day. Two of these facilities, together occupying less than one square mile, would only have to operate at capacity for 10 weeks per year to withdraw 2 MAF during Delta storms. Since they are designed to harmlessly divert water even during periods of moderate flow, the total amount of water they might safely divert per year could be much higher than that.

As for the estimated cost of fish friendly Delta diversions? About $3 billion. This concept, should it prove viable, suggests a cost-to-annual-yield of $1,500 per acre foot. In terms of cost/benefit, there is nothing that comes anywhere close to this. For such a relative pittance, we Californians could build this, and build the tunnel.

That cost estimate includes conveyances to not only get this water into the San Joaquin Valley's network of aqueducts, but also into large scale aquifer storage. Another opportunity lies in the possible utilization of ancient streambeds, now underground, which could facilitate rapid transfer of water into vast underground storage. According to USGS, the storage capacity of aquifers just in the San Joaquin Valley is estimated to exceed 100 million acre feet.

Harvesting Storm Runoff - Off-stream and In-stream Reservoirs

An "off-stream" reservoir is defined as a reservoir that is not located on a streambed, and is supplied by a pipeline, aqueduct, or adjacent stream. The advantage of off-stream reservoirs is that unlike reservoirs that are created by constructing a dam across an otherwise unimpaired river, they will not prevent silt from continuing downstream, nor will they impede the migration of fish such as salmon which swim upstream to spawn. The San Luis Reservoir is California's biggest off-stream reservoir. Located in the mountains to the southwest of the Delta, water is pumped into it from the California Aqueduct. It has a storage capacity of 2 MAF.

There are several proposals to expand existing offstream reservoirs in California or construct new ones. The largest of these is the Sites Reservoir Project, planned for a valley west of the Sacramento River and north of the Delta. The Sites Reservoir is estimated to cost $4.4 billion and will have a storage capacity of 1.5 MAF.

Other significant projects include the Los Vaqueros Reservoir Expansion Project, which at a cost of $1.0 billion will increase storage by 120,000 acre feet, and the Pacheco Reservoir Expansion Project, which will cost an estimated $2.5 billion and increase storage by 140,000 acre feet. Both of these reservoirs will be supplied water via connections to the California Aqueduct, and both of them are located in the mountains surrounding the Santa Clara Valley. Despite their high cost, proponents consider them necessary to ensure adequate water to municipal consumers in the San Francisco Bay Area.

These projects and other smaller proposals have the potential to add another 2 MAF of surface storage in California, and as off-stream reservoirs, they don't have to reserve storage capacity for flood control.

This means the ratio of total storage capacity to actual usable water that can be stored and released in any given year is much higher than with in-stream reservoirs. The so-called yield of offstream reservoirs can exceed 50 percent and in some cases can go much higher than that. While the capacity of these reservoirs is an objective fact, however, the amount of yield is in large part a function of policy, which in turn is often driven by how much water state regulators deem safe to withdraw from the rivers that feed these off-stream reservoirs.

Notwithstanding these many obstacles to coming up with more definite projections, altogether, an investment of $10 billion in the construction of currently proposed off-stream reservoirs could increase California's annual supply of water by about 1 MAF, at a cost-to-annual-yield of $10,000 per acre foot.

What about in-stream reservoirs?

While considered more problematic for environmental reasons, in-stream reservoirs nonetheless represent the vast majority of California's existing surface storage, which as previously noted currently have a combined storage capacity of approximately 50 MAF. There are at least two in-stream reservoir proposals that merit ongoing discussion. The first of these is the proposed expansion of Lake Shasta by raising the height of the dam 18 feet.

The cost/benefit of this proposal is compelling. At an estimated cost of $1.8 billion, raising the dam would increase Lake Shasta's total storage capacity by 600,000 acre feet. Because Lake Shasta already provides adequate flood protection, 100 percent of this added capacity could be captured and released each year, assuming there was enough rainfall to fill the lake. That is a matter of controversy and speculation, but what is undeniable is that Lake Shasta could have captured this additional water in 2017, 2019, 2022, and 2023. Put another way, over the last seven years, this additional capacity would have allowed Lake Shasta to deliver, on average, another 340,000 acre feet per year to California's farms, cities, and ecosystems. If those sorts of yields held into the future, the result would be a cost-to-annual-yield of just over $5,000 per acre foot, with the economic bonus of additional hydroelectric generation.

An argument in favor of the expansion of Lake Shasta is that it is only expanding an existing dam, not creating a new one. The impact on the upper Sacramento River and its tributaries is therefore minimized. Also Lake Shasta is a deep reservoir, which means it can release cool water into the Sacramento River in the summer.

This creates options for habitat maintenance to benefit species such as California's endangered salmon that require the water temperature to stay below 70 degrees.

Another in-stream reservoir proposal that merits discussion is the Temperance Flat Reservoir. Along with the Sites Reservoir, funding for this reservoir was approved by voters in a 2014 water bond to construct more water storage in California. The Temperance Flat Reservoir would have a capacity of 1.3 million acre feet and could be built at an estimated cost of $2.7 billion. Arguments in favor of Temperance Flat are that its site on the San Joaquin River would be upstream from the existing Millerton Reservoir, which means its presence would not further impair fish migrating upstream. Another benefit is that this proposed reservoir is located south of the Delta, and could therefore supply water directly to Southern California farms and cities.

