



San Diego County Water Authority

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May 25, 2015

Randy Record and
Members of the Board of Directors
Metropolitan Water District of Southern California
P.O. Box 54153
Los Angeles, CA 90054-0153

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- Ramona Municipal Water District
- Rincon del Diablo Municipal Water District
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- Santa Fe Irrigation District
- South Bay Irrigation District
- Vallecitos Water District
- Valley Center Municipal Water District
- Vista Irrigation District
- Yuima Municipal Water District

RE: Board Memo 5-1: Authorize: (1) Additional funding for conservation incentives; and (2) Implementation of modifications to the Turf Removal Program

Chair Record and Members of the Board:

We submit for the record the following comments to supplement our May 8, 2015 letter and address Board Memo 5-1. A copy of our May 8 letter is attached and incorporated by reference.

We support turf removal in Southern California. We also understand why the public would respond enthusiastically to a program it is being told is "free." However, MWD's program, even with the modest changes described by staff, is neither sustainable nor fiscally responsible.

- First, the program is not "free." As the General Manager stated at our last meeting, every \$100,000,000 in program costs represents a 7 percent rate increase.
- Staff's recommendation to increase conservation program expenditures to \$450 million is more than ten times the \$40 million budget the board adopted for the current budget cycle. By staff's own estimate, even this extraordinary amount of funding will only pay for the MWD program for the next six months or so, through fall 2015. Staff's proposal is silent on what it would recommend the board do at that point, or, what impact this spending will have on the budget or water supply availability next year.
- Board adoption of the staff recommendation will exhaust **all** of MWD's water management reserves, leaving no funding available to purchase additional water transfer supplies should the drought continue in 2016 or to purchase water to refill our depleted storage, should additional water supplies become available.

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- MWD is not paying for this program with state bond money or "extra" money it has lying around. **One hundred percent of the program is being paid for with water rates** that have been set by this board to generate net revenues in excess of MWD's adopted budgets and maximum reserve targets. **Since 2012, MWD has collected from ratepayers \$795,000,000 more than necessary to pay 100 percent of its costs.**

Rate increases to pay for the unprecedented expansion of this program are inevitable.

Ratepayers are already at risk of facing stiff MWD rate increases in 2016 if the drought continues (as well as rate increases from retail water suppliers). Worse yet, these rate increases will hit Southern California's low-income ratepayers hardest, forcing them to pay for a program which benefits those who can better afford to pay for their own turf removal.

The MWD program needs an immediate overhaul that is not accomplished by the recommendations contained in Board Memo 5-1. The problems with MWD's program, including the fact **it is clearly paying far more than is needed to "incentivize" turf removal**, are apparent to any agency that has administered successful programs in the past. See *Turf Removal & Replacement: Lessons Learned*, California Urban Water Conservation Council (March 2015).

Our objections notwithstanding, the Water Authority and its member agencies will seek a fair share of any funds that are authorized by the board under Board Memo 5-1 since our ratepayers will be forced to pay roughly 25 percent of these increased costs and inevitable rate increases.

Sincerely,



Michael T. Hogan
Director



Keith Lewinger
Director



Fern Steiner
Director



Yen C. Tu
Director

Attachments:

1. Water Authority's May 8, 2015 Letter to MWD Board RE: Board Memo 8-2
2. *Turf Removal & Replacement: Lessons Learned*, California Urban Water Conservation Council (March 2015).



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South Bay Irrigation District
Vallecitos Water District
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Yuima
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RE: Board Memo 8-2: Authorize (1) \$150 million in additional funding for conservation incentives from the Water Stewardship Fund and the Water Management Fund; and (2) Implementation of modifications to the Turf Removal Program -- **OPPOSE**

Chair Record and Members of the Board:

As you know, the Water Authority and its member agencies have an outstanding record of leadership in water conservation planning, programs and implementation. The San Diego region's per capita water use has dropped by 22 percent since 2007. More than a year ago, in response to the current drought, the Water Authority launched its *When in Drought, Save Every Day, Every Way* campaign to further increase public awareness. Through our continuous efforts, a recent poll shows 87 percent of San Diegans believe saving water is a civic duty, 85 percent are aware the drought is very serious, and 81 percent have taken additional actions to reduce water use since mandatory water use restrictions were implemented in San Diego County last August. It is clear that San Diegans are doing our part to reduce water use, and we will continue to support the Governor's call for increased water conservation and strive to meet the State Board's newly adopted regulations. Against this backdrop, we must oppose staff's recommendation for the following reasons:

- **Lack of accountability.** In spite of repeated requests, MWD has failed to demonstrate actual near-term water savings resulting from the turf removal program. At an estimated cost of almost \$1,500 per acre-foot (AF), which staff has amortized over ten years, the near-term cost of any water savings would be substantially more than \$1,500/AF and well in excess of MWD's current spot market transfers. Short term, there has been no demonstration of meaningful water savings as a result of these subsidies, and certainly no demonstration of water savings that would not otherwise have occurred, either as a result of the high cost of water or state mandates limiting the amount of water retail agencies and their ratepayers may use on ornamental landscapes. Long term, MWD's program includes *no measures* to ensure that turf that someone is paid to remove today won't be reestablished in the future. *Without*

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such accountability, this program constitutes a waste of ratepayer dollars and a gift of public funds.

- **Lack of transparency.** MWD has not even provided an accounting of the participants who have received the more than \$77 million that has already been spent on the program. No further public rate dollars should be allocated or spent without an accounting of past expenditures. We renew our request for an immediate audit of this program, including identification of fund recipients, evidence of the turf removal or other "conservation" improvements that have been made with these public funds, and disclosure of any consultants or business entities that have benefitted from the implementation of this program by MWD.ⁱ
- **Lack of available funding to pay for this massive, unbudgeted program expansion.** It appears that there are insufficient funds available to pay for the staff recommendationⁱⁱ; and it is therefore highly probable that rate increases will be required for which there has been no public notice. In a PowerPoint presentation to the Finance and Insurance Committee last month, staff reported a Water Management Fund balance of \$32.2 million as of March 31, 2015.ⁱⁱⁱ This month, staff is requesting to use \$9.975 million of that remaining balance to purchase transfer supplies from Yuba County Water Agency, leaving only \$22.25 million available in the Water Management Fund.^{iv} This means that the rest of the funding - \$127.8 million - must come from the Water Stewardship Fund. But in order for the Water Stewardship Fund to generate that level of funding, *MWD would have to sell 3.12 million acre-feet of water (MWD must also make payments due on long term contracts paid for with Water Stewardship Rate dollars).* Since MWD's water sales are obviously going to be much lower than 3 million acre-feet, there is no identified source from which to generate the \$150 million needed for this program. MWD is running this program as an "open checkbook," but it has not planned or budgeted for these expenditures.
- **The conservation program is being funded with rates the Superior Court has already ruled are illegal.** MWD is continuing to collect the Water Stewardship Rate even though the Superior Court has already ruled that it is an illegal tax. In addition, San Diegans are being excluded from full participation in the member agency program as a result of MWD's inclusion of the "Rate Structure Integrity" clause, as to which the Court has also ruled substantively in San Diego's favor, subject only to the question of standing.
- **The turf removal program is a regressive tax.** Many low income ratepayers allowed their lawns to die many months if not years ago due to the cost of water. Now, they are being forced to subsidize turf replacement by private golf clubs and other commercial and residential high water users.

We have stated our deep concerns about the turf replacement program and MWD's water conservation programs generally, due to the absence of accountability actually measuring conservation results or accounting for the ratepayer dollars being spent on these programs. We have provided suggestions and made requests for information and for an audit on many prior occasions. A copy of our most recent letter dated December 8, 2014, is attached.

Instead of adopting staff's recommendation, we urge the board to: 1) order an immediate audit of the \$77 million that has been spent to date, including the information described above; and 2) request that staff bring back a detailed report including (a) data and an analysis demonstrating the near-term and long-term benefit of these programs, (b) a recommendation and firm budget cap for any proposed expanded conservation program, and (c) identify the source of available funding to pay for it. Staff should also report on the demand reduction impacts from permanent landscape ordinances and/or code changes limiting outdoor water use and how such changes should contribute to phasing out subsidies as a primary means to achieve water conservation.

For these reasons, we oppose staff's recommendations.

Sincerely,



Michael T. Hogan
Director



Keith Lewinger
Director



Fern Steiner
Director



Yen C. Tu
Director

Attachments:

1. Water Authority's December 8, 2014 Letter to MWD Board re 8-1

ⁱ We have been asked, for example, what role MWD's past General Manager, Ron Gastelum, has played in the development and implementation of the turf removal program and whether he has benefitted financially from it on behalf of his client "Turf Terminators." In addition to his former role as General Manager of MWD, Mr. Gastelum also represents a number of MWD member agencies.

