10,000 Rain Gardens Project 2010

Report to the
Marin Municipal Water District

By the Salmon Protection and
Watershed Network (SPAWN)

MARIN MUNICIPAL WATER DISTRICT

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Table of Contents

Executive Summary 5

Background and Introduction to SPAWN's Rainwater Harvesting Efforts & Genesis of the 10,000 Rain Gardens Project 9

10,000 Rain Gardens Project Goals 10

Program Outcomes 11

- Goal 1: Provide widespread public outreach and customer service related to rainwater harvesting in the MMWD service area. 11
- Goal 2: Provide a range of education and training opportunities in rainwater harvesting within the MMWD service area 16
- Goal 3: Encourage and implement a variety of rainwater harvesting projects 20
- Goal 4: Foster an educated water conservation community invested in and motivated to implement best management practices to support the interconnected and multiple benefits of rainwater harvesting 26

Demonstration Project Case Studies 32

- Richardson Bay Audubon Center 32
- Marin Art and Garden Center 36
- Tamalpais Valley Community Services District 40
- Fairfax Town Hall 43
- Fairfax Town Hall "Cover Your Grass" Demonstration Project 46
- San Anselmo Public Library 48

Recommendations for the Future 51

- Property Owner Surveys and Consultations 51
- Tours and Workshops 52
- Public Presentations 53
- Demonstration Projects 53
- Exhibits, Education,and Outreach 54
- Additional Efforts 54

Appendices 55

Executive Summary

In 2009, the Marin Municipal Water District (MMWD) Board of Directors unanimously selected and contracted with SPAWN, the Salmon Protection and Watershed Network, to launch the ***10,000 Rain Gardens Project***, a one-year rainwater harvesting pilot project to encourage innovative water conservation projects within the Marin Municipal Water District.

The goals of the 10,000 Rain Gardens Project were to:

1. Perform widespread public outreach and customer service related to rainwater harvesting.
2. Provide a range of education and training opportunities in rainwater harvesting.
3. Encourage and implement a variety of rainwater-harvesting projects.
4. Foster an educated water conservation community invested in and motivated to implement best management practices to support the interconnected and multiple benefits of rainwater harvesting.
5. Serve as a successful model of agency-NGO partnership that can be replicated to design comparable programs in other watersheds.

SPAWN implemented a multi-faceted approach to accomplish these goals through installation of pilot projects at residential and public facilities; individual landowner consultations; technical hands-on workshops for professionals and the public; project site tours; various public education materials and exhibits; development of strategic partnerships with governmental and non-governmental organizations; and through a media strategy to reach and educate the general public in rain harvesting and rain garden concepts. A summary of our specific accomplishments (described in further detail later in this report) include:

- Designing and installing five publicly accessible demonstration projects at strategic community locations with high visibility.
- Facilitating the installation of at least 18 additional rainwater-harvesting projects in Marin as a result of our outreach, training, and bulk cistern orders.

- Designing, producing, and installing five interpretive signs for the model demo projects.
- Presenting four hands-on rainwater-harvesting design and technical workshops.
- Conducting six rainwater harvesting project site tours.
- Creating and publishing a Marin-specific resource website – www.Raingardens.SpawnUSA.org – filled with valuable resources.
- Creating and displaying a traveling exhibit at a summer festival and at other events in communities throughout the District.
- Designing, producing, and distributing "This Garden Harvests Rainwater" fence sign.
- Participating in five educational public presentations to large and small audiences throughout Marin.
- Increasing community outreach and raising awareness.
- Developing strategic partnerships with Ross Valley Sanitary District, Town of Fairfax, Tam Valley Community Services District, Marin Art and Garden Center, Richardson Bay Audubon Center, and Sustainable Fairfax.
- Distributing at least three media releases, resulting in at least six articles and announcements being published in the Marin Independent Journal (Marin IJ) and other local Marin papers, as well as two placements on ABC7 news channel and on KQED.
- Receiving more than 100 requests for owner site consultations from customers across the District.
- Completing 67 property owner site consultations (a total of 60 consultations were budgeted for, 7 additional were performed).

The results of the year-long pilot program suggest there are many opportunities and challenges for continued rainwater harvesting in the MMWD service area. Challenges to rainwater harvesting can be categorized as policy and legal, health and safety, financial, cultural, and physical site constraints. The design, cost, strategies, and functions of a rainwater harvesting project are influenced by the specific context of a property, property owner motivations, and factors that extend beyond any one property, agency, or interest. Continuing to develop strategic partnerships and watershed awareness will play a key role in actualizing the multiple benefits of wider adoption of rainwater harvesting by leveraging the collective resource base and integrating efforts for maximum positive influence.

Installing additional large-scale public demonstration projects at localities such as (schools, libraries, and fire stations) is a highly effective way to generate immediate demand reduction and/or alternate water supply capacity, as well as ongoing support of education, behavioral changes, and overall water conservation goals. Expanding the range and scale of BMP's showcased by the demonstration projects and organizing the sites into self-guided tours will provide continuous opportunity for community members to learn about different applications and what might be appropriate for their specific needs. Additional demonstration projects, along with continuing efforts to research, develop, and offer technical resources (including the website, site tours and

educational workshops), will support adoption of rainwater harvesting technologies. Developing and offering a range of technical trainings for professionals and property owners will build the community capacity for developing appropriate and effective systems for each specific context.

Many participants indicated a willingness to invest in harvesting water from one's roof and/or in transitioning turf to rain gardens, with water conservation and environmental considerations being their primary motivations more than reducing one's water bill alone. Additional projects will likely be installed as a result of the consultations and educational components of the 10,000 Rain Gardens Project, but there is often a lag time between learning a new technology and allocating the time and money to implement solutions. However, the up-front costs of design, installation, and materials – particularly for rainwater catchment in tanks or barrels – compared to the relatively low cost of municipally supplied water, remain a barrier to wider adoption of rainwater harvesting technologies. A comprehensive program with expanded educational opportunities and technical resources, combined with rebates to help cover some of the up-front costs, would increase the implementation of rainwater harvesting projects.

Using rainwater for non-potable indoor uses, such as flushing toilets and washing clothes, is under utilized in MMWD and California as a valuable tool for water conservation. Working with local municipalities to develop clear guidelines to ensure public health and safety while streamlining the permitting process for non-potable indoor rainwater catchment systems would help make rainwater harvesting more cost-effective and meet conservation goals by providing an additional supply to meet non-potable indoor water use throughout the year. Implementing a demonstration project for indoor non-potable uses of rainwater

harvesting that includes a strong monitoring and evaluation component would provide additional valuable information about this opportunity.

Transitioning high-water-use landscaping, particularly turf grass, into water harvesting landscapes planted with climate appropriate, low-water-use plants is a cost-effective way to decrease demand for irrigation water while also achieving additional benefits such as stormwater mitigation and habitat creation. With demand for landscape irrigation decreased, the potential to meet a higher percentage of any remaining irrigation demand using rainwater from tanks or barrels increases.

The individual residential property owner consultations were generally the least cost-effective technique used, though were important for exploring the range of challenges and opportunities faced by a cross section of property owners, and for receiving feedback about property owner needs. Future site consultations should be focused primarily on larger properties, such as homeowner associations, commercial sites, schools, and public facilities.

The SPAWN-MMWD 10,000 Rain Gardens Pilot Program was a cost-effective and efficient way to educate and motivate the public to understand and witness the benefits of rainwater harvesting. All of the techniques used were effective and, used together, form an integrated program that warrants continued development and expansion based on the lessons learned through this pilot program.

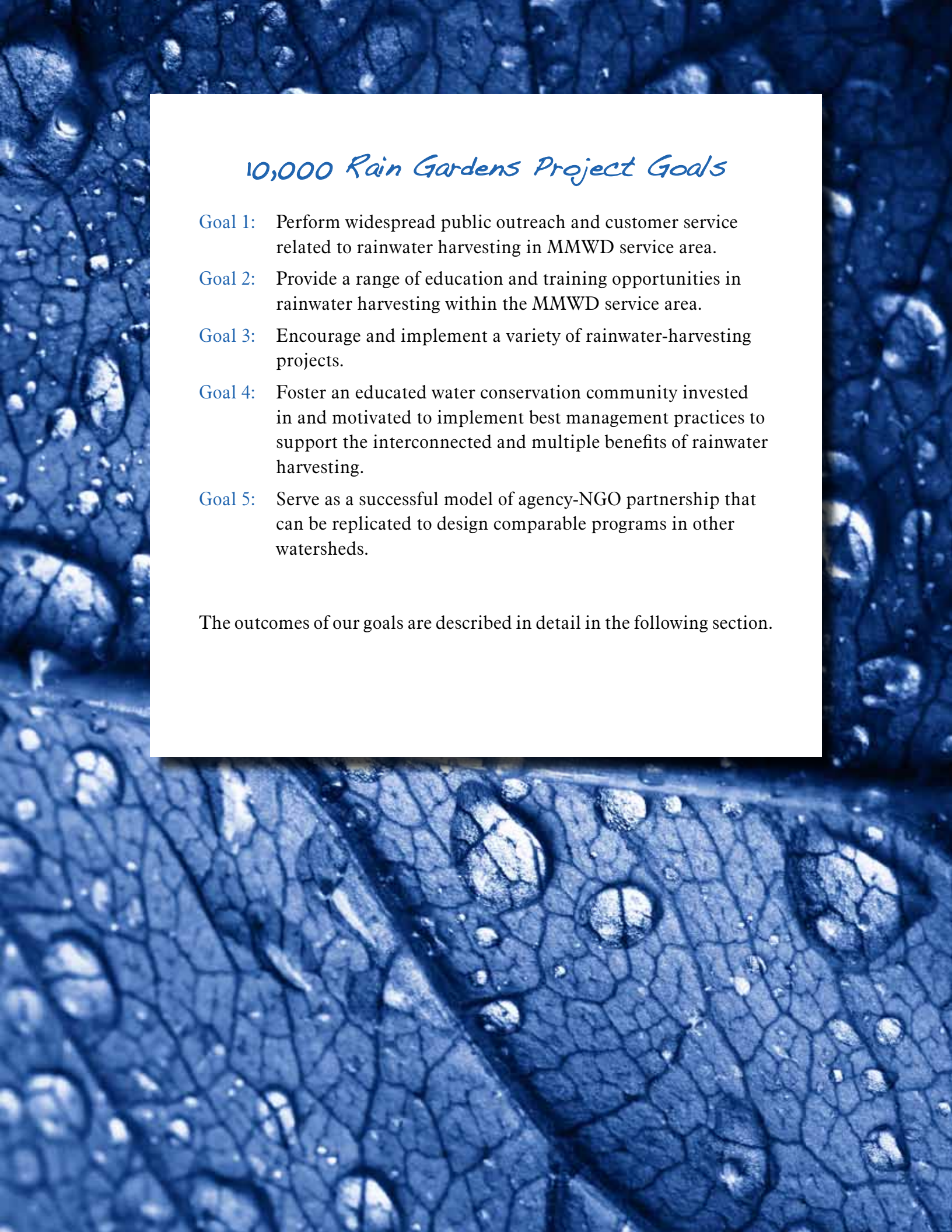
Background and Introduction to SPAWN's Rainwater Harvesting Efforts & Genesis of the 10,000 Rain Gardens Project

In 2006, through grants from the EPA, the State Water Resources Control Board (SWRCB), and the Bella Vista Foundation, the Salmon Protection And Watershed Network (SPAWN) installed a 30,000- gallon demonstration rainwater-harvesting project at the Lagunitas School's organic garden project to showcase a way to reduce stormwater-related erosion of adjacent creeks on endangered salmonids while also serving to conserve precious water resources and serve the community's needs. The project was a huge success locally, involving prominent community members, local students, teachers and parents, and over subsequent months generated large public interest. In 2007, SPAWN's project was listed as a SWRCB "Bay Area Success" story and continued to leverage public interest through SPAWN's media placements and creek walk tours for many hundreds of visitors from agencies, partner NGOs, and the general public.

In 2008, SPAWN partnered with the Marin Community Foundation's "Strategic Initiatives Program" to continue its work to provide training and resources to the public, and installed an additional seventeen rainwater-harvesting projects and led hundreds of people on tours to see them.

Top: Sign at Lagunitas School project.
Bottom: Marin Waldorf Terra Linda students with their project supported by SPAWN & Marin Community Foundation in 2008.