The primary reason funding for Temperance Flat has been denied rests on its expected yield, which has been estimated as low as 70,000 acre feet per year. These estimates, however, were based on an expectation of permanent drought conditions in the Southern Sierra, expectations that have been completely upended over the past three years. Temperance Flat could have been filled to capacity in at least two of the past three years, and the current expectation is that California's seasons are going to include very wet, potentially warmer winters. Having Temperance Flat could potentially add another half-million acre feet per year to California's water supply, and if so, would have a cost-to-annual-yield of $5,400 per acre foot, along with the capacity to generate hydroelectricity.

Harvesting Storm Runoff - Innovative Percolation

One of the most exciting and relatively uncontroversial ways to take the so-called "big gulp" when winter storms batter the state and water is plentiful is through groundwater replenishment. Driven partly by the need to replenish California's depleted aquifers, but also by the eventual promise of sustainably capturing and withdrawing millions of acre feet every year from restored aquifers, tremendous progress is being made in creative ways to get water out of the flooding rivers and into the ground.

Because groundwater pumping has exceeded rates of groundwater recharge, in 2014 the California State Legislature passed the Sustainable Groundwater Management Act (SGMA).In response, water districts, especially in the San Joaquin Valley, have been expanding dedicated recharge basins. During storms, water is diverted from rivers to fill these basins.

This reduces the probability of downstream flooding and uses water that would otherwise flow to the ocean. A report released earlier this year by the Public Policy Institute of California (PPIC) estimates the total volume of recharge in the San Joaquin Valley in 2023 was 7.6 MAF. The PPIC report also noted that much of this recharge was facilitated by "an executive order authorizing the diversion of flood flows for recharge without a water right permit, and support for acquiring temporary equipment to divert flood water from rivers and streams."

Climate change is expected to bring to California less predictable rainfall, with some winters delivering a series of torrential storms that are too warm to remain as snowpack and too voluminous to be retained in reservoirs. Developing the capacity to divert this flood water into temporary or dedicated percolation basins is a solution that could potentially increase groundwater reserves by tens of millions of acre feet in any wet year. Rapidly restoring aquifers with this volume of water is a practical way to enable preservation of California's farm economy. At the same time, it will restore groundwater for municipal use by the many communities in the San Joaquin Valley and elsewhere that have lost access to adequate household water because of overdrafting.

Expanding the areas used to divert runoff for the purpose of aquifer recharge has an additional benefit. Whether they are dedicated wetlands and floodplains adjacent to rivers, or flooded fields used to grow rice, or flooded farmland, adding water to these areas can expand vital habitat for hundreds of species of wildlife, provide food and shelter for these animals, and some species will even breed there.

For these percolation basins in California's agricultural regions, along with expanded percolation in California's urban areas as discussed in the next section, we can restore what author Erica Gies refers to as "water's slow phases." In her book, Water Always Wins: Thriving in an age of drought and deluge," she writes "Most modern development has erased water's slow phases — wetlands, floodplains, high altitude grasslands and forests — that soften flood peaks, store water for droughts, and keep natural systems healthy. What water wants, say water detectives exploring this question, is a kind of un-engineering that reclaims these slow cycles, offering us greater resilience."

Urban Runoff Harvesting

A 2022 study by the Pacific Institute evaluated the opportunity to harvest storm runoff in California's coastal cities.
The authors concluded that California's urban "stormwater capture potential is 580,000 acre feet in a dry year to as much as 3.0 million acre feet in a wet year." The Pacific Institute based their estimates on the average amount of rainfall hitting California's urban areas. The bigger challenge is designing systems to capture whatever the skies deliver.

In Los Angeles and Orange counties, significant progress has been made to capture storm runoff, but the challenges are daunting. Increasing the amount of unpaved surfaces, or developing permeable paved surfaces - even developing collection basins underneath playing fields and parks that storm water can drain into and percolate - are all projects underway in both counties. Meanwhile, the water stored in urban aquifers has to be treated to remove the contaminants that inevitably get picked up by the runoff.

The promise of capturing urban storm runoff, along with waste water recycling and desalination, is that together they present a scenario whereby our large coastal cities, with tens of millions of residents, can become much less dependent on imported water. At the same time, the techniques required to increase percolation of storm runoff yield profound aesthetic benefits. An example of this is the ongoing project to revitalize the Los Angeles River, transforming the main channel and its tributary streams into urban green spaces.

Recycling Urban Wastewater

Another large-scale possibility for more water supply is to recycle urban wastewater. Of the roughly 2 million acre feet per year of urban wastewater that is treated in California's coastal cities, only about 25 percent of it so far is treated and reused. The rest is treated and discharged into the Pacific Ocean or the San Francisco Bay and its estuaries. Getting the rest of this wastewater treated and reused would not only deliver more than a million acre feet of new water to California's coastal cities, but it would also solve the problem of nitrogen pollution, which even in treated water is currently being dumped into the San Francisco Bay and the Pacific Ocean. In both cases, but especially in the Bay and Delta, this nutrient-rich outfall has nurtured algae blooms that kill fish and create dead zones. Investing in wastewater reuse would increase California's water supply, but it would also rescue these ecosystems.