ⁱⁱ MWD's budgeted conservation program funding for fiscal years 2014/15 and 2015/16 totaled \$40 million; the staff recommendation in this month's Board Memo 8-2 will increase that budget more than six-fold to \$250 million.

ⁱⁱⁱ In this month's presentation, the projected balance of the Water Management Fund is shown as \$141.9 million as of June 30, 2015; no explanation is provided how the balance will increase by more than \$100 million from March to June 2015.

^{iv} This is all the money that is left in the Water Management Fund of the \$232 million transferred there from the almost **\$500 million MWD has over-collected from ratepayers since June 2013.**



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December 8, 2014

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Valley Center
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Vista Irrigation District

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OTHER REPRESENTATIVE

County of San Diego

RE: Board Memo 8-1: Authorize: (1) increase of \$40 million for conservation incentives and (2) increase to contract authority of the five-year agreement with Electric and Gas Industries Association for administration of Metropolitan's regional conservation rebate program – **OPPOSE**

Chair Record and Members of the Board:

The Water Authority and its member agencies strongly support and have an outstanding record of leadership in water conservation planning, programs and implementation. Through our collective efforts, the San Diego region's per capita water use has been reduced by almost 25 percent since 2007. In response to the current drought, we launched our *When in Drought, Save Every Day, Every Way* campaign in order to further increase public awareness. As a result of these efforts, a recent poll shows that more than 80 percent of San Diegans now believe saving water is a civic duty. While we continue to support the Governor and State Board's call to increase conservation, we must oppose staff's recommendation due to the manner in which ratepayer dollars are being spent and the absence of any accountability or demonstration that the expenditure of these funds is actually achieving the intended purpose.

Staff's recommendation is to spend five times more than its adopted budget on conservation programs in this fiscal year alone (leaving no conservation funding for the following fiscal year).ⁱ Funding would come from money MWD has over-collected from ratepayers over the last two fiscal years. This money could have been invested directly at the local level, on water conservation and supply programs that would not only alleviate the impacts of drought, but also provide long term water supply benefits. Instead, MWD is proposing to spend a significant portion of this money, over-collected from all ratepayers, on turf replacement on commercial properties including private golf courses. At MWD's \$2 per square foot rebate, this costs MWD ratepayers more than \$1,500 per acre-foot.

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Against this backdrop, we find it ironic that the MWD board just last month adopted a purchase order policy that allows MWD member agencies to increase purchases of low priced Tier 1 water (and avoid the higher Tier 2 rate on an annual basis as costs are incurred), completely eliminating the pricing signal Tier 2 was originally intended to send. MWD's "pricing signals" and behaviors - including this water conservation program - are completely upside down and inconsistent.

MWD is simply burning through ratepayer dollars irresponsibly in the name of water conservation. It could accomplish much more by structuring its rates according to its cost of service and sending true price signals about the value of water. At a minimum, before approving any further funding, MWD should redesign this program to place a cap on the amount of rebate applicants may receive so that conservation rebates are possible involving the general public and a wider range of applicants.

Given the proposed unprecedented level of spending associated with money being paid to private business, we request the General Auditor conduct a financial audit of all rebate programs, starting with a specific emphasis on the turf removal program. For the same reason, we request that the contract authority for EGIA be extended only to match the biennial budget, rather than through 2017. We believe this is absolutely essential to ensure that the MWD board of directors is being a responsible steward of ratepayer dollars.

Sincerely,



Michael T. Hogan
Director



Keith Lewinger
Director



Fern Steiner
Director



Yen C. Tu
Director

ⁱ The staff letter states that the current proposed increase is "intended to address immediate issues in the conservation program for the current fiscal year." MWD's adopted biennial budget for conservation for fiscal years 2014/15 and 2015/16 was \$40 million. With the addition of \$20 million in February and this request to add another \$40 million, the conservation budget for the current year alone would total \$100 million.

Turf Removal & Replacement: Lessons Learned

March, 2015
Author: Briana Seapy



California
Urban Water
Conservation
Council

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~Acknowledgements~

Thank you to all Council member agencies for making this report possible through your annual dues. Thank you also to the ten water agencies that contributed data and invaluable anecdotal lessons to inform this report. Your contributions will help guide water distributors looking to start or improve their own turf removal programs.



Turf Removal & Replacement: Lessons Learned

Introduction

A thirsty California uses over half of its urban water deliveries on landscape irrigation. Water intense turf grasses are the historical foundation of California landscaping. Water shortages, among other catalysts, are pushing California away from traditional turf grass landscapes towards sustainable landscaping. Sustainable landscaping intends a holistic, watershed-based approach to landscaping that transcends water-use efficiency to address the related benefits of cost savings, run-off reduction, green waste reduction, pesticide and fertilizer reduction, habitat improvement, and energy/greenhouse gas (GHG) reductions.

The transition from a turf-based landscape involves two steps. Turf removal is the first step, turf replacement the second. Customers' aesthetic preferences, geographic location, and bank accounts, along with product market availability, influence both turf removal and turf replacement decisions. Statewide, water agencies¹ are managing turf removal programs that stipulate replacement requirements, incentivizing a California landscaping transformation. These programs vary in size, scope, and specifications. The following report takes both a closer look at lessons learned from existing turf removal programs as well as a cursory glance at turf replacement options and implications.

Turf Removal Programs

Turf Removal Rebate Programs

Turf removal rebate programs offer rebates to end-users for removal and replacement of water-intensive turf lawns. Local and regional agencies are adopting these turf removal programs, anticipating that their upfront investment in rebates will yield long-term outdoor water savings dividends for years to come. For example, the Metropolitan Water District (MWD) spearheads a large-scale regional 'Cash for Grass' lawn conversion program. Currently, MWD provides water distributors within its service area a \$2 per square foot (sq. ft.) turf rebate subsidy. Agencies can add to this rebate as they desire. MWD has earmarked over \$85 million in funding for the rebate programs. Statewide, rebates range from \$0.50/sq. ft. to \$3.75/sq. ft.

Rebate Program Strategies

In general, rebate programs offer customers a dollar amount per square foot of turf removed. More specifically, individual programs require compliance with any number of turf replacement specifications;

¹ This report only includes information from local government water suppliers, referred to throughout as 'agencies.'

from pre- and post-removal inspections, to updated irrigation systems; in order to qualify for the rebate. To maximize the 'bang for their buck,' agencies invoke rebate qualification strategies to foster program growth and sustainability and to maximize water savings. Common rebate qualification policies include:

- Requiring well-documented rebate applications with historical water bills, landscape 'before' photos, and other documentation of maintained turf landscape
- Requiring attendance at a landscaping/irrigation workshop/class before submitting an application
- Requiring landscape design submission before property inspection
- Prohibiting re-installation of turf on rebated property under the same owner
- Prohibiting spray irrigation on converted landscapes
- Requiring drip or point source irrigation, micro-spray irrigation, low precipitation-rate nozzle spray irrigation, or hand-watering; requiring pressure regulators and filters for point source irrigators; requiring a smart irrigation controller
- Rebating only properties with evidence of living, maintained turf within a specified number of months prior to turf removal
- Rebating only properties that use sprinkler irrigation systems
- Rebating only areas that are visible to the public
- Requiring a specific percentage (e.g., 25%) of replacement landscape to be re-planted with water-efficient, or drought-tolerant plants
- Requiring sheet mulching to a specified number of inches (e.g., 2-4 in.) on all landscaped ground
- Rebating parkways (the strips of land between sidewalk and curb) separately and under different rebate terms and conditions
- Offering partial rebates for lawn removal, irrigation updates, and sheet mulching; offering complete rebates after planting appropriate plants in appropriate seasons (i.e., not mid-summer)
- Requiring replacement landscape to be made up of native, climate appropriate, or California-Friendly plants
- Requiring a specified percentage of pre-conversion property, or landscaped area (sq. ft.), to be made up of turf in order to qualify for a rebate
- Requiring California-licensed landscape contractors to convert landscapes if the property owners do not re-landscape themselves
- Requiring design consultation for do-it-yourselfers
- Prohibiting or restricting specific turf replacement options such as synthetic turf, concrete, permeable hardscapes, and gravel
- Setting a dollar or square foot rebate minimum
- Setting a dollar or square foot rebate maximum
- Requiring pre- and post-replacement inspections
- Setting a due date for landscape replacement completion
- Accepting only residential properties
- Accepting only CII properties.

Water distributors employ any number of these strategies with the intention of maximizing program cost-effectiveness and long-term water savings, while maintaining or increasing program participation. In the following section, data collected from water agencies across the state reveal a number of quantitative turf rebate program results, as calculated or estimated by the water agencies themselves.