In 2010, the Marin Municipal Water District selected SPAWN to lead their pilot rainwater harvesting program, allowing SPAWN and MMWD to broaden our reach within the larger Marin County community. Called the 10,000 Rain Gardens Project, the program is a continuation of efforts that have spanned almost five years to date and have generated significant public interest and demand from across the Bay Area.



10,000 Rain Gardens Project Goals

Goal 1: Perform widespread public outreach and customer service related to rainwater harvesting in MMWD service area.

Goal 2: Provide a range of education and training opportunities in rainwater harvesting within the MMWD service area.

Goal 3: Encourage and implement a variety of rainwater-harvesting projects.

Goal 4: Foster an educated water conservation community invested in and motivated to implement best management practices to support the interconnected and multiple benefits of rainwater harvesting.

Goal 5: Serve as a successful model of agency-NGO partnership that can be replicated to design comparable programs in other watersheds.

The outcomes of our goals are described in detail in the following section.

Program Outcomes

Goal 1: Provide widespread public outreach and customer service related to rainwater harvesting in MMWD service area.

Objective 1.1 Provide administrative and technical staff to respond to phone and email inquiries and provide technical assistance.

Over 2,100 members of the public in Marin expressed interest in and/or participated in our pilot program ranging from consultations to workshops, presentations, and tours*.

Public Participation	**2,061**
Consults requested	117
Additional participants at Consults	33
Workshops	89
Tours	63
Official presentations (estimate)	315
Unofficial presentations (estimate)	189
Demo project installation	34
Community tank orders	16
Information requests (estimate)	150
Traveling exhibit (estimate)	1,055

Table 1: This table summarizes direct participation in the 10,000 Rain Gardens Project.

**NOTE: Some interest and participation were from outside of the MMWD service area. This does not include untracked visits to the website or demonstration projects.*

During the course of the year, over 150 information requests were received and responded to by phone and email by technical experts at SPAWN, including Paola Bouley (Conservation Director), Jeff Adams and Lisa Chipkin (Water Sustainability Coordinators). These information requests influenced the creation of a Frequently Asked Questions page, which is included as Appendix 3 in this report.

Objective 1.2 Launch a traveling educational exhibit to bring water conservation resources to communities within the MMWD service area.

A portable educational exhibit was designed and produced to bring rainwater-harvesting education to the community in MMWD's service area. The exhibit consists of two framed panels and an eye-catching, colorful array of photos, rainwater related shapes and informational text. Additional materials accompany the panels and are distributed on the same 6-foot table; they include sample

Figure 1: A portable exhibit brought rainwater harvesting education and resources into local communities throughout the MMWD service district during the summer.

copies of excellent books on the subject of rainwater harvesting, an informational binder of rainwater-harvesting projects and definitions, articles, photos and un-endorsed products, a sampling of rainwater-harvesting components, and colorful 10,000 Rain Gardens business cards highlighting the program offerings and website address. The exhibit is sized to fit easily in the trunk of a car and sit on a 6-foot table.

The exhibit was well received and generated interest and discussion wherever it appeared and is now on display in the lobby of the MMWD headquarters.

Location	Event	Approximate # of Visitors
Fairfax: Fairfax Pavilion	Fairfax Eco Fest	200
Fairfax: Sustainability Center	Community Tour	35
Kentfield: College of Marin	Earth Day Festival	250
Larkspur	Flower & Food Festival	75
Marin City	Farmers Market	50
Mill Valley: Community Center	Water Wise Workshop	50
Mill Valley: New Whole Foods Site	Neighborhood Jubilee	75
San Anselmo: Drake High School	Sustainable Film Fest- Water	75
San Rafael: Civic Center	Farmers Market	75
San Rafael: Private Residence	Marin Designers Showcase	150
Tiburon: Audubon Center & Sanctuary	Community Tour	20
MMWD Headquarters	Ongoing display	TBD
	Total Approximate Visitors:	**1055**

Table 2: A traveling exhibit brought rainwater harvesting education "on the road" throughout the MMWD service district.

Objective 1.3 Conduct media outreach (at least two) and presentations (at least two) at local public venues and conferences.

The 10,000 Rain Gardens Project was publicized through a variety of sources, including press coverage in local papers; posting to community events calendars; public presentations; word of mouth; regular SPAWN e-newsletters; MMWD blog and website postings; and from partner NGO list serves, such as Sustainable Fairfax, Permaculture Marin, Richardson Bay Audubon Center, and Marin Master Gardeners. Using a diversified approach to public outreach and marketing proved an essential component of spreading program information throughout the county. A large amount of interest was generated through word-of-mouth and other organizations that helped to promote the program to their constituents.

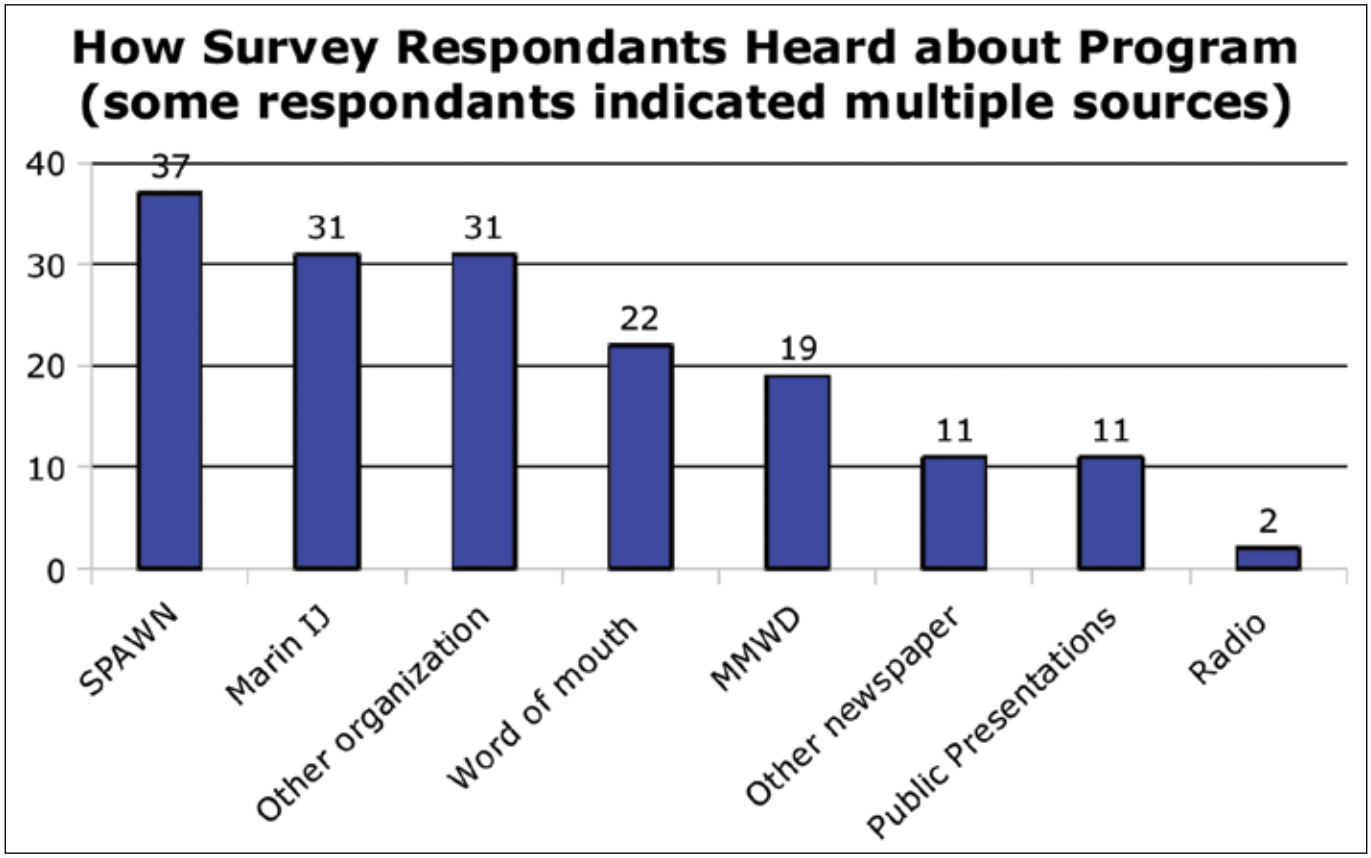


Table 3: Survey respondents heard about the program through a range of sources.

Respondents to an online survey developed to gather information and track interest in rainwater harvesting indicated where they heard about the program. More information about the online survey can be found below under Objective 4.3.

Examples of specific media coverage include, but are not limited to, the following:

- January 29, 2010, the Marin Independent Journal published an article by Nanette Londeree titled "Master Gardener: Collecting rainwater keeps it from going down the

drain" that featured the 10,000 Rain Gardens Project and an upcoming presentation at the Marin Arts and Garden Center in Ross.

- February 6, 2010, a Press Release titled "The SALMON PROTECTION AND WATERSHED NETWORK and MARIN MUNICIPAL WATER DISTRICT present the 10,000 RAIN GARDENS PROJECT Community Tour Series" was circulated.
- March 17, 2010, ABC7 News Tonight! broadcast a story titled "'Rain harvesting' making modern-day comeback." The story contained footage from a public presentation at the Mill Valley Community Center from 1/14/10 where SPAWN and MMWD presented on the 10,000 Rain Gardens Project and also featured a rainwater system designed and installed by SPAWN and the Marin Community Foundation at the Manor School in Fairfax. http://abclocal.go.com/kgo/video?id=7336326.
- March 18, 2010, the 10,000 Rain Gardens Project was selected as the monthly feature of Wholly H2O, an online clearinghouse of information for integrated water management.
- March 24, 2010, a Marin IJ Staff Report entitled "Rain garden workshop planned Sunday" promoted the first of SPAWN's hands-on workshops offered through the 10,000 Rain Gardens pilot project.
- July 7, 2010, a Press Release entitled "Marin's 10,000 Rain Gardens Project Launches Free Rainwater Harvesting Consultations for Landowners ~ Initiative Conserves Water & Helps Marin's Salmon Streams" was distributed. The Marin IJ ran a story featuring the project on July 9, 2010, titled "Consultations set for harvesting rainwater"
- July 8, 2010, Dan Carney posted information about the project to the MMWD Blog. http://thinkbluemarin.wordpress.com/2010/07/08/save-for-a-non-rainy-day/
- October 11, 2010, a Press Release titled "The Rain Cometh, Marin 10,000 Rain Gardens Project gears up for the rainy season with free rainwater harvesting workshops, tours and demonstration projects" was distributed.
- October 14, 2010, Kelly Dunleavy reported on the Fairfax Town Hall rain garden demonstration project in the San Anselmo – Fairfax Patch. http://sananselmofairfax.patch.com/articles/rain-rain-come-and-stay
- December 6, 2010, Lori Tompkins covered the Ross Valley Rainwater Harvesting Tour in the San Anselmo – Fairfax Patch. http://sananselmofairfax.patch.com/articles/what-to-do-with-all-this-rain-capture-it-for-the-garden
- December 10, 2010, Greg Gearheart, senior water engineer for the California State Water Resources Control Board, was interviewed on KQED. The SPAWN 10,000 Rain Garden Project was mentioned as a solution and resource. http://www.kqed.org/a/forum/R201012100931

Additional media outreach was associated with the traveling exhibit events listed in Table 2 and public presentation listed in Table 4 below.

Public presentations generated a significant amount of participation.

Date	1. Location	Est. # attended
1/7/10	Women's Club, Mill Valley	75
1/14/10	Mill Valley Community Center	150
2/4/10	MAGC, Ross w/ UC Cooperative	100
3/18/10	Eucalyptus Knolls HOA Board Meeting	15
7/22/10	Mill Valley Community Center	50
10/6/10	Fairfax Town Council meeting	25
	2. Total Estimated # Participants	**390**

Table 4: Public Presentation dates, locations, and estimated attendance.

Objective 1.4 Design and produce a "This Garden Harvests Rainwater" fence sign for participating residents and businesses in Marin.

A yard sign was designed and produced for residents and businesses practicing rainwater harvesting to help raise awareness among neighbors about rainwater-harvesting projects in their communities. A pro bono designer assisted us with the design and 120 signs were produced and are being distributed through local nurseries, retailers, and NGO's to property owners who have implemented rainwater-harvesting projects. Signs will be posted in visible locations at appropriate sites to demonstrate actions taken and continue to raise awareness about the range of opportunities for rainwater harvesting.