Large Scale Desalination

Desalination is also an obvious choice to create water abundance in California. It has already been proven successful in San Diego, where the Carlsbad Desalination Plant produces 50,000 acre feet of fresh water per year. But California is the most expensive place in the world to build a desalination plant. The Carlsbad plant cost more than $1 billion. The proposed Huntington Beach plant, which the California Coastal Commission vetoed in 2022, was estimated to cost roughly the same amount. Other nations can build these plants for half the cost per unit of capacity. In this regard, desalination suffers the same financial uphill battle as nuclear power plants: construction costs are grossly inflated due to overregulation and litigation. Since the price of water and power is largely determined by the amount that recovery of construction costs add to the bills sent to consumers every month, desalination and nuclear solutions are derided by critics as too expensive. But that expense is mostly a political choice, not an engineering reality.

Another common misconception regarding desalination is the energy cost. While desalinating seawater is an energy intensive process, when viewed from the perspective of California's total electricity consumption, it is not significant. For example, based on current technology, the 2 gigawatts of baseload electricity generated by the Diablo Canyon nuclear power plant would be sufficient to power desalination plants with a total capacity to produce 5 million acre feet of fresh water per year. As we move towards an electrified economy in California, the amount of electricity necessary for desalination at any realistic scale in California will not represent a significant burden on our power grid.

When comparing the electrical energy required to desalinate seawater, another surprising fact is that it takes roughly the same amount of electricity to transport an equivalent amount of water into Los Angeles via the California Aqueduct. And while the amount of electricity currently required to push urban wastewater through filters to purify and recycle it is roughly half as much as for desalination, that amount of required energy is going to increase as we begin to upgrade our filtration processes to remove PFAS (microplastics and other persistent so-called "forever chemicals") from our water systems.

Manage Non-native Predators

Water allocations to farms and cities have been reduced in order to save salmon and other threatened species of fish. It hasn't worked, and will never work, until it accounts for a key variable: predation.
Saving salmon and other endangered fish relies on what are referred to as the "Four H's," hydrology, hatchery, habitat and harvest.

The first three have been public policy priorities, hydrology in particular. Leaving more water in the rivers to help the fish is standard policy, resting on the assumption that more water invariably improves fish habitat.

Since the State Water Project was largely completed in 1967, California's rivers have never had such a high percentage of unimpaired flows combined with timed releases from reservoirs for the fish. But requiring millions of acre feet of storm runoff to pour into the oceans, year after year, is taking huge portions of California agriculture out of production and condemning a significant percentage of California's 13.3 million households to water restrictions.

Meanwhile, a big part of the problem is that nonnative bass are "harvesting" salmon each year by the tens of millions, and increasing flow and improving habitat appears to be helping bass populations more than it helps salmon populations.

An ongoing study conducted over several years measured the percentage of nonnative fish populations and found that in 2002, they already represented 82 percent of all fish in the Sacramento-San Joaquin Delta. By 2022, that percentage had increased to 98 percent.
There are habitat restoration and habitat management projects that can help protect salmon and other species of concern from bass. For example, locating smelt hatcheries next to nurseries in managed wetlands that exclude nonnative Mississippi Silverside predators may help that species rebound. Similarly, instead of trucking salmon smolts from the hatchery all the way to the San Francisco Bay (which disorients them on their return to spawn), why not move them into nearby exclusionary wetlands where they can grow much larger before being released downstream?

But more is needed. If the state can completely shut down commercial salmon fishing for two years in a row, they can also remove the limits on bass fishing.

That's what the State of Oregon did in 2016, when they removed limits on bass fishing for consumption, and again in 2023 when they removed limits on bass fishing for any purpose, including solely to reduce their population.

Hydrology, habitat, and hatchery strategies are not enough. The California Dept. of Fish and Game is trying to design an environment where bass and salmon can both thrive. It's a ridiculously improbable objective. The collateral damage of this flawed policy far outweighs the benefits of what in any case is a highly unlikely success. Removing limits on bass fishing may help salmon populations recover, which in-turn might make it possible to safely divert more water for farms and cities.

Thin California's Forests to Increase Runoff

Forest thinning reduces the amount of water that is immediately taken up by the roots of overcrowded trees and undergrowth and transpirated into the atmosphere. Instead, more of this water can run off into tributaries or percolate to recharge springs. How much water?

A fascinating 2011 study by experts from UC Merced and UC Berkeley provides enough data to begin to answer that question. It reports that 60 percent of the state's consumptive water comes in the form of Sierra runoff, and that when forest cover is reduced by 40 percent, total runoff will increase by an estimated 9 percent. California's consumptive use of water, including urban and agricultural use, but not including diversions to maintain ecosystem health, is around 40 million acre feet per year. That means if California's forests were thinned appropriately, 2.2 million acre feet of water (40 MAF x 60% x 9%) would be added to California's water supply in an average year.

This is not a trivial increase, particularly since it could be realized at no expense to the taxpayer. In fact, reviving California's timber industry would create thousands of jobs and industry profits, which would increase state tax revenues. Other benefits would include carbon sequestration as embodied within the many new lumber products, as well as lower prices for lumber which would lower the cost of new construction. (See our Policy Paper, Reducing California's Carbon Emissions through Modern Forest Management).