Rebate Program Data Summary

Turf removal rebate program data collected from nine agencies are summarized in the table below. The data presented in the following table come from the following agencies, variable in size and geographic location: City of Long Beach, City of Roseville, City of Sacramento, City of Santa Cruz, City of Santa Rosa, Contra Costa Water District, Los Angeles Department of Water and Power, Municipal Water District of Orange County, and San Diego County Water Authority.² These agencies are neither a random sample nor a statistically significant grouping; rather they are agencies that run well-known turf rebate programs and that have a wealth of insights to share.

The data collected, presented in Table 1 below, covers the following parameters: year started, rebate cost then, rebate cost now, total removals to date, average expected water savings, rebate costs to date, customer participation and breakdown by customer category, minimum and maximum rebates, and large landscape participation.

Table 1 demonstrates the challenge of objectively and quantitatively reviewing turf rebate removal programs. Fundamentally, this challenge stems from the absence of widely shared, consistent data collection standards. Additional variability comes from other factors. For example, not all agencies submitted data for all parameters presented below. In addition, both retail and wholesale agencies participated. The size and geographic location of participating agencies varies broadly, as well as the program years for which data was available. And finally, agencies use different calculation methodologies to report their program results, even for the same program parameter. Keep these caveats in mind while reviewing Table 1.

² The Metropolitan Water District of Southern California (MWD) shared its program information, but its service area includes other water agencies that volunteered data for this report. Consequently, MWD's data is not included in Table 1 to prevent double-counting rebate data.

Table 1: Average, median, minimum, and maximum turf rebate program statistics from nine California water agencies.³

	Year Started	Rebate Then (\$/sq. ft.)	Rebate Now (\$/sq. ft.)	Total Removals to date (sq. ft.)	Total Removals to date (# program participants)	Average Expected Water Savings (gal/sq.ft./yr)	Rebate Cost to Date	Total Program Cost to Date	Average \$/AF saved
Average	2010	\$1.00	\$1.44	2,316,107	1,308	31	\$1,754,187	\$1,798,895	\$2,011
Median	2010	\$1.00	\$1.00	543,838	883	34.0	\$721,517	\$931,692	\$1,413
Min	2007	\$0.50	\$0.50	57,556	138	13.5	\$33,461	\$478,472	\$354
Max	2014	\$2.50	\$3.75	11,872,491	4,103	46	\$3,800,000	\$3,986,520	\$5,840
Response Rate	100%	100%	100%	100%	100%	89%	56%	33%	56%

	Residential Customer % (SF)	Commercial Customer % (MF, CII)	Minimum Rebate Residential (sq. ft.)	Maximum Rebate Residential (sq. ft.)	Minimum Rebate CII (sq. ft.)	Maximum Rebate CII (sq. ft.)	% Participation made up by Large Landscapes (CII, MF, and > 1 acre)
Average	93%	7%	300	1214	500	6500	9%
Median	92%	8%	275	1000	250	5500	7%
Min	88%	0%	250	500	250	5000	0%
Max	100%	12%	400	2000	1000	10000	30%
Response Rate	89%	89%	100%	100%	100%	100%	78%

Table 1 offers a general quantitative context for existing turf rebate programs. It is evident that turf rebate programs are relatively new to California, launching within the last decade. Though average rebate value has increased over time and though the maximum rebates offered are roughly 50% higher now than at the start of these programs, there are still successful programs that offer the minimum \$0.50 rebate. In fact, median rebate value has stayed consistent over time for this sample of agencies. Cumulative program turf removals by area and by participants vary widely and correlate strongly with agency size and available funding. Anticipated water savings trend with agency climate - the warmer the climate, the greater the water savings - and range from 13.5 to 46 gallons per square foot of turf removal per year. Associated rebate costs and overall program costs vary by rebate levels, program participation, and cost calculation methodology. Agencies estimate that their costs for every acre-foot (AF) of water saved on account of the rebate program, pro-rated over an assumed 10-year program life, are anywhere from \$354 to \$5,840 (see [Rebate Program Cost-Effectiveness](#) below for further details on the \$/AF metric). Program participation breakdowns hover around 90% residential and 10% commercial, as measured by number of participants and not by rebated area. In general, large landscapes make up less than 10% of overall program participants. Minimum and maximum rebated areas typically increase for commercial customers when

³ Note the following five data annotations: 1) of the nine agencies, seven are retail, two are wholesale; 2) of the nine agencies, four receive external program funding, five do not receive external program funding; 3) no statistically significant outliers were found in the data used to develop Table 1; 4) no numeric data was entered for the 'Minimum and Maximum Rebate' categories for agencies with no defined minimum or maximum rebate restrictions; 5) 'Total Program Cost to Date' had the lowest parameter response rate –agencies did not have the information available, they were unwilling to share the information, and/or their information did not include third-party contractor time, pre- and post- rebate inspection time, and/or retail agency administration time.

compared with residential customers. These general data conclusions are to be taken with a grain of salt given the inconsistent data quality and verification; to draw any further detailed and specific quantitative conclusions from the presented data would be imprudent given the quantity, quality and consistency of available data.

Rebate Program Challenges & Risks

The wide variability in the data reported in Table 1 makes it difficult to draw precise, quantitative lessons. Nevertheless, the program managers interviewed for this survey have developed a body of anecdotal information regarding the array of expected and unexpected challenges and risks they have faced while administering turf rebate programs. Agencies contemplating a new, expanded or simply continued program can take advantage of this information to anticipate the challenges and risks and to design their programs to improve the odds of success. The following list details the ten most prevalent challenges and risks faced by existing rebate programs.

1. **Rebate Funding** – Approximately half of the agencies interviewed depended on external funding to run their turf rebate program. External funding has pros and cons. On the positive side, it enables a water agency to run a program that it otherwise might have been unable to run. On the flip side, once the funding has run out, the program must be put on hold. Indeed, the more popular the program, the sooner the funds run out. External funding also requires compliance with grant terms. Funders can impose restrictions or requirements on funding that complicate a program's implementation or popularity. For example, a grant might require all converted landscapes to include specific features like drip irrigation or 50% plant coverage.

Things are not necessarily easier for the half of surveyed agencies that rely solely on internal funding. On the positive side, internal program management streamlines funding processes and allows program managers to pace the distribution and continuation of funding as they deem fit. On the negative side, it can be difficult to find the money for rebate programs, especially absent sufficient political will.

2. **Non-Savers** – One risk common to all turf rebate programs is the chance that participants will undertake lawn transformations that ultimately do not save water. See [*Non-Savers*](#) below for an elaboration.
3. **Behavioral Limitations on Water Savings** – Regardless of the number of requirements and stipulations an agency establishes to maximize water savings, the actual water savings realized are subject to a factor out of agency control – end user behavior. Even super efficient irrigation systems are prone to improper use or failure absent proper maintenance.
4. **Staff Time & Resources** – Considering the standard stages of a rebate process – customer application, review, and acceptance; pre-inspection; customer guidance; and post-inspection – an internally managed rebate program is time-intensive. For example, one agency designates one

Full Time Equivalent staff person solely to its turf rebate program. To mitigate these staff costs, some agencies hire third party management consultants to help run the programs. While most of the agencies that follow this path still formally approve refund applications internally, the ability to outsource many of the rebate program tasks has proved cost effective for larger agencies.

5. **Growth Capacity** – Overall rebate program participation appears largely predictable, but managing the sometimes dramatic fluctuations in participation requires foresight. Agencies consistently note big jumps in program participation over periods as short as a few months. For example, one agency experienced a 600% increase in participation from one month to the following (50 to 300 participants). See *Application Trends* in the [following section](#) for participation triggers.
6. **DIY Landscapers** – Eager participants that wish to convert their lawns but lack sustainable landscaping knowledge and the will or funds to hire a designer or contractor can produce aesthetically displeasing landscapes. These landscapes leave negative impressions on neighbors and the public and can deter others from participating. Of course, not all do-it-yourselfers are guilty of 'ugly' outcomes, but agencies throughout the survey consistently identified 'ugly' outcomes that hurt rather than helped their programs.
7. **Savings Calculations** – Quantifying water savings attributable to the rebate program can challenge water agencies, especially those without Automated Meter Infrastructure (AMI). To accurately capture water savings, an agency must account both for weather variations and for water use patterns that are not directly attributable to the rebate program. In addition, irrigation patterns immediately before and after a landscape conversion produce their own water use anomalies. Just before the conversion, outdoor water use generally *declines*, as property managers tend to quit watering their old lawns. In contrast, just after the conversion, outdoor water use tends to *increase* as the same property managers frequently overwater their new plants until the plants establish themselves. To compensate for water use variability and obtain statistically significant water savings calculations, water distributors need to analyze both historical water use records and records several years after the conversion. Without sophisticated metering, let alone designated landscape meters, attributing water savings directly to turf replacement can be nearly impossible.
8. **Replacement Plant/Landscaping/Irrigation Materials & Requirements** – Programs across California lack a consensus on what to allow in replacement landscapes. Ultimately, a program encouraging holistic, sustainable landscaping may have stricter stipulations than a program simply seeking maximum water savings. Where each agency decides to land on the spectrum of replacement landscape requirements is left to a number of factors. These include funding obligations, geographic restrictions, customer and political will, and individual program managers. Managers face particularly hard decisions when deciding program requirements that require due-diligence research. For example, one Southern California agency removed permeable hardscapes from its

list of acceptable replacement options because it was observing the failure of certain permeable pavers. Other agencies continue to permit permeable pavers. They point to research that shows long-term infiltration benefits, even accounting for degradation and clogging over time. Similarly, one agency found that the plants it was recommending were not available in its region, causing undue stress on landowners trying to find responsible plant materials.