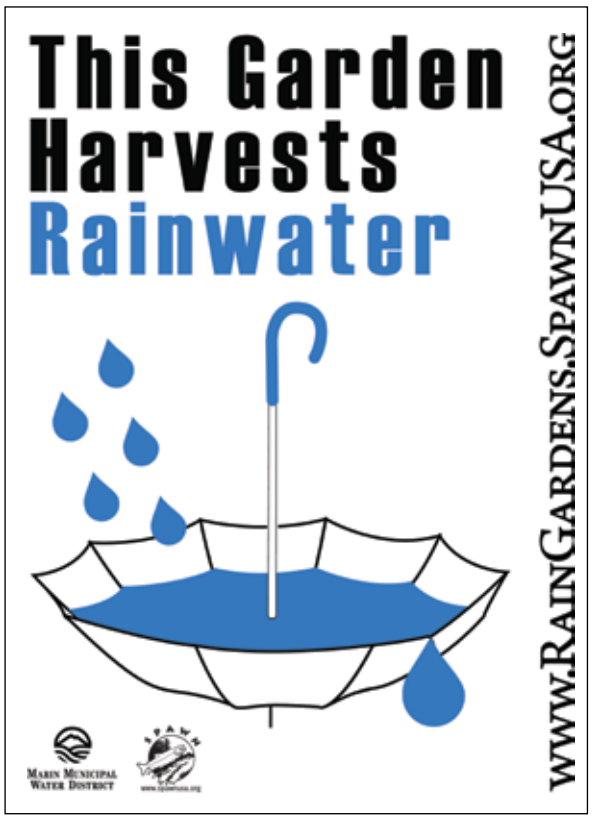


Figure 2: The yard fence-sign

Goal 2: Provide a range of education and training opportunities in rainwater harvesting within the MMWD service area

Objective 2.1 Educate the public through at least four hands-on technical workshops.

Six Rainwater Harvesting workshops were offered through the pilot program with a total of 89 participants. Qualified staff trained an average of 15 participants per workshop. The hands-on component of workshops included the installation of four rain gardens with appropriate plantings, two rainwater catchment systems, and one "cover your grass" lawn decommissioning.

Workshop Date	Location
3/28/10	Private Residence, Lucas Valley
5/22/10	Private Residence, San Anselmo
10/24/10	Tamalpais Community Center, Mill Valley
10/30/10	Richardson Bay Audubon Center, Tiburon
11/7/10	Sustainable Fairfax, Fairfax
11/21/10	Fairfax Town Hall, Fairfax
	Total Participants: 89

Table 5: Rainwater Harvesting Workshop dates, locations, and participation.

Workshops were successful because they educated participants, helped build practical skills, and implemented on-the-ground systems for immediate positive impact. Many participants expressed appreciation for the opportunity to gain hands-on experience working with these technologies and left feeling more empowered to take action at their own property. More workshop opportunities would accelerate the number of rainwater harvesting systems implemented and community members educated.

Figure 3: Hands-on workshops demonstrate the potential to work with neighbors and have fun while rapidly transforming a landscape to help conserve water.

Figure 4: Workshop participants implement a rain catchment tank and rain garden at the Richardson Bay Audubon Center, Tiburon.

General workshop features included:

- Introduction to key issues, design, materials, operations, maintenance, and local conditions.
- Hands-on experience accomplishing a project with beneficial functions for the host site and greater community.
- Opportunity to work collectively towards common goal, meet neighbors, and share ideas.

Curriculum was developed and test-run on the following topics:

- How to Design and Build Rainwater Harvesting Landscapes
- Cover Your Grass: Transitioning turf to watershed friendly landscaping. Sample workshop descriptions and outlines can be found in Appendices 1 and 2.

Objective 2.2 Educate the public through at least 6 project site tours.

Six project site tours were hosted during the pilot program with an average of ten participants showing up for each tour. Overall, this is a low turnout based on experience in previous years, averaging 20+ participants per tour. For each tour, we had between three to eight registrants who did not show up. This may have been due to the tour being free, and therefore, not requiring any commitment from registrants. This could also be due to a combination of close proximity to the holidays and inclement weather conditions during the November tours. Tours could have been spaced out more evenly through the year, though in this particular case we were waiting to complete the new demonstration projects to be able to include them in public tours.

Tour Date	***Location***
2/20/10	Sustainable Fairfax, Private Residence, Manor School
9/29/10	Sustainable Fairfax, Private Residence, Lagunitas School
11/10/10	Sustainable Fairfax
11/19/10	Tam Valley Community Center, Richardson Bay Audubon
11/20/10	Tam Valley Community Center, Richardson Bay Audubon
12/3/10	Marin Art and Garden Center, San Anselmo Library, Fairfax Town Hall, Sustainable Fairfax
	Total Participants: 63

Table 6: Rainwater Harvesting Tour dates, locations, and participation.

Tours of local rainwater-harvesting projects provide the community with an opportunity to go out with qualified technical staff and see what their neighbors have implemented to harvest rainwater. Tours typically visit two or three sites to provide participants with insight and inspiration about a range of options and methods for harvesting rainwater, and an opportunity to ask questions about how these practices would apply to their situation.

Figure 5: Participants see rainwater harvesting in action at the Manor School in Fairfax.

The demonstration projects implemented during the pilot program are publicly accessible and self-guided tour information is available on the website. This provides the opportunity for anyone interested to learn more about rainwater harvesting and see solutions in action without having to wait for a scheduled tour.

Objective 2.3 Launch a rainwater harvesting resource website specific to Marin.

An in-depth website, www.Raingardens.SpawnUSA.org, was developed and published to highlight program offerings, share educational information, and offer ways for community members to get started with rainwater harvesting. The website has been regularly updated and its components include:

- 10,000 Rain Gardens Project program overview.
- Opportunity to join the 10,000 Rain Gardens mailing list for program updates and offerings.
- Community rainwater harvesting survey.
- Rainwater harvesting benefits, principles, definitions, and tips for getting started.
- Rainwater run-off calculator.
- Annual Marin County rainfall averages by location.
- Rainwater harvesting methods using earthworks.
- Rainwater harvesting system components.
- Primer on safety and legal considerations.
- Information and registration for educational events (tours, workshops, other related events).
- Resource lists: Local guidelines, local designers and contractors, local suppliers, books, articles and other online resources.
- Project Gallery (local rainwater-harvesting projects described and illustrated in photos).

The website has been successful as a tool for conservation and rainwater-harvesting education, registration for 10,000 Rain Gardens Project events, as well as an opportunity to connect and dialogue with other agencies, organizations, educational institutions, and individuals interested and engaging in rainwater harvesting. Project staff have received many inquiries from local community members and folks from farther afield (from St. Helena to Los Angeles to San Luis Obisbo, CA., and

from Pennsylvania to New York and more…). General enthusiasm and appreciation for the website and the 10,000 Rain Gardens Project have been the norm.

Additional resources were identified as beneficial and/or requested by the public over the course of the program. These resources are identified in subsequent sections of the report.

10,000 Rain Gardens Project Website Screenshot

Goal 3: Encourage and implement an array of rainwater harvesting projects.

Objective 3.1 Implement at least 3 rainwater harvesting demonstration projects at publicly accessible sites.

Twelve non-residential sites expressed an interest to be host sites and five were selected throughout the MMWD service area as being publicly accessible sites for these demonstration projects, including locations in Mill Valley, Tiburon, Ross, San Anselmo, and Fairfax. Publicly accessible demonstration projects will play a continual role in providing the community with education and inspiration. For each site, an interpretive sign was designed and installed to provide visitors with basic information about rainwater harvesting and the site-specific system. A more detailed case study for each project is available at http://Raingardens.SpawnUSA.org.

SPAWN worked collaboratively with the host sites to design and install these projects with materials procured through the 10,000 Rain Gardens Project. Several local businesses provided discounts on materials, including The Urban Farmer Store, Clean Water Components, O'Donnells Fairfax Nursery, and Sunnyside Nursery. Hands-on workshops were held at three of the sites and public tours have included all five sites.

Demonstration Project Location	Cost*	RC	RG	WWP	M/C	EI
Tamalpais Community Center, Mill Valley	$3,000	1,550		X	X	X
Richardson Bay Audubon Center, Tiburon	$2,975	550	X	X	X	
Marin Art and Garden Center, Ross	$1,100^	2,500	X	X	X	X
San Anselmo Public Library, San Anselmo	$950	305	X	X	X	X
Fairfax Town Hall, Fairfax	$340	N/A	X	X	X	

Table 7: Demonstration projects throughout the MMWD service area showcase a range of rainwater harvesting and water conservation solutions.

Notes: RC = Rainwater Catchment (in gallons) RG = Rain garden; WWP = Water wise plants; M/C = mulch and compost; EI = Efficient irrigation

**Cost is for materials only obtained during this program, some at discounted prices from collaborating businesses. Labor was from SPAWN staff as well as host site staff, collaborators, and workshop participants.*

^ *The 2,500-gallon cistern was already on-site and not purchased through this program and therefore, not included in this cost figure.*


Figure 6: Left: 1,550-gallon cistern at the Tamalpais Community Center, Mill Valley; Right: rain garden at Fairfax Town Hall.

Highlights of demonstration projects include:

- 4,905** gallons of rainwater catchment tank capacity was installed (**this does not include private residence actions; see table under Objective 4.3).
- Potential to mitigate up to 87,662 gallons of stormwater during average rainfall year through rain gardens and tank capacity.
- 1600 square feet of rain garden and water wise landscaping.
- 800 square feet of turf was decommissioned using sheet mulch techniques, saving an estimated total water use of 19,750 gallons per year.
- 72 community members already participated directly in tours and workshops.
- Thousands of potential visitors each year will view the interpretive signs and see rainwater harvesting in action.
- Total materials cost for all five projects: $8,365.


Objective 3.2 Design and install strategically placed interpretive signage in conjunction with demonstration projects.

Each of the five demonstration projects has an accompanying interpretive sign located nearby to inform visitors of the general characteristics and benefits of the rainwater harvesting system. These signs will help to educate thousands of annual visitors to these sites and direct them to the 10,000 Rain Gardens website for more detailed information.

Please refer to the project Case Studies for photographs of each sign.

Objective 3.3 Conduct at least 60 site consultations throughout the MMWD service area.

Consultations requested	117
Consultations required under contract	60
Consultations completed	67
# People who participated in consultations	100

Table 8: This table shows how many consultation requests were received and fulfilled, as well as the total number of people participating in the consultations.

Each consultation included:

- Overview of 10,000 Rain Gardens Program and SPAWN.
- Overview of rainwater harvesting.
- Discussion of property owner's goals, interest in rainwater harvesting, and water bill.
- Site "walk and talk" to explore potentials.
- Next steps and further resources.

Many recipients of the consultations were brand new to the options, considerations, and technology of rainwater harvesting. A major focus was education about the range of opportunities and benefits, as well as the real and perceived barriers to implementation. This general education about rainwater harvesting combined with a brief overview of the program often took between 3/4 to 1 hour, or more. We expect that there will be ripple effects of these consultations, as many recipients expressed interest in and are in a position to spread this knowledge to neighbors, colleagues, and friends.

Consultation recipients included:

- Towns
- Non-Governmental Organizations
- Schools
- Homeowner Associations
- Residences

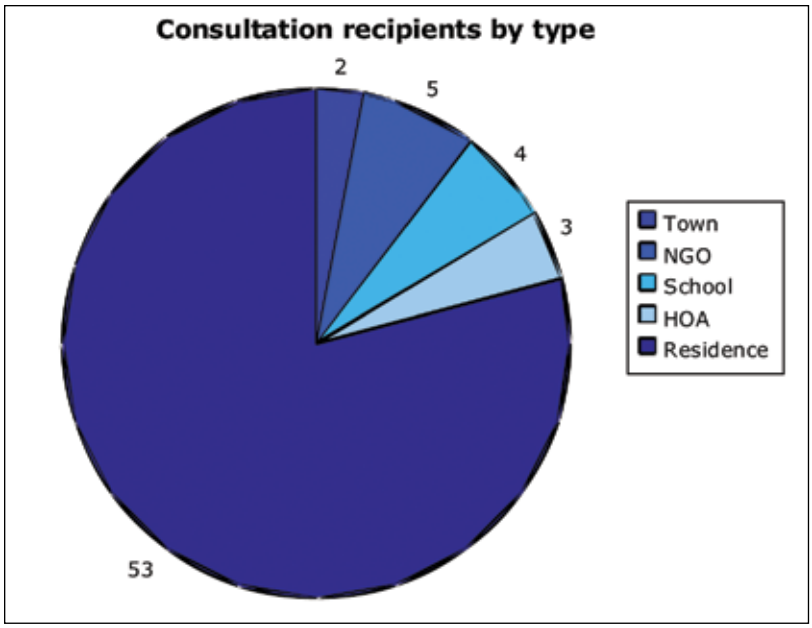


Table 9: Consultation recipients covered a range of sectors, with the majority being residential.

