Water Supply Enhancement

Water Use Efficiency
Cloud Seeding
Water Reuse

Water Use Efficiency

An effective way to manage water supplies is to increase the efficiency of use in order to reduce demand. The semiarid climate, periodic droughts and high cost of water locally make efficient use of valuable water supplies essential. This means that all water consumers use only the amount of water required to meet their needs. Water consumers include farmers, residents, businesses, schools, municipalities, parks and others. Efficient use of water results in little or no waste.

Some benefits of using water efficiently include saving energy, reducing flow into wastewater treatment facilities, and minimizing the need to develop new supplies, with associated costs, to meet expanding needs. Individual water consumers can also benefit by saving money on their water and energy bills when using water efficiently.

Efficient use of water entails responsible design of landscapes and appropriate choices of appliances, irrigation equipment and the other water-using devices that enhance our lives. In recent years, laws have been passed that require efficient plumbing devices, appliances, and landscape designs. However, it is still up to individual water consumers to use water wisely and minimize waste.

South Coast Sustainable Landscape Fair

The Santa Barbara County Water Agency (SBCWA) operates the Regional Water Efficiency Program to assist water purveyors and residents. Though the SBCWA does not sell water, it supports a variety of programs that are effective when administered at the County level in cooperation with individual water districts. These regional programs include:

- Landscape education
- Public information
- School education
- Irrigation efficiency training
- New development review
- Data collection
- Research regarding new technologies
- Compliance with regulations
- Planning and participation in state and federal technical committees.

Each of the regional program elements is described briefly below:

Landscape Efficiency Education

Roughly half of the water consumed in urban communities in Santa Barbara is used to irrigate residential and commercial landscapes, parks and golf courses. The climate of Santa Barbara County is perfect for low-water-using landscapes that are lush, attractive, and easy to maintain. The SBCWA, in cooperation with local water purveyors, provides information, training and demonstrations of water efficient landscape design and maintenance strategies. A major component of this effort is the promotion of appropriate, low water using plant species (natives and others that thrive in Mediterranean climates). Local demonstration gardens are listed on page 86.

Sustainable landscaping is a term that refers to landscapes that make efficient use of resources such as water and energy, while reducing pollution due to runoff of fertilizers and pesticides, and minimizing waste from excess pruning.

Typical landscapes require an input of time, money, labor, water, chemicals, and fertilizers. Maintained landscapes also create waste: plant trimmings and weeds, polluted runoff from the use of chemicals and fertilizers, and water lost by evaporation from plants and soils. In sustainable landscaping, the input and output of landscaping are both minimized.

Sustainable landscaping practices result in landscapes that are an integral part of the local environment. For more information on sustainable landscaping, see the free, full-color brochure *Sustainable Landscaping: Resource Efficient Landscapes for Southern California* produced by the SBCWA with support from local water purveyors and the Bureau of Reclamation. Call the SBCWA at (805) 568-3546 to obtain a copy.

Cachuma Resource Conservation District Large Landscape Audits

In Santa Barbara County, trained professionals from the Cachuma Resource Conservation District (CRCD) use the Mobile Irrigation Lab to provide irrigation evaluations to property managers with large areas of turf that require irrigation. Some of the properties that are targeted by this program include City and county landscapes, parks, golf courses, school grounds, and cemeteries. Evaluations include the measurement of the Distribution Uniformity of the sprinklers, a sprinkler inspection, a soil survey, and recommendations for controller settings. Following the evaluation, property managers receive a report from the CRCD that outlines recommendations and projections for potential savings.

Public Information

The SBCWA works closely with local water purveyors to inform the public about water issues and ways to use water efficiently. Some of the public information programs include: planning or participating in special events throughout the year such as the fairs, workshops and tours held during Earth Day (April) and Water Awareness Month (May), preparing and distributing literature regarding specific techniques to save water, and preparing a newsletter on current topics in water resources efficiency.

School Education

The SBCWA distributes free, locally developed water education materials that are available to teachers and other interested people. A brief description of those materials and services offered appears below:

Water Activities Manual (Grades 6 - 8)

This manual is especially designed for Santa Barbara County. It gives general information about water as well as specialized information on the county's unique water supply situation. Reading units are complemented by activities, worksheets, experiments, and field trip suggestions. Maps and tables give students a close-up view of water use and supply in the county. This publication is available in teacher and student versions.