9. **Collaboration** – Overlap between or proximity to other turf rebate programs can cause confusion in customers, especially when replacement requirements and rebate values vary drastically. Without proper agency alignment, 'double-dipping' is also a concern (when crafty customers seek double the rebate – one rebate from a local agency, one from a regional agency). For example, one Southern California regional distributor offered a rebate program at the same time as a city of within its jurisdiction. The agencies diligently worked together to align expectations and preempt complications; however, inevitable variation in rebate values and specifications and ultimately the abrupt end and re-start of the city's program led to customer confusion.
10. **Customer Communication** – In an effort to set clear expectations, achieve maximum water savings, and offer comprehensive customer support, agencies often overwhelm turf rebate customers with information. On the one hand, an agency's posting of detailed turf removal documents on its website (e.g., program requirements, terms and conditions, design advice, and tax warnings) risks shutting customers down with information overload. On the other hand, not posting these materials risks unclear messaging and legal vulnerabilities.

Rebate Program Take-Aways: What to Expect & How to Manage for Success

To create and manage successful turf rebate programs, agencies must learn from their peers and anticipate the trends and patterns that can predict or pre-empt program issues. The following list details 14 reasonable program expectations and management tips for mitigating associated program challenges and risks.

1. **Application Trends** – Agencies consistently observe spikes in program applications and participation immediately following three events: a drought emergency declaration; a rebate increase; and a special, landscape-focused agency event. Agencies also note that participation has held relatively high ever since the governor's emergency drought declaration in January, 2014 and the State Water Board's promulgation of emergency drought regulations in the summer of 2014.
2. **Rebate Value** – While the decision on the dollar-value of a program's rebate has real implications for customer attraction and retention, it alone does not dictate participation. For example, an agency with an eight-year-old turf rebate program recently cut its rebate value in half when funding was getting low, from \$1 to 50 cents per square foot, yet the program did not see a drop in participation. Since then, the agency has even grown its program participation and has effectively doubled its impact (i.e., the agency can double the

landscape conversion area supported by the program using the same remaining funds). Understanding local/regional costs for landscaping replacement, the marginal value of the anticipated water savings to your agency, and target customer demographics' willingness to 'pay' can help with rebate selection. Rebate levels can always be changed (unless specified otherwise by a funding entity), and many successful rebate programs have increased their rates temporarily as a 'drought' special, indicating a flexibility to adapt the value as needed.

3. **Marketing** – Agencies employ a range of marketing strategies to get the word out about turf rebate programs. These include bill inserts, direct mailings, social media, radio tags during weather and traffic announcements, Google ad-words, garden tours and landscape events and workshops, program-specific websites, and word of mouth. Most agencies indicate that three outreach and advertising strategies are most effective: a) bill inserts and direct mailings; b) annual spring garden tours or landscape workshops; and c) word of mouth via existing and aesthetically pleasing landscape conversions.
4. **Customer Care and Communication** – Many customers are completely new to landscaping, let alone to turf conversion. They require significant handholding on the program application, the landscape design, and the landscape installation. How a program 'holds' customers' hands varies from indirect strategies such as "check the website for information," to direct strategies such as "call the turf rebate program manager when needed." Though water agencies vary on how they manage continual customer need, an emerging theme suggests that kind and flexible customer service that rewards good intentions is key to successful landscape conversions and program longevity. For example, a delayed landscape conversion that fails to meet a program deadline because the customer was concerned about watering new plants in the summer may save more water than an incomplete conversion that fell-through because the customer did not comply with the program timeline and the rebate offer was revoked.

Maintaining flexibility with customers can come at the cost of increased program administration time. Streamlining and minimizing customer communication and standardizing customer expectations reduces program staff time. Agencies must seek an internal balance between customer intervention and customer independence that considers the impact on targeted outcomes such as successful conversions and water savings. Persuading customers to read available rebate parameters and conversion expectations before calling agencies with questions is a key strategy to streamline customer interaction, but as previously noted, turf rebate information can be overwhelming and daunting to the landscape novice. Clear and concise rebate program informational materials, easily understood by customers, will contribute to program efficiencies. Some agencies require customers to check a box indicating that the customer has thoroughly read and understood all the program terms and conditions before applying. This strategy may decrease agency liability, but many internet-users have been conditioned to check that box regardless of whether they have actually

reviewed the content. Implementing innovative strategies that encourage customers to do their own program research and that address multiple customer questions and concerns at the same time may pay back dividends in the rebate process by saving staff time. For example, one agency hosted a twitter chat when it first launched its program, answering many would-be participants' questions in one concerted effort.

5. **Customer Demographic Breakdown** – Generally speaking, agencies that offer rebates to both residential and commercial customers draw roughly 90% of their participants from the residential sector and 10% from the commercial sector. Spatially and financially, however, results vary, and commercial customers can far exceed residential customers in terms of acres of turf converted and rebates received. Depending on program goals (e.g., landscape awareness, magnitude of conversions, or customer relationship-building), an agency may delegate specific proportions of available funding to the residential or commercial sectors. For example, a water agency that wants to increase engagement with the CII sector can allocate more rebate funds to that sector than to the residential sector. Agencies have also noted a breakdown of roughly 15% do-it-yourself participants versus 85% hire-a-contractor participants, though this ratio is prone to vary significantly by region, program requirements, and customer demographics.
6. **The Design Phase** – Agencies have found that the landscape design component of rebate programs is instrumental in eliciting positive transformations and that most customer drop-outs occur upon facing program design hurdles. Most programs require some sort of landscape design submission to be eligible for the rebate. Some agencies will not even inspect properties until a landscape design is submitted, because they observe up to a 50% drop-out rate during the design phase. To empower customers and to encourage excellent designs, agencies adopt different strategies. Two of these are; a) customer class requirements where customers participate in a landscaping class before they apply to the program; and b) discounted design consultations where customers can receive a two-hour landscape architect consultation for a heavily reduced price.
7. **Rebate Timeline** - From the application to the final inspection, rebate processes can last anywhere from 45 days to over 4 months. Customer and agency enthusiasm can wane during this time, and participant paper trails can get lost and confused. An agency needs a consistent approach to managing the lengthy conversion processes. It also needs to capitalize on the increased customer contact that a rebate program generates by encouraging long-term customer commitments to landscape maintenance that extend beyond the rebate time-frame. For context, the average, healthy, California native garden takes two years to fully establish. Customer communication and education during the rebate time-frame is critical to the future establishment and management of replacement landscapes after the rebate process concludes.

8. **Customer Fallout** – Turf rebate program attrition rates are consistently high. Three reasons for this are: a) the lengthy conversion timeline; b) the rigorous replacement requirements; and c) landscaping's complexity. Agencies observe anywhere from 25-45% of applicants pulling out of the rebate process before they receive their rebate check – typically the last step of the process. Applicants will be rejected by the program or drop out of the rebate process for multiple reasons. These include: fatal flaws in their applications, failure to comply with the turf replacement requirements, and simple process fatigue. Programs with strict deadline cycles see most of their drop-outs leave the program right before the final deadline, because they were unable to stay on track. Programs with an involved design component see most drop-outs during the design submission phase.

Agencies use a range of strategies to minimize drop-out rates. Some agencies explicitly confirm that the customer is aware of all the program requirements by requiring attendance to a sustainable landscape class or workshop that sets explicit expectations as an application pre-requisite. Others provide design advice, tools, or professional services to applicants who are do-it-yourselfers, as these customers struggle the most with program design components.