Consultation requests came from throughout the MMWD's service area. Consultation recipients were distributed relatively equally among the five divisions of MMWD's service area. The number of consultation requests submitted on-line was boosted when an article ran in the MarinIJ and after the two public rainwater-harvesting presentations held in Mill Valley in January 2010. Given our contract budget, qualified staff performed an average of 1.5 hour consultations with selected survey respondents to allow for a total of sixty.

Site-specific data collection on water use, water conservation potential of rainwater harvesting, square footage of irrigated area by landscape type, and average system costs to property owners during site consultations was limited by the amount of time within the contract budget available for each consultation and the educational focus of the consultation. Water bills were reviewed with property owners as promised, though quite often participants did not have one available at the time of consultation.

A range of challenges to rainwater harvesting were observed or expressed during the consultations. These observations were used to create a question about barriers and reasons for not implementing more rainwater harvesting measures in 2010 on follow-up surveys emailed to participants. Results from the 15 respondents (6 of the 21 total respondents left this question blank) of the Consultation follow-up survey and 8 respondents of the Tour/Workshop follow-up survey are illustrated on the next page.

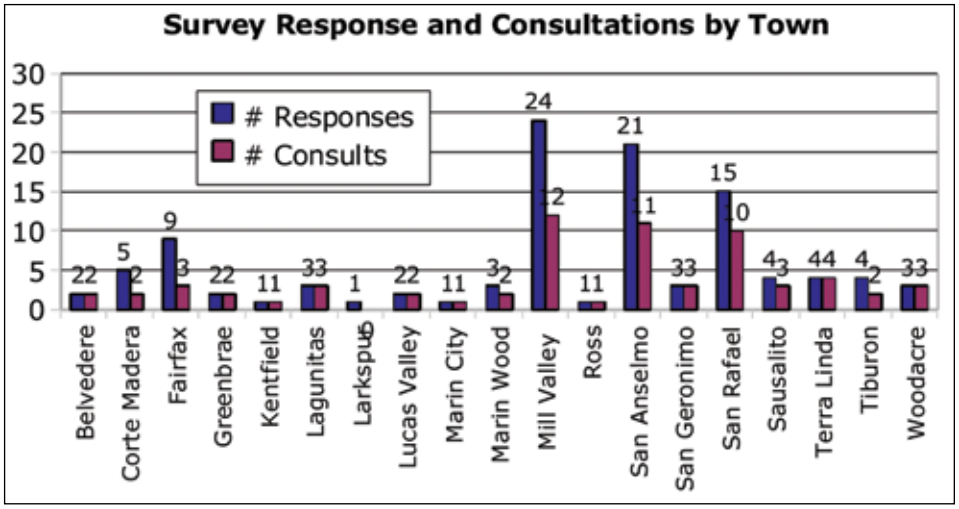


Table 10: Consultations requested and completed in different towns and unincorporated areas of MMWD service area.

The real and perceived challenges to accelerated adoption of rainwater harvesting observed or expressed during site consultations can be broken into several categories.

Policy and Legal

- Set -back requirements for tanks– property lines, creeks.
- Requirements of Board approval, if applicable.
- Building and Plumbing codes, as applicable.
- Design review requirements, if applicable.
- Polluted soils prevent ability to dig.

Health and Safety

- Added up-front and annual costs for backflow prevention to protect municipal system.
- Seismic safety of tanks, particularly in the many areas with steep hillsides.

Financial

- Up-front investment costs for design, install, and materials for tank and barrel systems compared to cost of municipal water.
- Added up-front and annual costs for backflow prevention.
- Added up-front and annual costs for pumping and/or water treatment, as appropriate per system.
- Engineering requirements and costs for hillside properties.

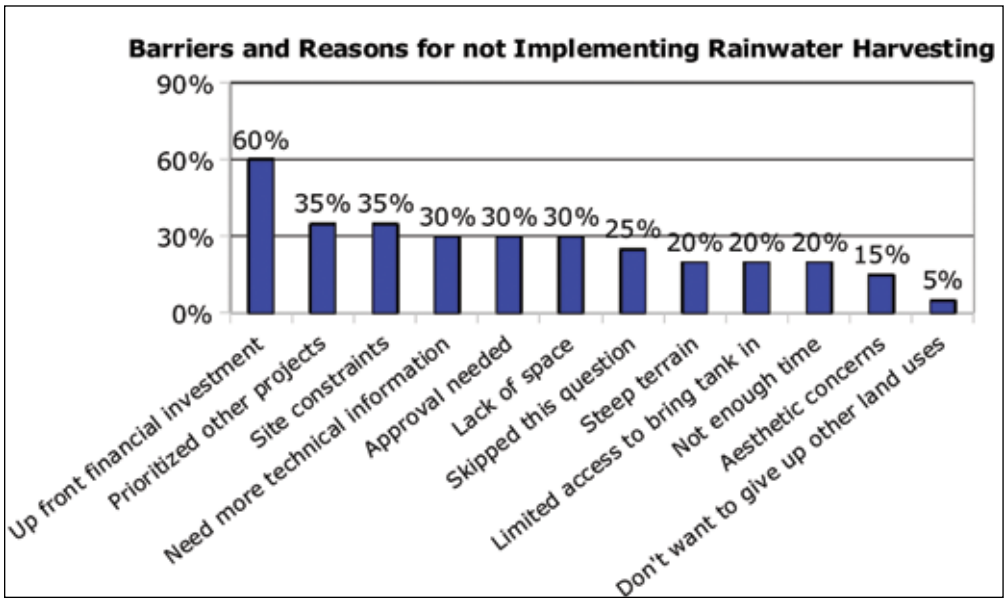


Table 11: Understanding the barriers and reasons for not implementing rainwater harvesting actions will help provide direction to future programs

Cultural/ Personal

- Aesthetics
- Land use trade-offs
- Neighboring properties drain to site

Physical Site Constraints

- Steep and/or unstable terrain.
- Lack of space for adequate supply and/or for the amount of impervious area that could be collected from, due in part to land use trade-offs and existing/mature landscaping or recent investment in landscape.
- Only small spaces available.
- Difficult access to bring tank in (due to fences, building, mature trees, etc.)
- Areas of slow/low/no percolation and/or high ground water.

Goal 4: Foster an educated water conservation community invested in and motivated to implement best management practices to support the interconnected and multiple benefits of rainwater harvesting

Objective 4.1 Develop strategic partnerships with local agencies and NGO's.

Strategic partnerships played a key role in education, outreach, and implementation of demonstration projects. The challenges and opportunities for rainwater harvesting extend beyond any one property, organization, agency, or interest group. By developing strategic partnerships, the opportunity for implementing rainwater harvesting practices to address a range of challenges and achieve multiple benefits for the economy, ecology, and community is strengthened.

Objective 4.2 Involve volunteers and expert pro bono support for achieving program goals.

Volunteers and pro bono support extended the ability to meet project goals and engage the local community. The traveling exhibit, demonstration project tours, and workshops provide ongoing opportunities for volunteers to help educate and raise awareness within the community. Pro bono services were essential in the design of the interpretive sign, fence sign, and rain barrel beautification. Local businesses generously offered discounts on materials for the demonstration projects. Demonstration project host sites provided in-kind staff support in the design and installation of the rainwater harvesting systems.

Objective 4.3 Involve private landowners as partners in the solution to water resource management and stormwater problems.

The individual and collective actions of landowners will play a key role in the solution to water resource management. An on-line survey was created to provide community members an opportunity to request a site consultation and register interest in rainwater harvesting. This survey allowed the 10,000 Rain Gardens Project team to gather base level information on property owner location, water budget, motivations, intended applications, willingness to invest, willingness to host a workshop or tour, and previous or intended participation in other program activities. The results of this survey are summarized in the section that follows.

A follow-up survey was also created and distributed to recipients of consultations, as well as to participants in workshops and tours. These surveys were designed to gauge satisfaction levels, determine what worked and what didn't, identify water conservation actions taken, identify barriers to action, and better understand who made use of multiple program services. The results of this survey are summarized in the following section.

Survey Monkey was used to collect and analyze the survey responses.

Survey respondents were asked to report how many gallons per day they used on their last bill cycle, and the results are summarized in the table below. Due to surveys being filled out throughout the

year, the gallons per day reported was for different times of year. There was only one respondent who provided information from a June – July billing cycle.

Period	Average GPD	High GPD	Low GPD
December/January	143	337	47
February/March	209	458	48
April/May	303	748	61
June/July	107	107	107
August/September	412	784	123
October/November	282	696	62

Table 12: Water use reported in surveys at different times of year is summarized.

A total of 112 completed surveys were received. The responses are summarized below.

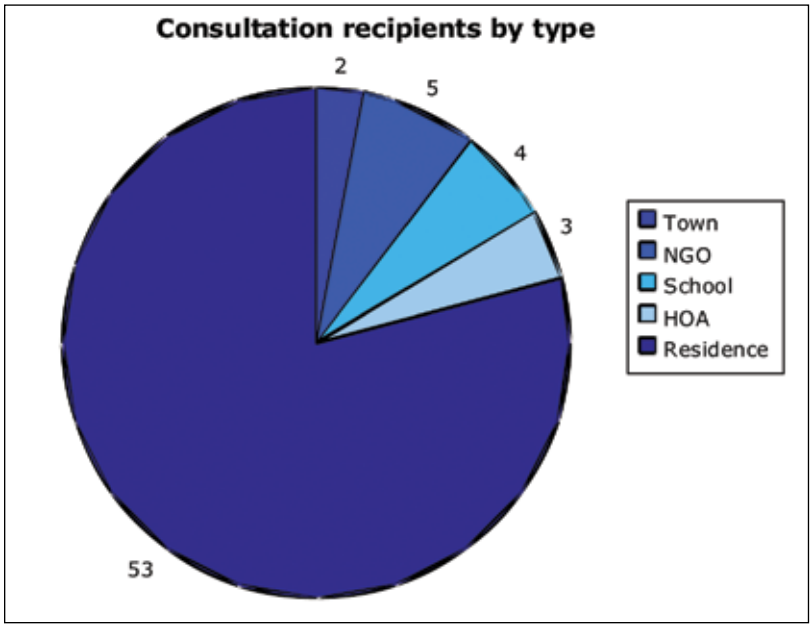


Table 13: Survey respondents were predominantly residential.

General demographic information

The vast majority of survey respondents were residences, with some of these also being landscape designers, consultants, and contractors.

Motivations for rainwater harvesting as part of a water conservation strategy

There are many different motivations for rainwater harvesting. Response to our on-line survey indicates that water conservation and environmental considerations serve as primary motivations for rainwater harvesting more than reducing one's water bill, though the up front costs of certain rainwater harvesting applications (particularly rainwater catchment in tanks or barrels) compared to the relatively low cost of municipally supplied water remains a barrier to wider adoption. There is a large interest in a rebate program to help cover some of the up front system costs.

These motivations were further confirmed during site consultations and public events where participants routinely expressed a desire to be "part of the solution" and "do the right thing." Implementing a rainwater harvesting project is one way that property owners can take an active role in addressing some of the myriad challenges of our times.

Helping property owners understand the potential for low-cost rainwater harvesting applications (such as rain gardens), combined with transitioning high-water-use plantings to water wise landscaping, holds enormous potential to decrease the demand for potable municipal water for non-potable outdoor use during the irrigation season. This transition from "high water to harvesting water" has the potential for a suite of other positive outcomes, from improving stormwater quality and providing wildlife habitat, to increasing the aesthetics of our communities and growing more food locally.