Water Education Web Site

Through a partnership of local water purveyors, educators and the Bureau of Reclamation, this web site provides teachers, students and others with easy access to information about water including lesson plans, activities, resource materials, water quality and weather data, other web sites, photos, ways to access local water purveyors and other helpful information. The web site address is **<www.sbwater.org>**.

Water Education Resource Guide

This guide provides ordering information on free and low-cost water education materials. In addition to classroom materials, the guide provides information on films, maps and posters, local field trips, speakers, and on-line resources.

Water of Santa Barbara County

(Grades 4-12)

This publication describes the various water sources used in Santa Barbara County, and provides general information on the water cycle, how water is used in the county, and water conservation tips.

Water Resources of Santa Barbara County

This general information report is suitable for students grades 6 through 12, and adults. It provides an overview of rainfall, water sources and supplies, and water demand.

Classroom Presentations

SBCWA staff give classroom presentations (on a limited basis) on a variety of water supply and conservation topics. Local water purveyor personnel provide most classroom presentations.

Teacher Workshops

The SBCWA also sponsors training in water education curriculum, including Project WET. Call the SBCWA to learn about this program and currently scheduled workshops.

Statewide Water Education Committee

The California Department of Water Resources (DWR) holds semiannual meetings for water purveyors and educators in California. SBCWA staff participates in these meetings, which facilitate the exchange of information and ideas regarding water education.

A CIMIS station in operation

Irrigation Efficiency Training/Assistance for Farmers

The County supports a variety of services for agricultural water users. In cooperation with the County, the Cachuma Resource Conservation District offers irrigation system evaluations for agricultural water users, conducts workshops on irrigation efficiency and provides a toll free CIMIS (California Irrigation Management Information System) Hotline. The SBCWA provides funding assistance to the Cachuma Resource Conservation District to conduct these programs.

California Irrigation Management Information System (CIMIS)

CIMIS is a network of more than 90 computerized weather stations located at key agricultural and municipal sites throughout California. Six of these stations are located in Santa Barbara County. Stations are located in Santa Barbara, Goleta, Santa Ynez, Santa Maria, Guadalupe, and Cuyama. The California Department of Water Resources operates the system.

How does CIMIS work?

Each weather station automatically reads and collects information on wind speed and run, average vapor pressure, air temperature, relative humidity, dew point, solar radiation, soil temperature, and precipitation. The information is transmitted to a central computer database in Sacramento that converts the data into reference evapotranspiration, or ETo. ETo is the combined value of the water needs of cool-season grass and soil evaporation. The daily water needs of crops or landscape plants can then be estimated using ETo and crop coefficients, factors that adjust ETo for specific types of plants.

From this information, agricultural or landscape irrigators can establish a water budget irrigation schedule. In many cases, this method of irrigation

scheduling can reduce the amount of water used in irrigation, and at the same time improve growth performance.

How to access CIMIS

A toll-free hotline has been established to access CIMIS information. The number is 1-888-CIMIS2U (1-888-246-4728). The SBCWA provides brochures that can assist growers and landscapers in using ETo to determine irrigation schedules. For a brochure, call the SBCWA or the Cachuma Resource Conservation District.

Tours and Demonstrations

Local agencies sponsor tours and demonstrations for farmers and others to learn more about efficient water use in agriculture. Some of these efficient water use practices include laser levelling land for more efficient furrow irrigation application; tailwater recovery systems for reuse of irrigation water; nursery cultivation of plant cuttings that are then transplanted to the field, thus eliminating more consumptive pre-irrigation in the field; use of drip irrigation and other efficient technologies.

Irrigation Water Management Program

The objectives of the Irrigation Water Management Program are to conserve water and energy in Santa Barbara County. This is accomplished through the implementation of Best Management Practices (BMPs) for operating and maintaining agricultural irrigation systems. Staff from the Cachuma Resources Conservation District (CRCD) provides irrigation system evaluations to local agricultural water users to help implement the BMPs. The CRCD manages the Mobile Irrigation Lab, which travels to the site to be evaluated. As part of the evaluation CRCD staff analyzes the Distribution Uniformity of the sprinklers; provides an estimate of seasonal evapotranspiration, effective rainfall, leaching and irrigation water requirements; tests pumping plants for energy efficiency; and measures the water quality by testing pH, electrical conductivity, nitrates, hardness and iron in the irrigation water. Following the evaluation, the agricultural water user will receive a report from the CRCD that outlines recommendations and projections.