9. **Lawn Acceptance Status** – Traditionally, agencies require lawns to be well-maintained prior to a rebated conversion in order to realize real water savings. California's lasting drought, however, has stressed lawns. Agencies can no longer expect perfectly watered and manicured lawns upon rebate program pre-inspection. With drought watering restrictions and increased conservation ethics, it is more common to find homeowners these days who are willing to 'let their lawn go.' Some agencies realize that to follow the watering restrictions is to see some decrease in lawn health. Other agencies do not wish to punish homeowners for good behavior. Still others view lawn conversions as a long-term investment that may not yield immediate savings, but will ultimately realize long-term water conservation. For all these reasons, some agencies have relaxed their pre-inspection lawn status requirements and are accepting rebate applications for less-than-perfect lawns. Agencies are particularly willing to overlook a stressed lawn during pre-inspection if seasonal and historical billing data or aerial imagery is available to prove that the property was recently fully irrigated. Accessing historical water use data to support claims of historic irrigation is easier for districts with automated metering infrastructure and dedicated irrigation meters. Even then, the records must be normalized for weather.

10. **Replacement Requirements** – What an agency chooses to allow or prohibit within its turf replacement requirements can determine the cost and feasibility of successful conversions. Agencies who make the requirements too strict will find that fewer people will apply to the program or comply with the terms and conditions. Those who make them too loose will find that the resulting landscapes will not meet agency expectations. When designing rebate program requirements, agencies with existing turf rebate programs suggest five points: a) align

with near-by rebate program requirements; b) focus on the aesthetics of early conversions to boost program popularity; c) offer specific climate-appropriate and native plant suggestions and work with local nurseries and plant retailers to make sure suggested plants are available; d) require irrigation system upgrades; and e) specifically address - through required educational opportunities - the behavioral and educational barriers to water conservation. These include irrigation management and sustainable landscaping practices.

11. **Social Norms** – Powerful in their ability to attract or dissuade customers to a rebate program, social norms can make or break a program's success. For example, agencies have seen that one to two stunning conversions in a neighborhood can catalyze an entire neighborhood's transformation. Conversely, a single ugly conversion can discourage a neighborhood from participating in a rebate program. Agencies suggest that managers of new programs do whatever it takes to promote a neighborhood's beautification, and not its 'uglification.'
12. **From Early Adopters to High Water Users** – Existing turf rebate programs have shown that a water district's most water-conscious customers will undertake the initial lawn conversions. Over time and with successful conversions, agencies have found that the program ultimately attracts the less-conscious, high-water users.
13. **Cross-Agency Collaboration** – Two rebate program situations involving multiple agencies in the same geographic area have led to customer confusion. First, some retail water agencies fall within the jurisdiction of a regional wholesaler. Second, many retail agencies have service area boundaries contiguous with one or more other retailers. In either case, customers can be confused by the existence of multiple turf rebate programs, and agencies can experience cross-agency program conflict. To minimize confusion and avoid conflict, regional programs must generate buy-in from member agencies and stakeholders early on in the program design process. Similarly, independent retailer rebate programs should seek alignment with other regional or proximate agency programs to provide their customers with consistent and clear expectations.
14. **Wisdom Over Time** – As with any new program, there is a learning curve to turf rebate programs. Though this report hopes to help flatten that curve, existing programs are learning new "lessons" daily. Agencies starting new programs should consult directly with well-established turf rebate programs. Additionally, agencies with existing programs recommend trying small scale pilots before launching large scale rebate programs. These pilots allow agency staff to work out program hiccups and save significant time and money down the road. For example, one agency piloted its turf rebate program with a small subset of customers before implementing it on a large scale. Based on the pilot, this agency ultimately decided to only require commercial entities to submit conversion plans, not residential homes; that agency had found that the otherwise required conversion plan 'homework' significantly deterred residential participation.

Landscape Conversion Water Use Impacts

Water Savings

Water savings attributable to landscape conversions - with or without irrigation system upgrades - vary between regions and between neighbors. Geographic climate differences, programmatic variability in landscape and irrigation replacement options, and capricious human behavior complicate water savings predictions and reduce the transferability of reported results. Studies across California measure, model, and/or predict average turf-replacement water savings of anywhere from 18% to 83%. In gallons per square foot converted area per year (g/sq ft/yr), agencies estimate and calculate a water savings metric that ranges from 13 to 70+ g/sq ft/yr. Southern California agencies consistently report savings of around 45 g/sq ft/yr. Table 1 below summarizes percent water savings attributable to landscape conversions as measured, modeled, or predicted by a variety of California and non-California sources and studies.

Table 2: Percent water savings attributable to landscape conversions; Single Family (SF), Commercial Institutional and Industrial (CII)

Source	Water Savings Average	Conditions
UC Davis Study	60% City-Wide	Student model of replacing turf areas with native plants, City of Davis, CA
Metropolitan Water District Study	18% SF 24% CII	Sample of CII and SF turf conversions within MWD Cash for Grass rebate program; water usage from agency billing data
Santa Monica City Garden-Garden Case Study	83% SF	Controlled, side-by-side, Single Family Residence case study in Santa Monica, CA
Council 'Turf Removal PBMP'	35-75% per capita use	Range identified via literature review of 'typical residential' site replacing cool season turf grass in CO ⁱ and NV ⁱⁱ
AWE Outdoor Water Savings Research Initiative	33-76%	Range identified via literature review of landscape conversions in FL ⁱⁱⁱ and NM ^{iv}

Water Savings Caveats

Replacing turf grass with low water-demand ground cover is not solely responsible for the quantifiable changes in outdoor water use before and after landscape conversion. In part, water savings may be attributable to other factors such as fluctuating climates, customer behavioral change, decaying irrigation system upgrades, expanded knowledge and awareness of landscape managers, and decreased ET from a reduced canopy cover immediately following a conversion. Some of these factors are intentionally captured in program design to reduce water use. It would be informative to separate out the quantitative value of water savings attributable to each program requirement, but for water distributors, it is often more important to include as many water-saving program requirements as is realistic to maximize program value. An improved understanding of the percentage of conversion water savings attributable to specific program results such as irrigation system updates or behavioral change would help to refine program

design and to achieve the highest water saving potential. For example, if a rebate program's plant coverage replacement requirement yielded negligible water savings, and 99% of actualized water savings were attributable to customer behavioral change, then rebate programs could increase their cost-effectiveness by emphasizing the components of their programs that most impact property owner behavior. Of course, water savings are not the only benefit achieved from landscape conversions. Indeed, the multiple benefits associated with turf replacement projects such as GHG emission reduction and native habitat creation will complement water savings in the bigger watershed picture.

Non-Savers

As mentioned above in [Rebate Program Challenges & Risks](#), some rebate customers see no water savings despite replacing their turf. Anecdotally, water agency employees observe negligible initial water savings on many turf conversions. They note that while climate appropriate and native landscapes require different irrigation techniques, they still use roughly the same quantity of water as efficiently-watered turf grasses upon *installation*. Once established, however, they need less water.

The Southern Nevada Water Authority (SNWA) presented on this 'non-saver' phenomenon during the 2014 WaterSmart Innovations conference. In SNWA's presentation, 'The Non-Savers: An Evaluation of Turf Conversion Properties That Don't Save Water,' presenters concluded that approximately 10% of customers increase their water use after a landscape conversion and 10% neither increase nor decrease their water use after a landscape conversion. The study found few statistically significant factors predicting differences between non-savers and savers. It did, however, note three interesting differences: 1) non-savers converted a lower percentage of their landscaped area or house lot area; 2) non-savers had a higher minimum percent plant cover pre-conversion; and 3) non-savers had newer home construction and/or more valuable property. Qualitatively, sites ranked as having 'very poor' pre-conversion turf quality were also more likely to fall into the non-saver category than program participants with higher pre-conversion turf quality.

These results are intuitive – smaller conversion projects on plots with significant pre-existing plant coverage and newer construction (and therefore newer irrigation) with stressed turf conditions may show lower water savings post conversion than their counterparts. Creatively designed rebate program requirements can help to minimize the number of non-savers and maximize water savings. Even non-savers, however, can still benefit programs by expanding the visibility of sustainable landscapes and increasing the level of customer awareness of sustainable landscaping practices.

Turf Replacement Cost-Effectiveness

Both turf rebate programs and third parties have quantified the value of water savings attributable to rebated conversions. Their results show that for every acre-foot (AF) of water saved, pro-rated over an assumed program lifetime of 10 years, water distributors and their funders typically pay anywhere from

\$1,000 to \$1,700⁴. Quantified cost outliers approach \$400/AF and \$5,900/AF. Among other factors, this cost-effectiveness metric (\$/AF saved over 10 years) depends on rebate values, program administrative costs, regional water savings potential, and end user behavior. Compared with other conservation strategies, an average lawn conversion rebate program, as it is valued now, is one of the most costly conservation and supply augmentation approaches that a water agency can undertake (see [Appendix A](#) for details).