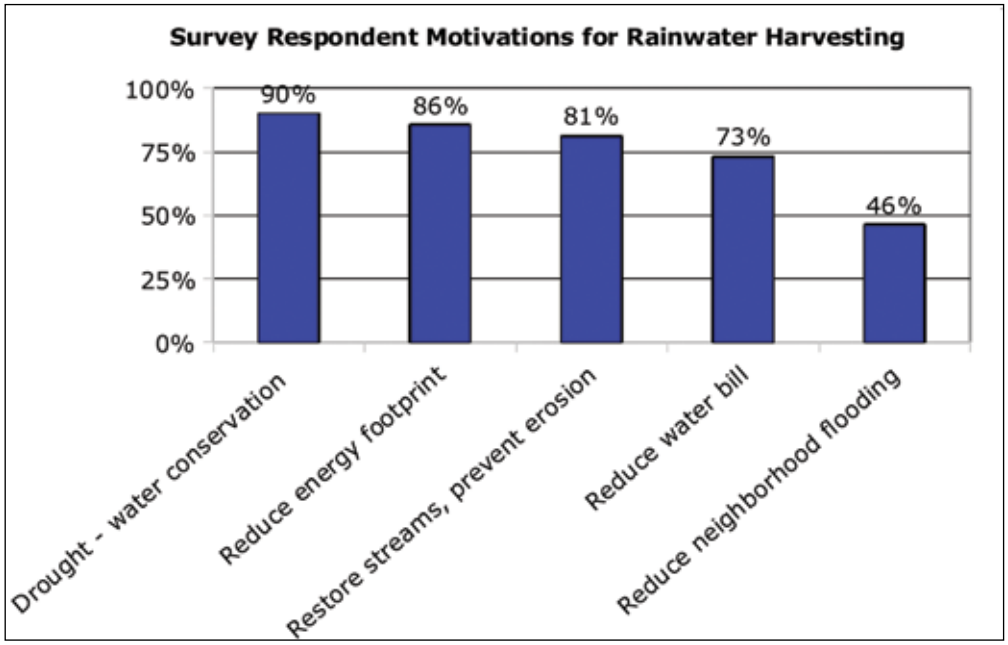


Table 14: People are motivated about rainwater harvesting for various reasons.

Applications of rainwater harvesting

There are multiple potential applications for rainwater harvesting. The specific context of a property and property owner motivations will influence the design, cost, strategies, and functions of a rainwater harvesting project. Many respondents were unaware of the potential for using rainwater for non-potable indoor uses such as flushing toilets and washing clothes. Developing a streamlined permitting process and good demonstrations of these non-potable indoor uses by making use of more rainwater during the rainy season would increase the amount of water conserved. Extending the seasonal use of rainwater would

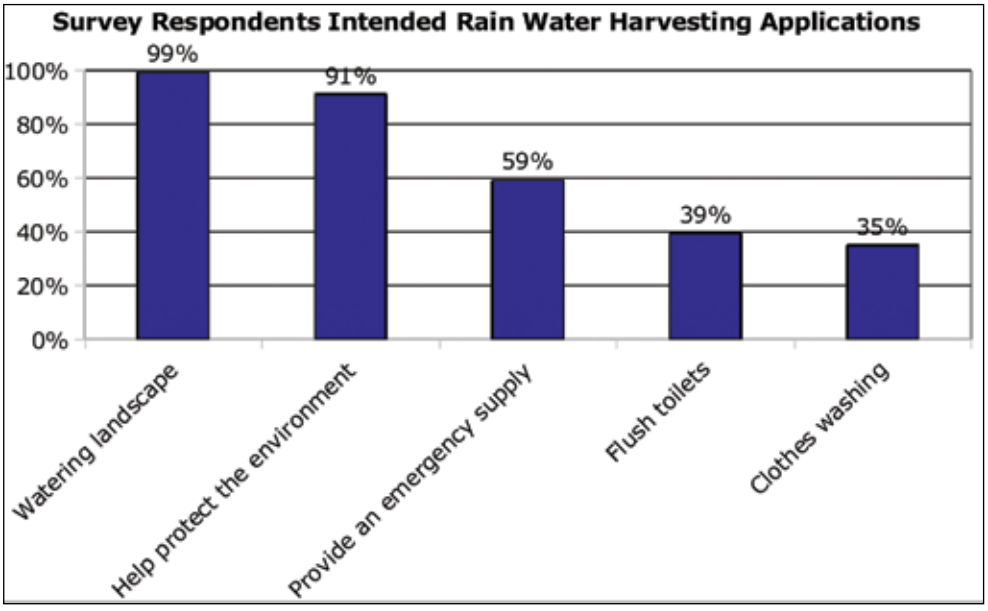


Table 15: Applications for rainwater harvesting vary.

make a system more cost-effective as well because a tank could be filled, used, and refilled multiple times each year.

Willingness to invest in rainwater harvesting systems

There was a 98% indication of willingness to invest in harvesting water from one's roof with technical and design support, and an 86% indication of willingness to invest in transitioning turf to rain gardens. Focusing on technical training for landscape professionals and property owners holds a great potential for water conservation. Expanding a program to provide site-specific design support would also likely increase the amount of private funds invested in rainwater harvesting. Supporting and training neighborhood and watershed groups to work together on assessing, designing, implementing, and maintaining rainwater harvesting projects would reach a greater number of people for each hour of staff time.

Roof harvesting	98%
Transition lawn to rain garden	86%
Interested in bulk tank order	81%

Table 16: The vast majority of survey respondents indicated a willingness to invest in rainwater harvesting if provided with technical and design support.

Willingness to host a rainwater harvesting workshop or tour

A 93% majority of survey respondents indicated a willingness to host a rainwater harvesting workshop on their property, with 84% indicating a willingness to have their property included on a public rainwater harvesting tour. This amount of community support demonstrates the willingness and desire of neighbors to help each other develop effective rainwater harvesting solutions as a key part of our water budget.

Willingness to host a workshop	93%
Willingness to host a tour	84%

Table 17: The community demonstrates a willingness to host rainwater activities that help educate others.

Interest in or previous participation in other rainwater harvesting activities

Response to our survey shows that the majority of interest generated by this program is from community members who have not previously participated in SPAWN's rainwater harvesting tours or workshops, though the majority of these respondents would like to participate in these activities. Combining the community interest to participate in workshops and tours with the community willingness to host them provides a great opportunity to expand training and educational opportunities in rainwater harvesting while accomplishing on-the-ground systems.

Already participated in a tour	23%
Already participated in a workshop	16%
Interested in participating in a tour	74%
Interested in participating in a workshop	77%

Table 18: The majority of respondents had not previously participated in a rainwater harvesting tour or workshop, but expressed an interest in participating

We are aware of at least 18 additional rainwater catchment systems that were installed in 2010 either by property owners who participated in the 10,000 Rain Gardens Program and/or in the two community bulk tank orders that were facilitated by SPAWN. The total capacity of these systems is 30,165 gallons.

SPAWN organized these bulk orders to help community members save money, while promoting technologies that protect creeks and fish, and conserve water and energy.

Capacity	Location
550	Fairfax
10,000	Forest Knolls
500	Forest Knolls
3,000	Kentfield
1,850	Lagunitas
3,000	Mill Valley
2,200	Mill Valley
305	Mill Valley
5	Mill Valley
305	San Anselmo
500	San Anselmo
4,100	San Anselmo
305	San Geronimo
600	San Rafael
150	San Rafael
100	San Rafael
2,500	Sausalito
200	Woodacre

Table 19: Additional rainwater catchment systems installed by private landowners in 2010 in MMWD service area.

Figure 7: A truckload of rainwater cisterns arrive in the San Geronimo Valley for Marin residents participating in SPAWN's 10,000 rain gardens program.

There will likely be additional projects installed as a result of the consultations and educational components of this project, as there can be a lag time between learning a new technology and allocating the time and money to implement. Having an ongoing monitoring program to survey community members would provide insight into how many people end up taking action.

Demonstration Project Case Studies

Richardson Bay Audubon Center

Project Overview & Perceived Benefits or Uses

The Richardson Bay Audubon Center (RBAC) offers educational programs designed to foster a love for the outdoors and inspire a sense of stewardship. Throughout the year, many school groups, bird watchers, and other visitors enjoy the site. This rainwater demonstration project was designed to be integrated into the "Audubon at Home" program which educates and encourages the public to take individual conservation action that can sustain birds, other wildlife, and healthy habitats in our yards and neighborhoods, as well as other activities held on site.

Figure 8: Whole system view of the Audubon demonstration project.

The system is designed to capture water from two sections of the community building roof, directing run-off into a network of rain gardens at the front of the building and a 550-gallon cistern at the side of the building. Stored water is saved for use in the summer to establish native plants and/or for use with the worm bins. Overflow from the cistern is directed to the rain gardens designed with native plants to attract wildlife and provide habitat while helping to infiltrate water from the roof into the soils. At the front of the building, run-off has been redirected to help mitigate problems of pooling at the building's foundation, and pooling and erosion of the adjacent paths, field and watershed. Two rain gardens are integrated to preserve existing shrubs and native grasses, and new native plants have been planted on the rain garden berms. The upper rain garden overflows through a pipe buried safely under the path to the lower rain garden, which provides additional area for the water to infiltrate in the ground and passively water native plantings.

General System Statistics

Watershed A: to rain garden only	315 square feet
Gallons per inch of rain (90% efficiency)	176 gallons
Gallons per year (22-inch avg. rain)	3,885 gallons
Watershed B: to collection tank and rain garden	189 square feet
Gallons per inch of rain (90% efficiency)	105 gallons
Gallons per year (22-inch avg. rain)	2,331 gallons
Rain catchment capacity	550 gallons
Rain garden 1 basin area	35 square feet
Rain garden 2 basin area	65 square feet
Total Rain Garden design capacity	100 cubic feet
Total materials cost	$2,975

Table 20: General system statistics of Richardson Bay Audubon Center demonstration project.

Rainwater Catchment System Features

The ground below the tank was leveled, and a foundation ring and pea gravel were installed. The existing downspout was cut off at a height that allowed a manufactured combination downspout/first flush diverter to be inserted with adequate space to run the water to the tank by gravity.

This system is plumbed so that the first flush water goes to the rain garden via the same pipe as the overflow. A hose bib at the bottom of the tank allows buckets to be filled or a hose to be attached for low-pressure use of the water. Due to issues with the old plumbing in this building, the cistern provides the only water available.

Rainwater run-off enters the cistern through the top. A slip union was used to allow the inflow pipe to be disconnected easily for access to the cistern through the porthole for annual inspection. The overflow pipe coming off the side provides ventilation and is covered with wire mesh secured by a pipe clamp to prevent mosquitoes or other critters from entering the tank. A backflow prevention device was installed at the water meter.

Figure 9: Rain catchment conveyance pipes

Rain Garden and Watershed Friendly Landscaping

To provide the water a safe way to overflow from the first rain garden, a trench was dug across the path to a second rain garden. An atrium grate was installed at the desired height to maximize the holding capacity of the first rain garden while allowing water to spill

through the drain pipe before going over a berm and potentially causing erosion to the berm and adjacent path. A water bar was installed above the trench to direct surface water flows from the path into the second rain garden.

In the lower rain garden, a spillway was installed at the low point in the berm to allow excess water to overflow into the surrounding meadow. Rocks were placed at the spillway to dissipate the energy of the water, screen out any mulch or sediments, and minimize the potential for erosion.

Native plants were installed in the rain garden and wood chips provided for free by a local tree company were used to lay a thick layer of mulch to both the basins and the berms.

Plant List:

- Coffeeberry
- Coyote brush
- Artemesia
- Yarrow
- Monkey flower
- Nine bark
- Rushes (in basin)

Figure 10: Close-up of system conveyance

Figure 11: Trenching the overflow across the path to a second rain garden.

Figure 12: Installing the overflow pipe.

System Costs

Total cost for materials for this system was approximately $2,975.

Item	Cost
550-gallon polypropylene tank	$520
Gravel foundation ring	$200
0.5 cubic yard pea gravel (including delivery)	$85
First flush and leaf diverter	$90
Pipe and various fittings	$200
Plants	$175
Backflow prevention installation	$1,205
Backflow inspection (5 years)	$500

Table 21: Materials costs of Audubon project.

Figure 13: Workshop participants plant the rain garden with natives

Figure 14: Interpretive sign for Audobon project

Marin Art and Garden Center

Project Overview & Perceived Benefits or Uses

The Marin Art and Garden Center (MAGC) receives hundreds of visitors annually and is a premier site for horticulture and landscape education in Marin County, including hosting the Marin Master Gardeners and the Bay-Friendly Qualified Landscaper training programs. The location for this demonstration was selected for easy access for visitors and integration with existing educational activities. The project is adjacent to an outdoor classroom used for many activities at MAGC as well as the compost demonstration area that regularly attracts visitors to this area. Interpretive signage at the project site as well as directional signage around the MAGC grounds will provide visitors the opportunity to see rainwater harvesting in action and gain a better understanding of the technology.