If California's forests were thinned and properly managed, the incidence of so-called 'megafires' would drop. The positive benefits of that are enormous: avoiding devastated ecosystems and wildlife, destroyed property, lost lives, stupefying costs to rebuild, toxic runoff, horrific landslides, millions of tons of CO2 and particulates, and smoke choking half the state for weeks on end. But a significant if relatively unheralded benefit of forest thinning is an increase in the quality and quantity of water that makes it into our rivers.

How Much Water? At What Cost?

There is no reason why Californians can't have abundant water again. Yes, the state's population has more than doubled since the original State Water Project was launched in 1957. Yes, climate change is expected to bring less predictability to our weather - longer droughts, warmer winters, and some years characterized by a seemingly endless series of drenching storms. But with commitment, ingenuity and investment these obstacles can be overcome.

Californians have wealth and innovative capacity today that substantially exceeds what we brought to bear on challenges of comparable magnitude nearly 70 years ago, and as just noted, we have plenty of water supply project options from which to choose. All we need is the will to move forward.

Here is a summary of these project options, and how much water we might expect from each of them:

The Delta Conveyance, or Delta Tunnel, is officially estimated to cost $20 billion and will enable between 500,000 and 1.0 million acre feet per year of water to be moved from the Sacramento River north of the Delta to the pumps on the southern edge of the Delta that move water into the California and Delta Mendota aqueducts.

The Fish Friendly Delta Diversions proposal has the potential to divert 2 million acre feet or more per year from gravity fed channels in Delta Islands into southbound aqueducts and San Joaquin Valley aquifers. Its estimated cost is under $5 billion.

Expanding surface storage via raising the Shasta Dam by 18 feet would cost approximately $1.8 billion, increasing storage capacity by 600,000 acre feet. How much of this capacity could be released in the average year is uncertain, but in four of the last seven years, 100 percent of this extra capacity could have been captured and released.

The Sites Project, a 1.5 million acre foot off-stream reservoir for which construction may finally begin in the next year or two, is expected to cost $4.4 billion. Located in a valley west of the Sacramento River, Sites is expected to yield at least 500,000 acre feet per year.

The Temperance Flat Reservoir, located upstream from the Millerton Reservoir on the San Joaquin River, would store 1.3 million acre feet and is estimated to cost $2.7 billion. It would have been filled in four of the last seven years, and its location south of the Delta makes it an extremely practical storage solution for San Joaquin Valley farmers and Southern California cities.

Altogether, Shasta, Sites, Temperance Flat, and other reservoirs that are smaller but located in critical areas adjacent to major coastal cities could be built for around $15 billion and would probably yield at least 2 MAF per year.

One of the highest potential sources of new water is to permit farmers to withdraw water from Central Valley rivers whenever they are at flood stage. Over the past two years great progress has been made in streamlining the authorization process so that farmers are able to take action before the floods have come and gone. As noted, in 2023 over 7 MAF is estimated to have been recharged in San Joaquin Valley aquifers. This is a cost-effective way to more rapidly recharge these mostly depleted aquifers and will eventually enable sustainable groundwater withdrawals to be increased.

Urban runoff harvesting, recycling urban wastewater, and desalination have the potential to make California's major coastal cities less reliant on imported water. The cost to build treatment plants able to recycle urban wastewater is conservatively estimated at $20 billion. With PFAS standards on the way, that cost will increase. But approximately 2 MAF per year of water can be added to our urban water supply if this investment is made.

The cost of desalination plants is currently around $1.5 billion for 50,000 acre feet per year of fresh water, or $30 billion for 1 MAF per year of total capacity. These prices will come down through technological advancements and, hopefully, through deregulation. Adding a few hundred thousand acre feet per year of desalination capacity for California's southern coastal cities could be that extra perennial supply that makes these cities far more resilient to possible disruptions to their other sources of water.

The capital investment in water supply projects, when adding all of these up, indicate that for around $75 billion, between 10 and 15 MAF per year of new water supply capacity could be added in California. The clear favorites in terms of cost-to-annual-yield are:

- Forest thinning, which would actually generate tax revenue, but will take a long time
- Fish Friendly Delta Diversions (but the concept needs to be further validated)
- Farmer diversions of rivers at flood stage into fallow fields and percolation basins
- Raising the height of the Shasta Dam
- Building the Sites Reservoir

The less cost effective projects in terms of cost-to-annual-yield nonetheless have compelling reasons for being part of California's strategy to achieve water abundance:

- Wastewater treatment needs to be part of overall potable treatment upgrades which are necessary because of PFAS; also at the currently inadequate treatment standards we release nutrient rich wastewater that harms ocean and estuarine ecosystems.
- Urban runoff harvesting contributes to a broader strategy of urban greening and rewilding, and can be part of projects to remediate contaminated urban aquifers.
- The Temperance Flat Reservoir is situated south of the Delta and would be in the best position to supply water to farmers in the San Joaquin Valley.
- Other urban adjacent reservoirs are critical to water security in California's coastal cities.
- Desalination provides an uninterruptible source of water which can be of critical importance if other sources of water are disrupted.