The \$/AF saved ratios may change over time. On the one hand, savings attributable to conversions may increase over time as the climate appropriate plants mature and require less water or as hotter and drier climates increase turf grass water needs disproportionately to drought-tolerant-plant water needs. On the other hand, water savings attributable to rebate programs may decrease over time due to property management changes, irrigation system decay, or decreased end-user water consciousness in post-drought years. Water savings may also stay constant over time. A Nevada-based study on xeriscape lawn conversions (see [Climate Appropriate Landscapes](#) below for the meaning of Xeriscape) found that water savings did not significantly change over time. This study used only Nevada Xeriscapes limiting the transferability of the study results, but it does suggest stabilized water savings as a third possible outcome.^v The degree of change over time in water savings will ultimately determine the return on turf rebate program investments. Extensive program cost analyses that capture additional externalities from turf conversions, positive or negative, such as waste generation, maintenance time, and habitat value, are not readily available. Future studies should consider the multiple effects of landscape conversion when calculating cost-effectiveness metrics.

The Future of Turf Replacement Rebate Programs

Turf rebate programs have an uncertain future. Program success over the past year, as measured by dramatic participant growth, could foreshadow a future in which the programs continue to grow exponentially, both expanding in popularity and shaping social norms. On the flip side, the rapid growth could give way to saturated target demographics, insufficient funding for continued programming, or calculated cost-benefit decisions to end programs.

In the long term, California cannot afford to spend \$3 per square foot to replace the roughly 2.5 million acres of turf grass (1.089e+11 square feet) in the state. Given that current expenditures are unsustainable, existing programs should be considered loss-leaders. They should seek a defensible and repeatable proof of concept that substantiates the value (economic, aesthetic, environmental, and health) of turf removal and sustainable landscaping on a state-wide scale. The following seven program considerations stand out as top priority program improvements to support water savings, improve fiscal investments, increase program defensibility, and generate streamlined rebate processes:

⁴ These values were calculated and estimated using a wide range of methodologies. From statistical evaluation capturing several years of water use data before and after participant conversions and controlling for confounding factors such as weather, to simplified calculations that multiply an average water savings number (e.g., 45 gallons per square foot per year - approximated and adopted by many Southern California agencies) by the area of conversions completed.

1. From the start of a turf rebate program, collect the necessary data to defensibly calculate and statistically analyze the water savings attributable to conversions. Commit to a standardized and transferable calculation methodology for measurement and verification of program outcomes.
2. Offer and/or require hands-on landscape design and irrigation guidance through classes or other means to educate and engage homeowners and to realize high-quality and sustainable conversions that expand beyond turf removal to embrace the principles of the watershed approach. (See [Appendix B](#) for an explanation of the watershed approach.)
3. Design, test, and implement innovative strategies to maximize conversion impact. Strategies could include varying rebate levels to correspond with microclimates; increasing rebates for simultaneous neighborhood conversions; or acknowledging successful conversions with yard signs that attribute beautiful new landscapes to the turf rebate program. These strategies should simultaneously maximize water savings while attracting participants and establishing social norms.
4. Use multiple post-conversion inspections to determine how conversions hold-up or change over time. For example, check the landscape immediately after a conversion completion, then check it again one year later to evaluate plant health, aesthetic appearance, and irrigation system decay. Additional inspections will also remind property owners to continually manage their own landscapes.
5. Design program finances and rebate levels to achieve the desirable degree of participation, water savings, and longevity. This process requires studying participation trends over time from similar agencies and determining how an agency can manage available funding and staff resources to implement and sustain a program. This design process may also require including additional water-saving criteria in rebate terms and conditions.
6. Emphasize long-term customer behavioral changes throughout the rebate process by:
 - seeking customer commitment to water conservation ethics;
 - educating participants on the multiple benefits of landscape conversion and on the practicalities of landscape maintenance;
 - reminding customers of these topics throughout the project; and by
 - positively reinforcing customer progress and program participation.

Importantly, a (sometimes large) portion of water savings post conversion is attributable to the increased customer knowledge and understanding of landscape irrigation and maintenance needs. Consistent customer contact and prompts that extend beyond the conversion project timeline will reinforce behavioral change and maximize water savings impacts.

7. Motivate a shift to the watershed approach to landscaping by coupling turf rebate programs with additional holistic landscape considerations and incentives. Incentivize on-site stormwater capture

and retention through all-inclusive or tiered rebates that encourage rainwater harvesting and stormwater retention in addition to turf replacement and irrigation upgrades.⁵ Seek funding from mutually benefited organizations such as stormwater agencies. Consider soil health improvements and/or the use of compost for rebate requirements or additional rebate incentives to ultimately increase water retention capacity and reduce the need for supplemental irrigation. Design variable or tiered rebates that incentivize planting new landscapes during the appropriate season. For example, offer an initial, nominal rebate for sheet-mulching a lawn during spring or summer months. Then, offer an additional rebate for new landscape planting during the fall months.

Challenging questions about rebate programs remain: do these programs only reward wasteful water users or well-off home owners who could afford the conversions without rebates? Is there social equity in rebate programs? Should California water agencies be implementing comparatively non-cost-effective conservation programs in a drought? Are there cost-effective, alternative approaches to incentivize landscape conversion (see [Appendix C](#))? These are thought-provoking, valuable questions to ask. Given the current popularity of these programs, they are likely to remain until they simply become too expensive for water distributors. Only time and a continued commitment to improving region-specific program design and data collection will reveal the true impact and potential of turf removal rebate programs.

⁵ For ideas on incentivizing stormwater retention, check out Portland Oregon's '[Clean River Rewards](#)' program and '[Downspout Disconnect](#)' program, or Seattle's [RainWise Rebates](#).

Turf Replacement Specifications

Different rebate programs permit a range of replacement ground covers. Three primary material replacements are available: climate appropriate plants, permeable hardscapes, and synthetic turf. Where one rebate program allows any of the three, another program allows only one. The following section briefly covers what each of these replacement options entail and lists their pros and cons including water use; maintenance; retention, runoff, and erosion; ecosystem services such as habitat creation, fire control, and cooling; GHG emissions and waste generation; public health; and cost effectiveness. (Please see [References & Resources](#) at the end of the report for further research.)

Climate Appropriate Landscapes

Climate appropriate, drought tolerant, and/or native plants and planting materials are a preferred turf replacement option for many water distributors. Most rebate programs require that a certain percentage of replaced landscape area consists of climate appropriate plants. Dubbed 'climate-appropriate,' these plants are better adapted to California climate zones than their water-intense peers, and therefore, they require less irrigation. Drought tolerant plants are those specifically recognized for their ability to survive extended periods of time with little to no rain or irrigation. Not to be confused with climate-appropriate or drought tolerant plants, native plants are plants indigenous to a specific region, as identified during a specific period of history. California native plants, generally thought of as plants that existed in California prior to European settlement, are by definition climate-appropriate because they exist naturally in a climate that suits their needs. These plants have co-evolved with native animals, fungi, and microbes over long periods of time, and therefore they provide the additional benefit of habitat creation for native animals. Not all climate appropriate or California native plants, however, are drought tolerant simply because not all California climates commonly experience (or used to experience) repeated droughts. Thus, landscapers must ensure that their choice of native is appropriate for their specific micro-climates.



Image Credit: www.gopixpic.com

Among recognizable climate-appropriate landscape brands are: Xeriscape™, California-Friendly™, Bay-Friendly, River-Friendly, and Garden-Friendly.

Xeriscaping, the first widely-recognized turf alternative, gained its popularity in the arid southwestern United States. For many, it conjures images of gravel, adobe, succulents, and cactuses. In actuality, however, Xeriscaping encompasses a broader array of plant varieties selected for water efficiency and soil health.

The wide array of 'Friendly' brands indicates California

climate-appropriate and native plants. They are growing in popularity, especially since the 2014 drought emergency declaration and the growth of turf rebate programs. Gardens built using climate-appropriate plants are often also designed around watershed-approach principles such as decreased water use and

increased percolation, healthier soils, habitat creation, and hydrozones that cluster plants with similar water and sun requirements and help minimize erosion and unused runoff.

Critics disapprove of climate-appropriate and native gardens as a viable turf replacement options for four principal reasons:

1. Cost – Compared to turf grasses, native and climate appropriate gardens are typically more expensive to purchase and install.
2. Maintenance – Heterogeneous gardens often require a greater depth of landscaping knowledge and understanding; even if resulting gardens ultimately require less maintenance, the initial learning curve is steep.
3. Aesthetics – Some landscape conversions designed with native or climate-appropriate plants do not result in aesthetically pleasing front yards, offending neighbors and discouraging further conversions.
4. Property Value – The market value for homes **may** decrease based on the absence of a turf grass lawn.