Figure 15: 2,500-gallon tank on gravel foundation ring.

The system is designed for rainwater catchment from the roof of half of a shed, measuring approximately 115 square feet, to feed into a 2500-gallon cistern. The overflow from the cistern is directed to a basin-and-berm rain garden situated in an adjacent planting area. The water from the cistern is distributed by low-pressure gravity irrigation to existing and new native and water-wise plantings in and around the rain garden, and will also be available for use in the composting process and for cleaning hand tools.

General System Statistics

Area of collection	115 square feet
Gallons per inch of rain (90% efficiency)	64.5 gallons
Gallons per year (44-inch avg. rain)	2,837 gallons
Rain catchment capacity	2,500 gallons
Rain garden basin area	60 square feet (30 cubic ft)
Rain garden design capacity	1 inch of rain
Irrigated landscape area	250 square feet
Estimated Total Water Use for landscape	2,175 gallons
Est. water availablefor compost and tool cleaning	325 gallons
Total materials cost	$1,100

Table 22: General system statistics of Marin Art and Garden Center project.

Rainwater Catchment System Features

A gutter was installed on the half of the shed roof designated to collect water to convey rainwater run-off to the cistern. Gutter screens were added to filter leaf debris from entering the tank. Due to the limited height differential between the gutter and the inlet for the rain tank (which was already on-site and waiting to be put to a better use in a more visible location), no first flush or additional debris exclusion was used in this system. In the future, a Brazilian Ball Pre-Filtration system could be installed to provide a first flush. (For a case study on this technology created by the WATER Institute at Occidental Arts and Ecology Center, see *"Roof Water Harvesting For A Low Impact Water Supply,"* available at www.oaecwater.org/.)

Figure 16: System inflow with additional bulkhead added for overflow.

A 2,500-gallon polypropylene cistern was placed on a gravel foundation ring filled with pea gravel. An additional 2-inch bulkhead was installed just below the inlet to allow overflow water from the cistern to travel by gravity through a 2-inch PVC pipe to the rain garden located approximately 50 feet away. MAGC has an existing backflow prevention device at the water meter.

Rain Garden and Watershed Friendly Landscaping

To build the rain garden, undesired vegetation was removed and the existing mulch was raked away from the area. A basin was dug, and the excavated soil was used to build a berm on the downhill side. Rocks were placed to create a spillway so that if a rain event exceeds the rain garden's capacity, water would have a safe way to exit the system without causing erosion. Mulch was pulled back in to cover the exposed soil, and additional mulch was added to aid in the rain garden's water-holding capacity. The rain garden was designed to integrate with existing plantings in the area, and additional native and climatically-adapted plants were added.

A low-pressure gravity drip irrigation system was installed to convey water from the bottom of the tank to plantings around the rain garden without the need for a pump. The system uses a Holman battery controller to regulate the flow of water, which then passes through a 400 micron IrriGRAY filter to remove any sediments from the water.

Figure 17: Drake High School Mobius students preparing rain garden.

A ¾-inch poly tubing carries the water to the planting area, and then connects to a 3/8-inch in-line dripper tubing with emitters at 12 inch spacing. This dripper tube is run in 3 laterals through the planting area, and has screw-on end caps to allow the system to be easily flushed for maintenance.

Figure 18: Basin and berm rain garden.

Plant List:

- Existing and New
- Silk tassel
- Elderberry
- Oregon grape
- Oaks
- Wild Rose
- Yarrow
- White sage
- Salvia spp.
- Lambs quarter
- Lantana
- Catmint
- Germander
- Red fescue
- Carex

Figure 19: Low-pressure gravity irrigation system.

System Costs

The total cost of materials purchased for this system was $1,100. Including the cost of the 2,500-gallon NORWESCO polypropylene tank (approximately $900) and the 2-inch pvc pipe and some fittings (approximately $100) that were already on-site that brings the total to $2,100.

Item	Cost
Gravel foundation ring	$315
1.5 cubic yards of pea gravel (including delivery)	$140
Gutter, gutter screens and assoc. parts	$75
Pipe fittings	$25
Irrigation system	$320
Plants	$225
Total purchased materials cost	**$1,100**

Table 23: Purchased materials costs for MAGC system.

Figure 20: MAGC interpretive sign.

Tamalpais Valley Community Services District

Project Overview & Perceived Benefits or Uses

The Tamalpais Community Services District (TCSD) provides a range of services to its approximately 7,000 constituents in the Tam Valley. This rainwater harvesting demonstration project is located at the TCSD's Tamalpais Community Center, an active hub which hosts a range of public activities and events, and is adjacent to a well-used bicycle route up the Tennessee Valley to the Marin Headlands.

Figure 21: Rainwater demonstration project at TCSD.

The system is designed to capture rainwater run-off from the Community Center roof. At the southwest side of the building, a downspout directs run-off into a 1550-gallon cistern, and at the northeast corner of the building, a downspout directs run-off into a 50-gallon rain barrel. In both cases, overflow is directed back to the existing drainage system. Space limitations, mature landscaping, and slope impacted this design, eliminating the possibility of installing a rain garden for overflow. Stored water is saved for the summer to help establish new native plantings and to irrigate established landscaping.

General System Statistics

Catchment A and B (each)	260 square feet
Gallons per inch of rain (90% efficiency)	145 gallons per catchment
Gallons per year (34 inch avg. rain)	4956 gallons per catchment
Rain catchment A capacity	1550 gallons
Rain catchment B capacity	50 gallons
Irrigated landscape area	175 square feet
Estimated Total Water Use (ETWU)	1,525 gallons
Available capacity remaining	25 gallons
Total materials cost	$3,000

Table 24: General system statistics for Tamalpais Community Services District project.

Rainwater Catchment System Features

The ground below the tank was leveled, and a foundation ring and pea gravel were installed. The existing downspout was cut off at a height that allowed a manufactured combined downspout/

first flush diverter to be installed with adequate space to run the water to the tank through a "wet conveyance" system.

This system is plumbed so that the first flush water goes into the existing drain system where all the run-off from the roof was previously going. Water enters the tank through the manufacturer-installed bulkhead fitting on the side. An additional 2-inch bulkhead fitting was installed just below the level of the inflow to provide for an overflow outlet. The overflow pipe provides ventilation and is also piped to the existing drain system.

Figure 22: Left: Tank on gravel pad with overflow to existing drainage system. Right: First flush and debris diversion.

TCSD has an existing backflow prevention device.

A pump is used to distribute water from the tank to a drip irrigation system. A SMART controller with an on-site weather station is used to program the irrigation system and adjusts the amount of water applied based on weather conditions. This system allows the stored rainwater to be used as effectively as possible based on the rate that water content in the soil is transpired by plants and evaporated from the soil.

System Costs

The total cost of materials for this system was approximately $3,000.

Item	Cost
1,550-polypropylene tank (including delivery)	$980
Gravel foundation ring	$315
1.5 cubic yard pea gravel (including delivery)	$135
First flush and leaf diverter	$80
Pipe and fittings	$200
Pump and irrigation	$1,050
Plants	$160
Paint	$75

Table 25: System costs for TCSD project.

Figure 23: SMART controller and pump for irrigation.

Rain Garden and Watershed Friendly Landscaping

Figure 24: Native planting at TCSD.

Native yarrow, coffeeberry, and monkey flower grown in SPAWN's native restoration nursery were planted in the area around the tank. The coffeeberry plants will eventually provide additional visual screening of the tank and are beneficial to local wildlife. The yarrow and monkey flower will fill in the gaps between the existing plantings, providing beautiful flowers and foliage as well as wildlife benefits. Once these plants are established, usually in 1 to 3 years, stored rainwater can be re-purposed to establish additional native plantings, to supplement irrigation demand for other nearby landscaping, or to irrigate the small demonstration vegetable garden to showcase the use of rainwater for growing food.

Figure 25: TCSD Interpretive sign.

Fairfax Town Hall

Project Overview & Perceived Benefits or Uses

The project site at Town Hall is centrally located between a vibrant downtown and popular bicycle and hiking trails. Adjacent to the pavilion and a public park that is actively used, including a weekly farmers market in the summer and several festivals, thousands of people will pass by this rainwater harvesting project each year. Town staff helped to identify this high- visibility location that could be transformed into a cost-effective demonstration of rainwater harvesting with immediate positive impacts. A presentation was made to the Town Council for approval.

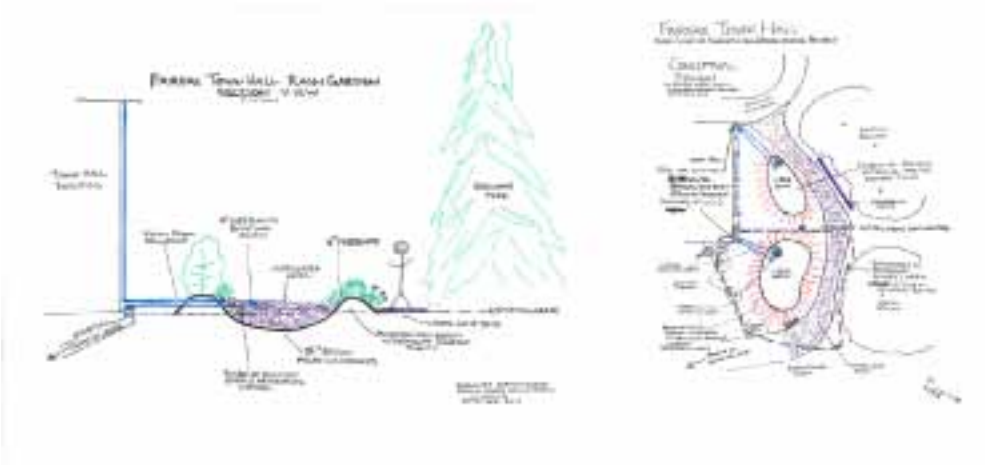


Figure 26:Conceptual designs of the rain garden. Left: section view. Right: plan view.

The rain garden was designed and installed to demonstrate a simple and effective solution to stormwater mitigation and water conservation. Roof water from Town Hall discharges directly into Fairfax creek, and this rain garden will act as a buffer for a portion of the building's roof area. There is enough capacity to handle the smaller, more frequent storm events of up to one inch of rainfall. With a chance to slow down and soak into the ground, this stormwater is turned into a resource to support appropriate plantings. A mulch-filled basin acts as a sponge to hold moisture longer into the dry season and feeds healthy living soil. The combination of mulch, healthy soil, and plants helps to biologically filter the water while also decreasing the demand for irrigation and improving plant health. Rain events that exceed the capacity of this rain garden overflow via a pipe back to the original drain. Plantings were selected to require little to no summer irrigation water once established.

General System Statistics

Area of collection	810 square feet
Gallons per inch of rain (90% efficiency)	504 gallons
Gallons per year (40-inch avg. rain)	20,185 gallons
Rain garden basin area	80 square feet (80 cubic feet)
Rain garden design capacity	1 inch of rain
Total landscaped area, including path	625 square feet
Total materials cost: Rain garden	$340

Table 26: Fairfax Town Hall rain garden project system statistics.

The size of the rain garden was constrained by an underground utility line, creek, and public pathway. To identify the location of all underground utility lines, USA Dig came out to the site. This project was implemented during a hands-on workshop with 16 participants. The area of the rain garden was laid out, and the existing mulch was pulled to the side for later use. The basin was dug to a maximum depth of 18 inches, and the soil was used to create a berm.

Figure 27: Rain garden site before (left) and after (right) a one-day training workshop.

The downspout was disconnected from the existing drainpipe and adapted to a pipe that conveyed the water ten feet away from the building's foundation to the rain garden. Due to the constraints of this particular site, a second pipe was installed as an overflow back to the existing drainpipe to provide a safe place for water to go in the event of a storm that exceeds the rain garden's capacity to hold, infiltrate, and evapo-transpire. Rocks are positioned to dissipate the energy of the incoming water, disguise the overflow grate, and prevent mulch from exiting the system.

A load of wood chips was provided free from the Town. The basin is filled with wood chips to increase water retention and promote soil building. Low-water-use native and Mediterranean adapted plants are planted on the berm where they will benefit from the increased available water in the soil and provide aesthetic interest and wildlife habitat. Organic compost was spread around the new plants and a thick

layer of chips was applied as mulch. These plants will establish quickly and need only occasional hand watering during the first years of establishment. No irrigation system is installed on this project.