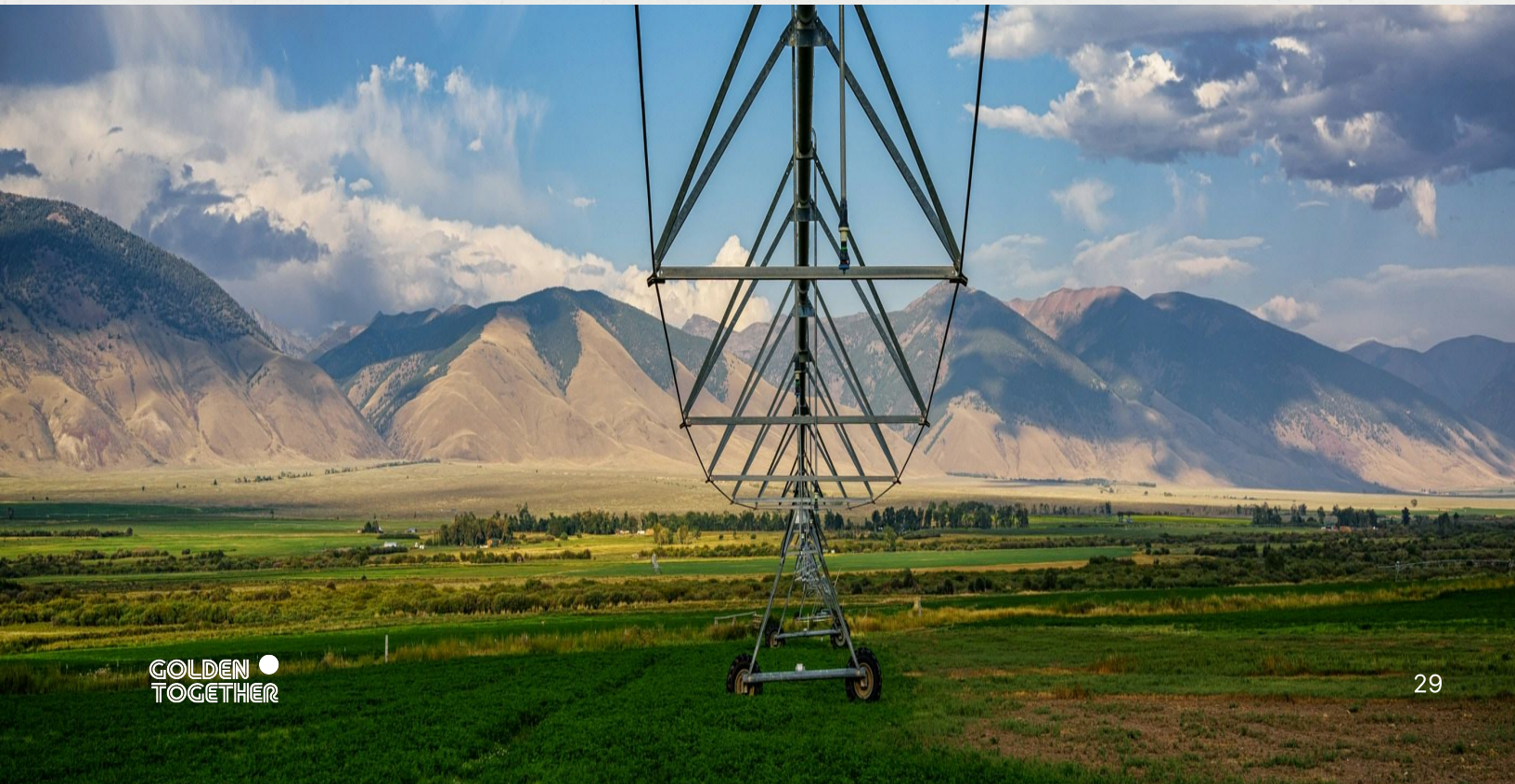
Before moving on to specific recommendations it is necessary to emphasize that achieving water abundance in California requires more than identifying and building new ways to harvest, distribute, store, and treat water. We have to repair and upgrade everything we've already built. A comprehensive description of this would include strengthening levees throughout the state, and even if this is done, the inherent vulnerability of hundreds of square miles of Delta islands that are below sea level, protected by over 1,000 miles of levees, makes a compelling case for the construction of the Delta Conveyance.

Repairs and upgrades would also include repairing our degraded aqueducts. It would include dredging our reservoirs to restore them to full capacity. It would mean going through every bit of our urban and rural municipal water systems and upgrading them; removing pipes with a high lead content, replacing leaking water mains, repairing and updating treatment plants and remediating aquifers.

The total cost to fulfill all elements of this parallel objective of water resilience and water quality, equally necessary, is comparable to the cost to increase our water supply. Therefore we estimate approximately $150 billion needs to be invested in total before all Californians will enjoy a water system that delivers universal access to abundant, affordable, clean water, and is safe from floods and earthquakes.

But these are mutually reinforcing projects. Abundant water creates more options downstream. More water is available for communities that are presently water stressed, and with abundance more water is also available to maintain healthy ecosystems.

Abundant water translates directly into affordability, resilience, sustainability, and equity. Here are specific recommendations towards making abundant water in California a reality.



Policy Recommendations

Our recommendations begin by proposing new ways to supply the tens of billions of dollars in financing that will be necessary to restore water abundance in California. But funding can only be used efficiently if there are also changes to environmental regulations and changes to the permitting process, for which we have additional policy suggestions.