Image Credit: www.californianativeflora.com

In contrast, supporters give seven reasons for favoring climate-appropriate and native gardens as a viable turf replacement option:

1. Cost – Long term cost analyses suggest that money saved on maintenance, waste removal, and water costs yield a reasonable return on investment, particularly when landscape conversions are large-scale commercial projects or when property managers receive rebates.
2. Maintenance – Property owners and managers spend fewer hours maintaining an established native or climate appropriate garden than a turf lawn.
3. Aesthetics – The plants available to native and climate-appropriate gardens vary in size, shape, and color, and can yield beautiful landscapes when designed properly.
4. Property Value – Market value for homes **may** increase based on the presence of a water efficient landscape based on native or climate-appropriate plants.
5. Water, Waste, and Energy Savings – The decreased water, fertilizer, and pesticide needs, and the decreased maintenance time associated with native and climate-appropriate gardens saves water while reducing chemical use, green waste, and GHG emissions when compared with 'mow-blow-and-go' turf grass maintenance.
6. Habitat Creation and Soil health – Native plants can create habitat for native animals, such as bees, that are key species in keeping our watersheds healthy. Native plants can also help to restore soil health through habitat creation by incorporating animal byproducts into the soil.
7. Stormwater Management – Well-designed native gardens retain stormwater, allowing it to percolate to subsurface aquifers, filter pollutants, and avoid at-capacity sewer lines.

Permeable Hardscapes



Image Credit:
<http://www.santacruz.watersavingplants.com/>

Permeable hardscapes are ground covers constructed above drainable soils or stone aggregates. When compared to traditional solid concrete, brick, or asphalt pavers, permeable hardscapes reduce runoff and erosion. Permeable hardscapes vary widely in permeability. They include: gravel; gridded or interlocking pavers with gravel or dirt infill; cobblestones; and porous, pervious, or permeable pavers (e.g., porous asphalt and pervious concrete).

Critics disapprove of permeable hardscapes as a viable turf replacement option for five reasons:

1. Failure Over Time – Anecdotal evidence has led some agencies to remove permeable hardscapes as an allowable alternative to turf grass. These agencies note that property managers/owners report a decrease of permeability over time, as percolation pores and grooves clog with compacted dust and grit. Research shows that after a few years of use or after poor installation practices, percolation from some 'permeable pavers' can decrease by orders of magnitude.
2. High-Maintenance – Porous pavers require a stone aggregate detention basin below the pavement surface. To maintain infiltration rates, this basin must be periodically washed out to prevent dirt and particulate build up. Some porous surfaces require vacuum sweeping to maintain infiltration rates; certain old porous surfaces can only be reclaimed as 'permeable' by drilling half-inch holes in the surface to allow water to reach the stone aggregate basin.
3. Climate- and Soil-Sensitive – Climates that experience freeze-thaw cycles frequently see damaged pavers. They crack after partially clogged pores fill with water, freeze, and then expand. Sanding surfaces for snow traction also quickly renders porous pavers ineffective by clogging pore spaces. Similarly, snow-plow piles with high sediment content can melt into pavers and clog them. Finally, regardless of a hardscape's permeability, high clay-content soils limit infiltration into aquifers and can cause pooling and runoff.
4. Heat Island – Some porous pavers are dark surfaces (e.g., porous asphalt) that increase heat absorption and contribute to the urban heat island effect.
5. Limited Environmental Benefits – In contrast to other turf replacement alternatives like climate appropriate plants, permeable hardscapes do not offer ecosystem services such as GHG sequestration, air filtration, or habitat creation.

Supporters give seven reasons for favoring permeable hardscapes as a viable turf replacement option:

1. Reduced Runoff / Increased Percolation – At least upon installation, the runoff coefficients of most porous pavers are more similar to grass (and some in far excess of grass) than to non-porous

pavements. These lower runoff coefficients mean increased infiltration into the soils and increased subsurface water storage.

2. Low-Maintenance and Functional – In contrast with plant and turf grass ground covers, hardscapes require little to no maintenance or chemical application. They also serve as a functional space for many activities.
3. Water Savings – With little to no watering requirements after installation, permeable hardscapes can reduce outdoor water usage by almost 100%.
4. Water Filtration – Stormwater pollutants are removed by filtration through the paver pores and/or in the permeable ground underneath or in-between permeable hardscape surfaces.
5. Efficient Construction – In comparison with traditional pavements, porous pavements take less time to construct and install.
6. Durability – Properly constructed pavers can last 20-40 years and maintain infiltration rates orders of magnitude higher than turf grass throughout their lifetime.
7. Low Cost – Well-installed and designed permeable pavers or other permeable hardscapes can save money over a landscape's lifetime through water savings, landscape materials applications, and maintenance opportunity cost savings. Indeed, considering just installation costs, permeable pavers are cost-competitive with both plant and synthetic turf alternatives. Permeable pavers are also cost-competitive with traditional pavers when storm water management systems are included in the cost calculations. Alternative permeable hardscapes like gravel beds cost significantly less than plant and synthetic turf coverage of a similar area.

Synthetic Turf

Artificial grasses have been around since the mid to late 1900's. Consisting of synthetic fibers, rubbery infill, and subsurface layers designed to pad, drain, filter, and ground the fibrous artificial turf, this groundcover was originally popularized in sporting arenas. It offered water and maintenance cost and time savings. Synthetic grass design has evolved over time to combat its negative reputation in the environmental and public health world, though artificial grass critics remain skeptical. Improved technologies have bettered the ergonomics of synthetic grasses to decrease the threat of athletic injury. New materials limit lead-contaminated infill and minimize heat dangers. Recently, spurred by ongoing drought and decreased water and maintenance costs, synthetic turf has gained popularity among California single family homeowners.

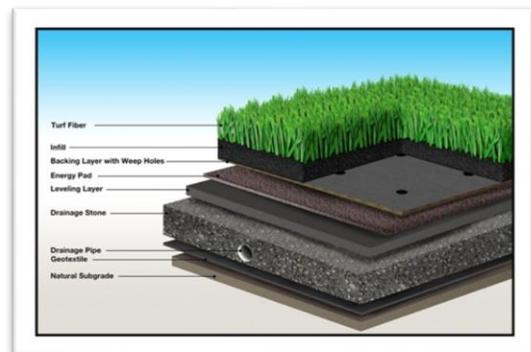


Image Credit: The Synthetic Turf Council

Critics disapprove of synthetic turf as a viable turf replacement option for six reasons:

1. Heat Risks – Surface temperatures on synthetic fields have been documented as high as 199 °F, increasing potential for heat-related health hazards and increasing the urban island effect.

2. Health Hazards – Beyond heat injuries, researchers have documented increased incidence of sports injuries, increased risk for bacterial infections, and increased asthma triggers. They have hypothesized connections between heavy metals and toxic compounds found in synthetic turf infills (and their cleaning agents) and diseases such as cancer.
3. Waste Generation – At the end of its 6-15 year lifetime, synthetic turf typically ends up in a landfill, even if it is technically recyclable.
4. Aesthetics – Wear and tear on synthetic turf materials creates damaged-looking and faded groundcover; unlike natural grasses, artificial turf cannot regenerate itself.
5. Environmental Impact – Artificial turf does not offer several environmental benefits offered by turf grass and living plant alternatives such as biofiltration, cooling effects, carbon sequestration, and habitat creation. Instead, the synthetic turf can increase runoff, leach toxins into soils, and cause soil compaction and loss of microbes.
6. Limited Water & Maintenance Savings – Hot or dirty synthetic turf surfaces require irrigation and cleaning maintenance. This increases water and time costs and occasionally requires costly specialized equipment and toxic chemical cleaning solutions. These maintenance factors can lengthen the return on investment time for synthetic turf installation well beyond the industry-supported claims of three to five years.

Supporters offer six reasons for favoring synthetic turf as a viable turf replacement option:



Image Credit: frassfakegrass.com

1. Convenience – Artificial turf can be used continuously as a functional space; no “down time” has to occur for fertilizing and cutting. In addition, synthetic lawns can be enjoyed year-around in climates that do not support continuous natural turf growth.
2. Health Benefits – Industry supporters claim modern synthetic turf technologies reduce sports injuries and control for bacteria growth.
3. Waste Reduction – Some artificial turfs are now 100% recyclable. In addition, artificial turf manufacturers themselves integrate into their product post-consumer, recycled materials such as tire rubber that would otherwise be sitting in a landfill.
4. Aesthetics – Fade-resistant, durable artificial turf products resemble a perfectly manicured lawn, year-around.
5. Environmental Impact – Artificial turf eliminates the need for fertilizers and pesticides that can run off in stormwater and leach into water tables. Artificial turf also reduces GHG emissions and green waste by eliminating ‘mow-and- blow’ maintenance.
6. Water & Maintenance Savings – Artificial turf requires little to no water or maintenance. This saves property owners and managers money and time. These savings mean property owners can see their purchase and installation expenses paid back within three to five years.