Plant List:

Berm

- Yarrow
- Sage
- Coffeeberry
- California buckwheat
- Red fescue

Basin

- Rushes

Figure 28: workshop participants preparing rain garden.

System Costs

Total materials cost for this rain garden was $340.

Item	Cost
Plants	$240
Compost	$50
Pipe and fittings	$50

Table 27: Fairfax rain garden costs.

Figure 29: Fairfax Town Hall interpretive sign.

Fairfax Town Hall "Cover Your Grass" Demonstration Project

Figure 30: "Cover your Grass" transformation site before (left) and after (right).

Project Overview & Perceived Benefits or Uses

Transitioning this high water use turf to a water wise landscape offered a simple and effective way to conserve water, save money, and provide other beneficial functions. During a "Cover Your Grass" workshop a patch of purposeless turf at Fairfax Town Hall was decommissioned using a process known as sheet mulching. In its simplest version, this process consists of overlapping layers of cardboard or newspaper over the project area to smother unwanted vegetation and then applying a thick layer of wood chips. Care was taken to keep mulch at least six inches from the trunk of existing vegetation. To keep the wood chips from spilling onto the sidewalk, a one-foot strip of turf was removed along the curb.

Figure 31: Participants prepare the site and cover a layer of cardboard with wood chips.

This landscape transformation took the sixteen workshop participants approximately one hour to complete, eliminating the need for irrigation and green house gas emissions from the fossil-fuel-powered equipment used in turf care. The ongoing maintenance of this area is also decreased, requiring only the occasional replenishment of wood chips (which creates a local place to use some of the wood chips generated annually by tree work in town). The decomposing wood chips build healthy soils that can sequester carbon and increase the water holding capacity of the landscape.

The only materials used for this particular project were cardboard and wood chips. Both of these are commonly available free of charge. A portion of a roll of cardboard, available from some packaging suppliers, was donated by an individual and provided an easy, time-saving addition to the discarded cardboard boxes collected and processed. The processing consists of breaking seams to open up boxes and removing any tape, stables, or other stickers. Good places to look for cardboard include furniture and appliance stores, bike shops, and hardware stores because they often have larger boxes.

Total project area	800 square feet
Estimated Total Water Use (ETWU) - Turf	19,750 gallons
Estimated annual water savings	19,750 gallons
Total materials cost	$0

Table 28: Cover Your Grass system statistics at Fairfax Town hall.

San Anselmo Public Library

Project Overview & Perceived Benefits or Uses

The central location of the San Anselmo Public library makes this a highly visible demonstration project that thousands of people will walk past annually. An interpretive sign provides an overview of the project and its benefits, and directs people to the 10,000 Rain Gardens website for additional information. Rainwater harvesting was incorporated into the existing plans to renovate the landscape at the library. This project consists of a small rain tank on the side of the building plus two rain gardens, one on each side of the library's front steps.

The system is designed for rainwater catchment measuring approximately 675 square feet in a 305-gallon tank from one of the four downspouts on the library building. The overflow and first flush from the system return to the existing drainage system. The water from the cistern is distributed by low-pressure gravity irrigation to plantings in one of the rain gardens.

Each of the rain gardens is connected to a downspout draining approximately 675 square feet of roof. The rain gardens were excavated to approximately two feet and filled with a "Bio-filtration" soil mix that promotes fast drainage. Overflow from the rain gardens goes to the street via pipes through the sidewalk, where all the water was originally going before this project.

Area of collection to tank, and each rain garden	675 square feet
Gallons per inch of rain (90% efficiency)	378 gallons
Gallons per year (44-inch avg. rain) per downspout	16,652 gallons
Rain catchment capacity	305 gallons
Rain garden basin area	180 square feet
Potential stormwater mitigation per rain garden	16,652 gallons per yr each
Total materials cost	$950

Table 29: San Anselmo Public Library system statistics.

Figure 32: Rain garden on left side of library entrance.

Rainwater Catchment System Features

The 305-gallon rain tank is placed on a concrete pad designed and built by the Town of San Anselmo. A first flush and debris diverter unit was installed at the downspout to eliminate debris (such as leaves) and minimize pollutants, (such as dust or bird droppings) deposited on the roof from entering the tank. Overflow from the tank and the first flush water return to the existing storm drain system. Due to site constraints, it was not practical to use a rain garden for providing additional benefits.

A low-pressure gravity drip irrigation system was installed to convey water from the bottom of the tank to plantings in the rain garden located in the front of the building without the need for a pump. The system uses a Holman battery controller to regulate the flow of water, which then passes through a 400 micron IrriGRAY filter to remove any sediments from the water. A ¾- inch poly tubing carries the water to the planting area, and then connects to a 3/8-inch in-line dripper tubing with emitters at 12-inch spacing. This dripper tube is run around the perimeter of the planting area, and has screw-on end caps to allow the system to be easily flushed for maintenance.

Figure 33: rain catchment system at San Anselmo library (left) and "Non potable rainwater: Do not drink" sign (right).

System Costs

The total cost of materials purchased by the 10,000 Rain Gardens Project for this system was $950.

Item	Cost
305-gallon tank	$340
Concrete pad – provided by Town	provided by Town
First flush and leaf eater	$125
Pipe fittings	$185
Low-pressure irrigation system	$300
Rain garden excavation and soil	provided by Town
Rain garden concrete and overflow	provided by Town
Plants	provided by Town
Total materials cost	$950

Table 30: System costs for San Anselmo Public Library project.

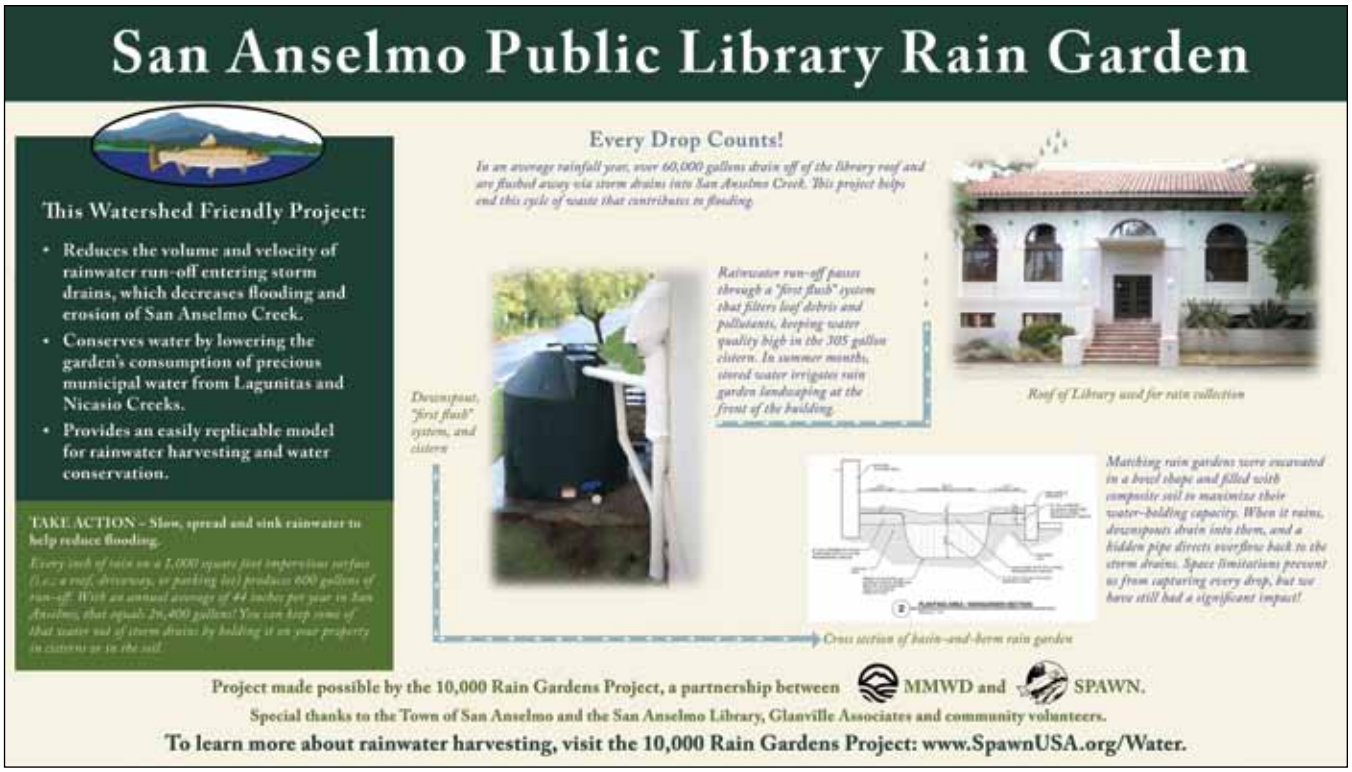


Figure 34: Interpretive sign at San Anselmo Public Library.

Recommendations for the Future

- Invest in installations of projects and interpretive signs at visible, large-scale public localities (such as schools, libraries, fire stations) where conservation and education efforts can be maximized. The large-scale projects are not only more cost-effective, but they also serve to generate wide public support and provide far-reaching educational and conservation goals.
- Residential consultations are very time-intensive and are good for initial scoping efforts, but in order to secure installation of full systems, more time and financial investments (such as rebates) are needed for these sites. Therefore, individual, site-by-site residential consultations are not a very cost-effective approach, especially in comparison to the capacity to train many residents at once during well-designed, hands-on workshops and project tours.
- Develop a rebate program that includes rainwater harvesting for indoor and outdoor use and greywater (especially laundry to landscape). Reward innovative water conservers that are leading the way in the District.
- Work with local municipalities to develop a streamlined process and guidelines to support safe use of rainwater for non-potable indoor uses such as toilet flushing and clothes washing. This would be a good focus for a demonstration project with a strong monitoring component.
- Expand public and private-NGO collaborations to leverage collective resource base and integrate efforts for maximum positive influence. Appropriate collaborators would include public and private schools, Marin County Stormwater Pollution Prevention Program, Get Ready Marin, homeowner associations, flood control districts, sanitary districts, watershed groups and councils, sustainability focused NGOs, schools, and local businesses supplying related materials and services, among others. Effective NGOs in this realm include SPAWN, Permaculture Marin, Sustainable Fairfax, and the Regenerative Design Institute.
- Focus on "big picture" awareness and strategic framing to help people relate the benefits of rainwater harvesting to their overall situation, water budget, and watershed concerns.

Property Owner Surveys and Consultations

- Focus site consultations on larger properties such as schools, homeowner associations, community centers, parks, and other public venues.
- Several recipients of consultations provided feedback that having more specific system design support, especially drawings, plans, materials lists, and/or costs, would be beneficial to helping them implement a project. One way to expand the outcomes of the consultation process would be to create a "Property Owner's Guide to Assessing Rainwater Harvesting Potentials" and/or "Property Owner's Guide to Water Budgets"

worksheet and require property owners to fill this out as part of the application process for requesting a consultation. The process of following the step-by-step procedures of such a worksheet would help property owners become more familiar with their site, provide valuable information for prioritizing consultations, and provide more design support during the consultation. With more base-level information provided in advance, the consultation could focus more on answering specific questions, addressing key issues, and creating a design and/or action plan.

- Supporting this guide with additional web-based resources, workshops, and tours would help a certain percent of property owners take action without the need for a consultation, thus allowing resources to be focused where they are needed most. Additionally, training more professionals in the landscape and construction fields would accelerate the incorporation of rainwater harvesting into an increasing number of projects. This guide could include compiling information such as:
  - Map of property
  - Zoning classification and setbacks
  - Total property size
  - Total square footage of each building, including "watersheds of the roof," and hardscape
  - Basic calculations about the amount of rainwater coming from each "watershed of the roof" and hardscape (an Excel spreadsheet would help to make this easy for property owners)
  - Square footage of irrigated and non-irrigated landscaping, including breakdown of general type of plantings (tree, shrub, turf, vegetables, etc.) and irrigation (drip, sprinkler etc)
  - Estimating water use needs for landscaped areas
  - Flow chart for deciding what type of professional assistance is needed for a given project
  - Basic worksheet to create a water budget and develop a general sense of the system type, scale, and components (as outlined above)
  - Flow chart of permitting and approval requirements for a given jurisdiction
  - Questions to ask during the initial consultation
  - Case studies of existing projects with descriptions of features, functions, and costs
- Another alternative to gathering the appropriate data and developing a site specific design would be to expand the length of the site consultation and/or have a follow-up visit although we do not recommend this approach, given limited funds available.