Moreover, we have identified specific examples of projects we recommend as priorities for funding. These examples are not meant to be all inclusive and are not meant to suggest that priorities for funding should exclude, for example, important environmental mitigation and habitat restoration programs. In fact, we believe these programs represent an underutilized alternative to the prevailing "more unimpaired flows" approach. Hence if more habitat restoration and related programs are implemented, more water can be safely diverted for use by farms and cities.

The water supply projects we have identified as appropriate for funding are therefore chosen to emphasize our recommended "all of the above" approach to achieving water abundance. But these supply-oriented choices are not meant to exclude the many related projects that focus on habitat restoration, upgrades to failing existing infrastructure, or reasonable efforts at water conservation.

New Sources of Funding

Allocate Two Percent of General Fund

Mandating that a fixed proportion of California's General Fund be used for water projects can be a revenue neutral proposition, because it is reasonable to require a two percent reduction in other programs in order to make this allocation for water. California's spending has exploded in recent years. While identifying specific areas to cut go beyond the scope of this policy paper, for now we simply point out that even after adjusting for inflation, California's General Fund spending has increased by 79 percent in just ten years, while the state's population has only increased by 1.9 percent. The potential for cuts to California's out-of-control state government spending easily exceeds two percent.

We also believe that a total investment of $150 billion will only be sufficient to completely rebuild California's water infrastructure and create water abundance if the recommended regulatory reforms are enacted. But if that happens, the impact of significantly lower construction costs and significantly lower permitting uncertainty will attract tens of billions in private investment.

1 - Allocate two percent of the state's General Fund to use for projects that increase California's annual supply of water to farms and cities.

2 - Unlock immediate access to tens of billions to invest in water projects by permitting up to half of the two percent allocation to be used to pay principal and interest on construction bonds.

3 - Give priority to underfunded projects approved by voters in Prop. 1 (2014) that are also already approved by the California Water Commission.

4 - Prioritize maintenance, repair and upgrades for projects to deliver abundant and affordable drinking water to underserved communities.

5 - The two percent of General Fund allocation does not expire until California's total water supply capacity reaches at least 80 million acre feet per year, with a minimum of 10 MAF per year for urban use and 35 MAF per year for agricultural use, with the remaining capacity available for environmental use.

6 - Eligible projects include funding for conservation programs achieving up to one million acre feet per year of water saved.

7 - Allocate funds based on an all-of-the-above strategy, allowing Californians to repair and upgrade aqueducts, dams, water treatment plants, build off-stream reservoirs, expand existing reservoirs, invest in wastewater reuse and desalination plants, runoff capture, and aquifer recharge and recovery.

8 - Provide funding for legal defense of projects approved by the California Water Commission and other water agencies against frivolous lawsuits designed to delay the completion of projects.

A Revolving Fund Solution

Regional water agencies, especially those serving agricultural districts or small rural communities, are usually the least able to fund water supply infrastructure projects from their own base of customers. Yet without reliable water supplies to these areas, California loses its capacity to grow abundant and affordable food. Water bonds and state budget allocations help, but a new source of funding needs to be established. We suggest the following:

1 - A state revolving fund will be set up with the explicit mission to allocate loans to finance the construction of water supply infrastructure in California.

2 - Priority will be given to agricultural districts and small rural communities.

3 - The loans will be low interest and long term, with repayment periods between 30 and 50 years.

4 - The loans would not be permitted to exceed 50 percent of the total project cost.

5 - Money for the state revolving fund will be made available from the Federal Water Infrastructure Financing Innovation Act.

6 - The revolving fund would also be authorized to accept appropriations from the State of California through the budget process or from the federal government through other programs and grants.

Legislative and Regulatory Reforms

1 - Require the State Water Project to deliver 70 percent of its contracted allocations. If the allocation falls below 70 percent over any 5-year period, payments by the contracted water users will be reduced to pay only for water delivered until such time as a 70 percent allocation is restored.

2 - Repeal the "Conservation as a Way of Life" legislation which creates a disincentive for water agencies to invest in new water supply infrastructure.

3 - Retain the overall goals of the Sustainable Groundwater Management Act (SGMA), but assign authority to approve and enforce groundwater management plans to a specially formed judicial body, instead of the politicized and special interest dominated agencies currently charged with enforcement.

4 - Avoid modifications to California's well established system of water rights, but streamline the ability for holders of water rights to engage in water trading without that changing the status of their water rights.

5 - Require actions implemented pursuant to the California Endangered Species Act to also take into account the human and economic impacts.

6 - Streamline the bureaucratic process so projects can be proposed and approved in a specified and reasonable period of time, instead of taking many decades to get approved and completed.

7 - Enact reasonable revisions to the Coastal Act to prevent unnecessary delays in the project approval process.

Project Permit and Approval Reform

1 - Revise the California Environmental Quality Act (CEQA), and streamline the process for judicial review if water projects are challenged under CEQA.

2 - For example, end the private right of action under CEQA; restrict the right to file CEQA lawsuits to District Attorneys in California's counties and the State Attorney General.

3 - Grant the Governor and California's Natural Resources Secretary the authority to override and approve any permit that is denied by the California Coastal Commission.