Conclusions

The limited quantity and quality of turf removal program data undermines conclusive program evaluation and recommendations, but anecdotal lessons learned can inform agencies as they manage new and expanding turf removal programs. Common challenges faced by program managers include limited time and money resources, customer unfamiliarity with landscaping, and undesirable conversion outcomes. Key strategies to overcome these challenges and to realize water-saving, aesthetically-pleasing landscape conversions include educational customer outreach, thorough conversion monitoring, and carefully designed program requirements.

A central component of turf removal program design are the turf replacement options. Without a complete life cycle analysis of all natural turf alternatives – i.e., climate-appropriate plants, permeable hardscape, and synthetic turf - it is difficult to quantitatively and conclusively compare the impacts of these groundcovers on financial resources as well as environmental impact. It is simpler; however, for agencies and property managers to consider the above qualitative pros and cons and choose based on what is most valuable to them as a water agency or as an individual.

Even if turf rebate programs are not a cost-effective method to augment urban water supply, there are substantial positive externalities associated with them. These include end-user education, multiple benefits from climate-appropriate landscapes, and encouragement of a general cultural shift towards understanding and accepting environmentally beneficial alternatives to turf grass. For agencies considering these programs, these non-quantifiable benefits may tip the scale and justify the investment in limited rebate programs. Program popularity with homeowners and program timeliness given California's ongoing drought indicate that these programs have the potential to catalyze broad transformations on a state-wide scale. Program design and limitations must be carefully considered to manage expectations and to generate desirable results for water agencies, customers, and the state as a whole.



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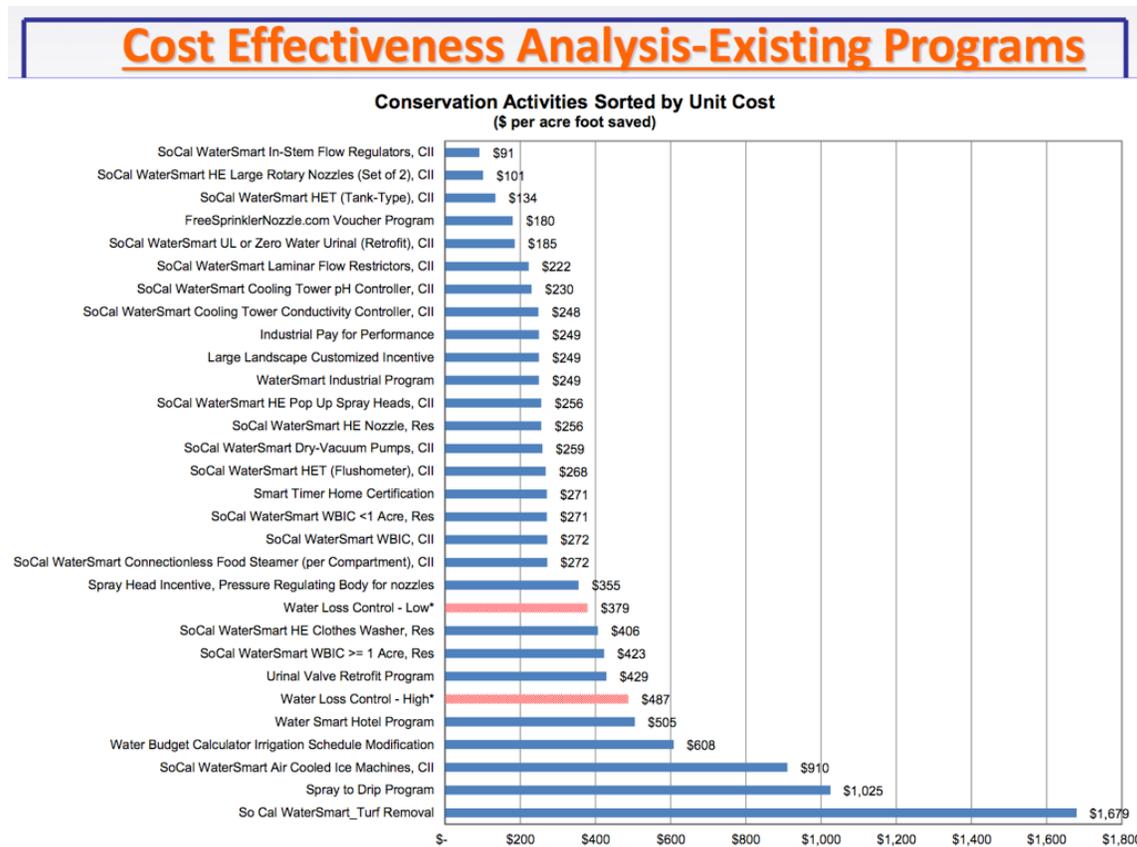
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Appendix A: Conservation Program Cost Effectiveness

The following chart, presented by Joe Berg from the Municipal Water District of Orange County at the WaterSmart Innovations Conference 2014, details the relative cost per acre foot (AF) of water saved for various water conservation programs. The turf rebate program value is found at the bottom of the chart, indicating that it is the most expensive program alternative evaluated in this study with a cost of \$1,679/AF water saved. It should be noted that since 2014, cost effectiveness numbers may have changed.



The following are California water source costs as calculated by the Public Policy Institute of California:

Method	Annual cost per acre-foot (\$)	
	Low	High
Conjunctive use and groundwater storage	10	600
Water transfers	50	550
Agricultural water use efficiency (net)	145	240
Urban water use efficiency (gross)	230	635
Recycled municipal water	300	1,300
Surface storage (state projects)	340	1,070
Desalination, brackish	500	900
Desalination, seawater	900	2,500

Appendix B: The Watershed Approach

A watershed approach intends an integrated, holistic approach to landscape design, construction, and maintenance that transcends water-use efficiency to reflect a site's climate, geography, and soils and to address the related benefits of cost savings, run-off reduction, green waste reduction, pesticide and fertilizer reduction, habitat improvement, and energy/GHG reductions.

California's landscapes provide essential functions throughout our urban environment. They are where we recreate; capture, clean and recharge groundwater; shade and cool our buildings; enhance property values; provide wildlife habitat; create space to grow food locally; provide a sense of place and much more. The optimal design, installation, and management of these spaces are critical to enhancing California's quality of life while protecting our limited natural resources.

The transition to the watershed approach will be a system-wide upgrade to the urban environment. In addition to reducing outdoor irrigation, the transformation promotes multiple environmental benefits for municipalities:

- Increased rainwater and graywater capture, storage, and reuse
- Increased stormwater capture and infiltration, decreased stormwater runoff
- Reduced synthetic pesticide and fertilizer application and runoff
- Reduced "green waste" production
- Increased soil health and water retention capacity
- Reduced energy consumption and greenhouse gas emissions and improved air quality, and
- Increased food production and habitat for beneficial insects and wildlife, and the restoration of native biodiversity

The transformation also promotes benefits for individual property owners:

- Increased cost savings (lower water bills and upkeep costs)
- Reduced landscaping maintenance
- Healthier neighborhoods and communities
- Increased sense of place and appreciation for local resources
- Improved stewardship ethics and associated positive feelings towards self and neighborhood, and
- Increased shared values between neighbors via increased community participation in a social-norm-defining transformation.

Appendix C: Other Turf Conversions – Demonstration Gardens

Turf rebate programming is not the only approach to catalyzing landscape conversions in California. There is a need for parallel efforts that leverage shifts in cultural preferences towards sustainable landscapes.

Among existing programmatic efforts to encourage turf removal, and more specifically to redefine social norms, is the installation and advertisement of demonstration gardens. These educational garden spaces replace turf in well-visited locations. Their beautifully-designed and functional landscapes attract the passersby and their informative signage educates garden explorers. Though less tangible than cash incentives, demonstration gardens can re-define public perception of unorthodox landscapes and gradually shift the current California landscaping paradigm from turf grass towards sustainable alternatives.



*Image Credit: Big Bear Lake
Department of Water & Power*

A series of California-Friendly® garden examples are hyperlinked through the Metropolitan Water District's [BeWaterWise](#) website. Though, some are designated botanical gardens, many are specifically demonstration gardens found in public spaces like libraries and water agencies. Numerous other demonstration gardens are scattered throughout the state on public and private property. These garden spaces often host gardening tours and workshops, school field trips, and other educational events. Beyond providing educational venues in pleasant and sustainable landscapes, these gardens increase public familiarity with non-turf landscaping alternatives. This familiarity breeds comfort and acceptance. Though demonstration garden impact on turf removal is not directly quantifiable, the gardens are readying the population of California for a landscaping paradigm shift.

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