Tours and Workshops

- Hosting additional tours and more frequently (i.e. once monthly) would provide cost-effective, ongoing opportunities for the community to learn about and observe rainwater harvesting designs in action.
- Workshops are a great way to engage the community while accomplishing a project. Continuing to develop and offer hands-on workshops is an effective way to generate interest, transfer technology to homeowners and professionals, and accomplish a system installation with benefits.
- Expand the palette of water workshop topics to provide additional opportunities and professional tools for building community capacity for developing appropriate and effective systems for each specific context. These workshops could be held as a series for property owners and professionals similar to the Ocean Friendly Gardens program developed by the Surfrider Foundation. http://oceanfriendlygardens.blogspot.com/

Additional topics could include:

- Developing a Water Budget for a water-effective site
- Site Assessment and Design
- Plant selection and care
- Technical training on rainwater catchment systems (The American Rainwater Catchment Systems Association, ARCSA, already has a training on this topic, and collaborating with them would be a good way to make this training more available in Marin. www.ARCSA.org.)

Charging a small fee for workshops would help to cover the costs for facilitation and administration, with the potential to make workshops more self-sustaining if host sites cover a portion of the costs of materials for their project.

Public Presentations

- Continue collaborating with other organizations to bring together a range of speakers. This appears to help draw a diverse crowd that may not otherwise attend an event held by any one particular organization or featuring any one particular speaker.
- Pair presentations with hands-on workshops and/or tours for maximum benefit.

Demonstration Projects

- Expand the network of demonstration projects of different scales and BMP's. Include projects that integrate rainwater harvesting for indoor and outdoor uses, as well as greywater to bay-friendly landscaping. Include monitoring and feedback loops as part of the demonstration project design and operations.
- Organize demonstration sites into additional self-guided tours and develop case study reports available online to support continuous self-study by community members as

they are interested or need more information.

- Incorporate monitoring of water flows, water quality, and other system variables to provide useful information on the costs and benefits of systems as well as feedback for how to adjust designs to increase effectiveness. Particularly, designing and monitoring a rainwater harvesting system for non-potable indoor use would help assess the feasibility of this practice.

Exhibits, Education and Outreach

- Seek further opportunities for educational exhibit to be shared in appropriate contexts where people are likely to be interested. Some ideas for this include:
  - Coordinate with other sustainability-oriented organizations to share display at their events when appropriate.
  - Coordinate with local schools to participate in school or grade-wide environmental education.
  - Coordinate with all Bay-Friendly landscaping events.
- Continue to make signs available to the public to help raise awareness of rainwater harvesting benefits and local projects, and generate dialogue and interest. Proceeds from sign sales could benefit further rainwater harvesting education opportunities. Signs could be distributed in the following ways:
  - Make available on MMWD website and at MMWD events.
  - Make available to other stormwater-related agencies and sustainability organizations for sale to their constituencies and membership.
  - Coordinate with local nurseries, garden/irrigation and hardware stores to sell to customers.
  - Share design with other water districts nationwide, with the ability to alter logos and website information - spread the image and message far and wide!
  - Provide additional funding to keep current 10,000 Rain Gardens website growing and current.

Additional Efforts

- Support bulk community orders to maximize financial benefits for individual landowners.
- Commission a more detailed analysis and quantification of rainwater harvesting as a viable component to the water supply portfolio to see how cost-effectiveness compares to desalination.

Appendix 1

Sample Workshop description and outline for 1-day hands-on training on designing and building rainwater harvesting landscapes

How to Design & Build Rainwater Harvesting Landscapes – Sample Description and Outline

Description:

Come learn how rainwater harvesting can be used to decrease and supplement landscape watering requirements, buffer stormwater impacts, and provide an emergency water supply. This participatory workshop includes discussion of rainwater harvesting components, design, and technology options, as well as hands-on site assessment activities and the installation of a small system with a tank and rain garden. Participants will leave with practical experience and resources to assess site-specific rainwater harvesting opportunities and design, install, and maintain a multi-functional rainwater harvesting system.

People interested in planning and development issues, as well as homeowners and avid gardeners, are welcome!

Sample Agenda:

(9:45-10:10 a.m.)	Welcome/sign-in. Materials available.
(10:10-10:30 a.m.)	Participant introductions
(10:30-10:45 a.m.)	Overview of SPAWN and 10,000 Rain Gardens Project and hydrologic cycle (definition – illustration) and changing and revitalizing the landscape.
(10:45 – 10:55 a.m.)	Break
(10:55-11:25 a.m.)	Overview of rainwater harvesting and the host project - Ecological design process and considerations – workshop site as case study - Technology options and components of system – go through steps needed to complete project - Health and safety

(11:25 – 12:30 p.m.)	Hands-on rainwater harvesting process – exact activities per project needs
	- Planting selections and process (11:25 – 11:35 a.m.)
	- Rain Garden layout and installation (11:35 – 12:30 p.m.)
(12:30-1:00 p.m.)	Lunch
(1:00-3:45 p.m.)	Hands-on rainwater harvesting process – exact activities per project needs
	- Rain cistern plumbing
	- Install bulkhead, inflow, overflow to rain garden, screening openings, downspout diverter and first flush, hose bib
	- Continue with Rain Garden installation
	- Planting
(3:45 – 4 p.m.)	Review project, wrap up, final questions

Appendix 2
Sample Workshop description and outline for 1-day hands-on training in lawn decommissioning

Cover Your Grass: Transitioning purposeless turf to watershed friendly landscaping – Sample Description and Outline

Description:

Many of us know by now that lawns are thirsty for two things we're growing short on: petroleum and water. Not only that, but studies have shown that Americans spend around $40 billion every year to water, fertilize, and mow their lawns, or an average of $700 annually per lawn. With outdoor irrigation accounting for between 30%-50% of the typical summer water bill, and lawns representing a primary high-water demand landscape feature, transitioning to water-wise plantings has significant water, financial, habitat, aesthetic, and climatic benefits.

According to the EPA, millions of pounds of petroleum-based fertilizers and herbicides are used on lawns annually across the United States, and 17 million gallons of oil are spilled refilling lawnmowers. All of this negatively impacts beneficial organisms in the soil, can result in an imbalance of natural predator species, leaches into groundwater, and runs off in storm events bringing toxic pollutants into our waterways and their delicate ecosystems.

In this hands-on workshop, we will transition a lawn into an aesthetically pleasing, low- maintenance, watershed-friendly landscape that welcomes an abundance of water and wildlife. Resources and techniques (including sheet mulching and soil building for successful rainwater harvesting) will be provided, along with information on roof run-off calculations, mulching, and planting of water-wise plants.

Sample Agenda:

(9:45-10:10 a.m.)	Welcome/sign-in. Materials available.
(10:10 – 10:15 a.m.)	Introduction to host organizations and facilities
(10:15-10:35 a.m.)	Participant introductions
(10:35 – 11 a.m.)	Overview of water harvesting landscapes and benefits of transitioning from turf to watershed friendly landscaping
(11 – 11:10 a.m.)	Break–transition outside
(11:10 – 11:30 a.m.)	Project site assessment, design considerations, and demonstration of sheet mulch process
	- Rain garden: assessment and design process, features, and functions

- Cover Your Grass: benefits of transformation; planting ideas and opportunities
- Demonstrate process: remove strip along edge (careful of sprinklers and roots); clean up cardboard; lay cardboard; spread mulch; Planting: bigger plants before, smaller after, or chop a hole

(11:30-12:30 p.m.) Begin hands-on activities – break into teams if appropriate

(12:30-1 p.m.) Lunch

(1-2:45 p.m.) Continue hands-on activities

(2:45-3 p.m.) Project review, wrap up, final questions

Note: Adjust workshop start and finish times based on estimated time requirements for specific project.

Appendix 3: Frequently Asked Questions

Question: Are any permits required for rainwater harvesting systems on residential properties?

Answer: This will vary based on your local jurisdiction. In general, a cistern can be installed ongrade without a building permit as long as it is less than 5,000 gallons and not more than two times as tall as it is wide. Talk to your local municipality's building department for the most accurate information for your particular property location.

Read about design guidelines here: http://raingardens.spawnusa.org/guidelines.html

Question: What are the regulations/permit requirements/setbacks, etc., for cisterns in Marin County?

Answer: Setbacks vary greatly depending on the zoning of each specific property. Unfortunately, due to other areas of focus and budget constraints, the 10,000 Rain Gardens Project staff has not been able to delve deeply into these questions yet. A good place to start this inquiry is with your municipality's building department.

Question: Do I need a permit for one 5,000-gallon cistern or per total of 5,000 gallons (i.e., two 2,500-gallon cisterns, etc.)?

Answer: You will need to consult with your local building department. Generally, a permit is required for each cistern that is 5,000 gallons or more. So, you can install one 5,000- gallon or two 3,000-gallon cisterns without a building permit, in general. Tanks must be placed on grade and be no more that twice as high as they are wide.

Question: Can you discuss low-pressure irrigation used in combination with rainwater harvested in cisterns?

Answer: You can find some of this discussed within the demonstration project case studies located in the Self-Guided Tours section of the 10,000 Rain Gardens Website: http://raingardens.spawnusa.org/self-guided-tour.html.

Question: What is a watershed?

Answer: A watershed is a geographic area draining to a common point. Your property is located in one or more watersheds. Within your property there are sub-watersheds influenced by topography, vegetation, soils, hardscaping, structures, and surrounding properties. In a healthy watershed, topographical microvariations, vegetation and mulch help to catch, slow, and release water into the soil where it can infiltrate or be used by the plants. Variations in topography hold water and provide direction to flowing water.

Question: How do my property and actions relate to my watershed and neighbors?

Answer: In our developed landscapes, we have altered the water cycle with a dramatic increase of impervious surfaces (roofs, roads, parking lots, etc.), extensive grading to promote quick drainage, and the influx of non-native vegetation (especially the transition to turf grass). These alterations lead to changes in the volume and velocity of stormwater rushing towards the drains, as well as to the water quality in our streams, as pollutants and sediments are picked up and carried into them.

Pre and Post development Graphic: http://www.nrcs.usda.gov/technical/stream_restoration/Images/scrhimage/chap3/fig3-21.jpg.

Stormwater run-off in Marin County flows to stormwater drains that connect with creeks and streams leading to the Bay. Along the way, it picks up all kinds of pollutants, ranging from gasoline and oil to heavy metals discharged from our vehicle brakes and tires, and from fertilizers and pesticides to animal feces and trash. This untreated stormwater contaminates our waterways. Retaining as much stormwater run-off as possible on an individual property reduces this impact.

Visit the Occidental Arts and Ecology Center's WATER Institute at: http://www.oaecwater.org/watershed.

Question: How do I calculate how much rain I could harvest from my roof and other surfaces?

Answer: Check out our rainwater harvesting calculator here to learn how: http://raingardens.spawnusa.org/calculating-stormwater-runoff.html.

Question: Where can I see examples of rainwater harvesting and water-efficient landscaping?

Answer: There are more and more rainwater harvesting projects sprouting up in Marin County. See our "Self-Guided Tour" page for details on five local demonstration projects you can visit any time: http://raingardens.spawnusa.org/self-guided-tour.html.

Question: How much does a rainwater harvesting system cost?

Answer: This depends entirely on the size and type of system, your specific property characteristics, and whether you will do it yourself or hire a professional. Rainwater harvesting with cisterns and tanks tends to cost more than developing your soil and landscape to harvest water in the soil. Changing your landscape to be more of a rainwater harvesting landscape can start out being free (just a shovel, free wood chips from a tree company, and some elbow grease) and go up from there, depending on how much engineering or professional landscape design you want to incorporate and what materials your design calls for.

Question: Are any rebates, incentives, or tax credits available to help me install a rainwater harvesting system?

Answer: Not currently. But do let the Marin Municipal Water District know about your interest in rebates and incentives.

Question: Can I design and install my own rainwater harvesting system?

Answer: Yes, in many instances. Many aspects of a rainwater harvesting system can be installed by a property owner, though there are some guidelines to follow. In some instances, professional services will be required.

Visit: http://raingardens.spawnusa.org/guidelines.html for an overview of rainwater harvesting system guidelines.

Question: What are the components of a rainwater catchment system?

Learn about the general components of a rainwater catchment system at http://raingardens.spawnusa.org/system-components.html.