4 - Across all agencies, including but not limited to the State Water Resources Control Board, the California Coastal Commission, and the California Department of Fish and Wildlife, revise and streamline the permitting process to eliminate unnecessary obstacles that delay projects for years, if not decades, and cost millions, if not hundreds of millions of dollars.

5 - Limit the number of hearings on a project, and require subsequent hearings to take place within 30 days of the previous hearing. This is to deter agencies that don't want to approve a project (but also don't want to get sued by the developer if the project is denied) from asking for modifications as a delaying tactic. As it is, the project developer may have the modifications ready within a few weeks, but the next hearing may not be scheduled for another year, and when that hearing arrives, the agency will ask for additional modifications, repeating the delay yet another year.

6 - If environmental regulations or any other governing regulations are changed, they shall not apply to projects that have already been approved, and these regulations shall not be changed more than once every five years.

7 - Establish criteria whereby property owners have "by right" ability to conduct vegetation management including the use of approved herbivores – sheep, goats, cattle.

Similarly, establish “by right” criteria for water agencies to dredge river channels and reservoir bottoms to improve throughput capacity and storage capacity.

8 - Streamline the permit process to facilitate local and regional (as well as urban and rural) projects to rewild and “daylight” streams to enhance percolation potential, reduce flood risk, and restore natural habitats.

9 - Streamline the process to allow farmers to divert flood water onto their fields and dedicated percolation basins, so they can take action before the floodwaters have receded and the extra water is unnecessarily released to the ocean.

Additional Structural Reforms

1 - Redefine “beneficial use” to include water used for food and people, and declare diversions of water for groundwater storage to be a beneficial use.

2 - Immediately stop current efforts to rewrite the endangered species Biological Opinions released in 2019 which restored some operational flexibility to the state and federal pumping plants that move water from the Delta into southbound aqueducts.

3 - Premise revisions to water allocations on accepted scientific methods, instead of relying on the presumption that any decision in the face of scientific uncertainty must be resolved in favor of reducing water allocations, purportedly because that will benefit threatened and endangered species.

4 - Prioritize actions to mitigate other factors affecting species health and survival that do not rely on increasing unimpaired flows and controlled releases into the rivers. These include regulations and investments to reduce discharge of pollutants, restore habitat, control invasive species, and make revisions to commercial and sport fishing management policies.

5 - Establish criteria whereby water quality control plans that reduce pollution, restore habitat, and manage invasive species, can qualify participating water agencies to withdraw greater allocations of surface water exports from the Delta.

6 - Change the composition of the State Water Resources Control Board as follows: The board will include an equal number of members from all regions, northern, central, and southern California. Board members will also be represented equally from each category of user, agricultural, urban, and environmental.

As it is, farmers and families have little to no representation. Consider expanding the board to nine members to ensure a diverse board membership as specified.

7 - Amend California's version of the Endangered Species Act to take into account human and economic impact in its implementation. To reduce complexity, consider revising the California Endangered Species Act to put it into alignment with the Federal Endangered Species Act.

8 - Require the people assigned to count the populations of endangered and threatened fish species, as well as the impact of Delta withdrawals, be qualified to identify and differentiate between fish species that are nearly identical in appearance, for example, rainbow trout and steelhead. As it is, sometimes unqualified people are taking the samples and conducting the counts. Also develop procedures to ensure that hatchery fish do not count in the "take" (for example, fish entrained in the Delta pumps), since many are not marked and are indeed counted, which in-turn leads to pumping reductions.

9 - Impose accountability on the policies and practices of the California Department of Fish and Wildlife. Despite imposing often draconian restrictions on water allocations and water project investment, and despite spending hundreds of millions of dollars, they have not delivered results. The counts of threatened and endangered fish species remain unimproved.

10 - Remove limits on commercial and sport fishing of nonnative fish.

11 - Revitalize California's commercial timber industry as outlined in our policy paper "Modern Forest Management" in order to increase the quantity and quality of runoff into our rivers.

12 - Enact the recommended regulatory reforms, particularly in the area of environmental laws and regulations, as specified in our policy paper "From Worst to Best: How California ended up with the worst business climate in America, and what it will take to turn things around."

13 - Notwithstanding specific recommendations for specific agencies cited in this report, evaluate the status of all agencies affecting water in line with the recommendations for regulatory reform outlined in our policy paper "From Worst to Best: How California ended up with the worst business climate in America, and what it will take to turn things around."

Conclusion

The theme that underlies all our recommendations is abundance. Water abundance, because of the challenging geography in our state where the supply is far removed from the demand, necessitates public sector investment. But with regulatory reforms as described, we can lower overall project costs, which will minimize the required public investment while attracting private sector investment.

Another theme that is central to our argument is that investing in practical infrastructure solutions that include proven cost-effective solutions such as surface storage, along with innovative new proposals such as the Fish Friendly Delta Diversions concept, gives us a chance to make wise use of taxpayer funds. In a manner similar to the successful State Water Project that broke ground nearly 60 years ago, we have an opportunity to make a public infrastructure investment that will pay economic dividends for generations to come.

We contend that with significant regulatory reforms, an investment of $150 billion will be sufficient to construct projects that will deliver between 10-15 million acre feet per year of abundant and affordable water, while also paying for repairs and upgrades to our entire existing system of water distribution and treatment, including replacing obsolete and often toxic pipes throughout our cities and disadvantaged communities. Through regulatory reform to bring down costs, and innovative financing, we envision the state providing a portion of the required investment, with local and regional water agencies and private investors providing the rest.

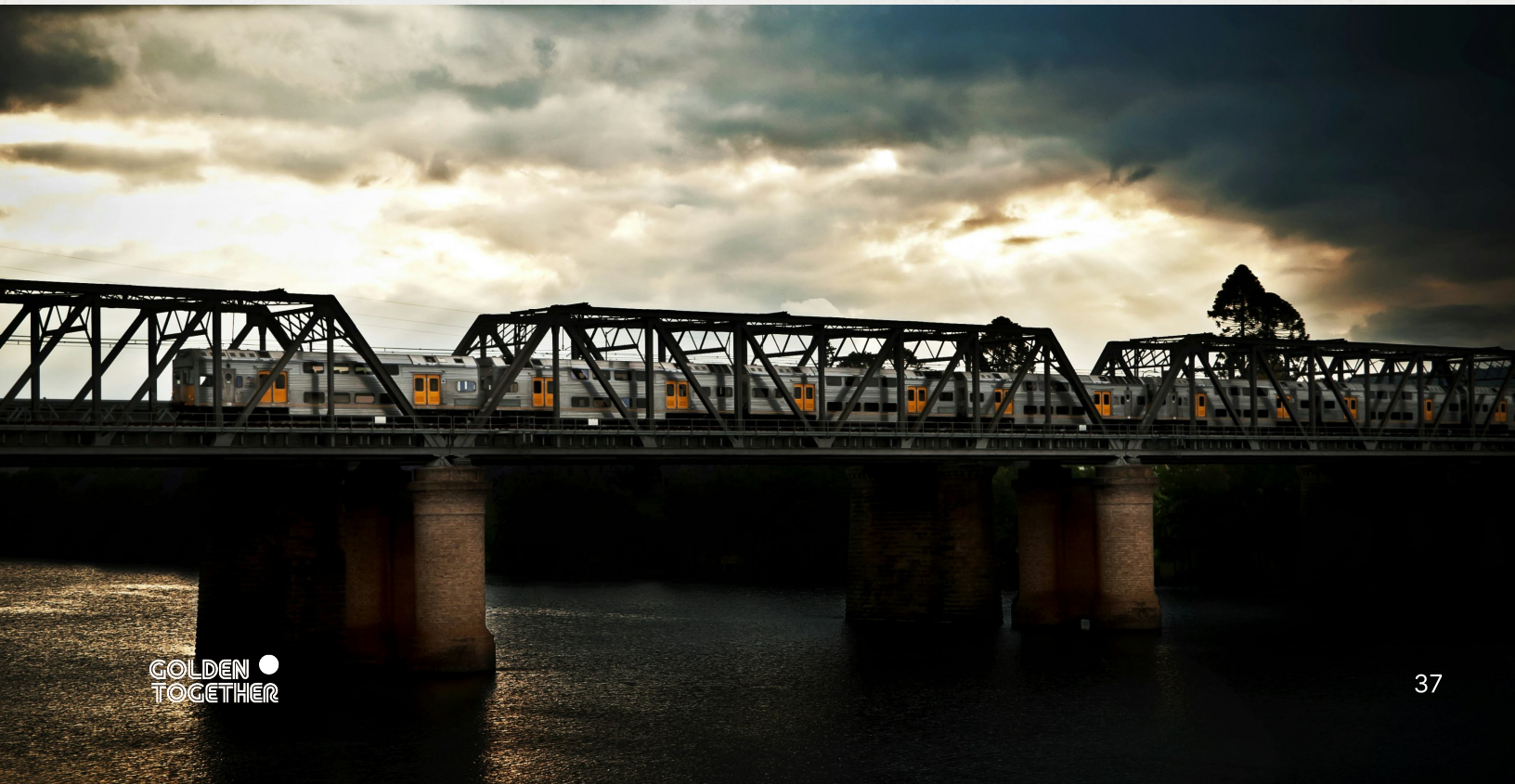
With water abundance, we also create more options for environmental stewardship. For example, raising the dam at Lake Shasta, a deep water reservoir, will allow greater flexibility to release cool water into the Sacramento River to assist salmon populations. In general, being able to withdraw additional millions of acre feet from the Delta during winter and spring flooding will create water surpluses, creating more options for timed water releases to maintain healthy aquatic ecosystems.

The projects we describe here can also make California's massive coastal cities better able to survive possible interruptions to their supply of imported water. This would greatly reduce the vulnerability of millions of residents to possible disruptions caused by climate change, or an earthquake destroying Delta levees, or other natural disasters.

More than anything else, we believe projects and investment at the scale we are describing will reflect a much needed cultural shift.

By doing something this big, with this much long-term economic benefit, we are returning to the cultural roots that have always defined us as Californians. We can do great things. We can set an example for the world - an increasingly water stressed world. When it comes to water, we really can have it all: abundant water for everyone and everything: people, farmers, and our precious environment.

We just have to think big, and get busy.



GOLDEN
TOGETHER