Mobile lab irrigation evaluation

Statewide Agricultural Water Efficiency MOU

There are many ways that irrigation water suppliers can promote efficient use by farmers. In the late 1990s, legislation (AB 3616) was passed that created a Memorandum of Understanding (MOU) outlining practical and cost effective efficient water management practices (EWMPs) for irrigation districts. The EWMPs contained in the MOU include such practices as water pricing, education, efficient irrigation technology, water management practices (irrigation scheduling, moisture monitoring) and weather monitoring. As a result of this legislation, a council was formed which includes the California Department of Water Resources (DWR), a number of large irrigation districts, public and environmental interest groups and agricultural agencies such as the Farm Bureau and the Natural Resources Conservation Service. This statewide council, comprised of the above entities and individuals that have signed the MOU, was formed to oversee implementation of the EWMPs. The SBCWA participates in these quarterly council meetings and promotes implementation of EWMPs by local irrigation water suppliers.

New Development Review

There are many ways that water use in new development can be minimized. Some methods include careful design and planning, the inclusion of efficient plumbing devices and appliances, appropriate landscaping (plants and irrigation systems) and efficient processes used in commercial and industrial projects that have high water demands. The County Planning and Development Department reviews all new development in the unincorporated areas of the county and coordinates this review with local water purveyors to assure an adequate water supply. At this time water purveyors, as well as staff in the SBCWA, have the opportunity to comment on design features as mentioned above and to recommend more efficient alternatives if needed. This is an important aspect of the Regional Water Efficiency Program because it is easier to influence water use before a project is installed than to change behavior of the occupants once the project is complete.

Data Collection

The SBCWA collects and analyzes data regarding water production and demand, water rates and use of recycled wastewater. This data provides valuable feedback to staff regarding water use patterns and the effectiveness of efforts to promote efficient use of water.

The SBCWA also participates in regional or national studies which enhance our understanding of water use patterns. In 1998-99 the SBCWA helped fund a national study regarding the residential end uses of water, which included one local study site — the City of Lompoc. Results of this study are helping local agencies better understand the impact of their conservation programs, and how residential water uses affect their water needs.

Research Regarding New Technologies

Each year new technologies and devices are developed that help consumers save water and energy. Water has become a scarce and expensive resource in most regions of country, at least periodically, as a result of short-term climatic changes.

Federal and state laws have changed in the past 15 years to require the manufacture and sale of efficient plumbing fixtures.

Compliance with Regulations

It has been proven that using water more efficiently can be less expensive and result in fewer impacts than developing new sources of water – such as building new reservoirs. This is especially true in many areas of California where water is a limited resource. Due to these economic and resource constraints, laws have been enacted that *require* efficient use of water. These laws address manufacture

Cultivation nursery for transplant cuttings in Santa Maria, utilizing a method of propagation which saves water

and sale of water efficient plumbing fixtures and appliances, design standards for landscapes and in some cases require water purveyors to develop and implement water efficiency plans. State and federal agencies have also adopted standards for efficiency that affect local water purveyors.

The Regional Water Efficiency Program staff review regulations and standards and assist local water purveyors with compliance. Many elements of the Regional Program satisfy specific requirements.

Individual water purveyors conduct many of their own water efficiency programs, directed at their customers' unique needs. For more information about water efficiency programs conducted by local water purveyors, contact the individual purveyors listed in the Water Purveyors section.

California Urban Water Conservation Council

In 1991 water purveyors, public and environmental interest groups, cities and counties, consultants and others joined together to sign a statewide agreement for implementation of far-reaching urban water conservation measures in California. The SBCWA was among the first public agencies to sign the agreement. This agreement (MOU) contains best management practices (BMPs) to be implemented by water purveyors serving urban customers, with the support of the environmental interests and others. The recently revised agreement contains 14 BMPs that are being implemented by signatory agencies. These BMPs include water conservation pricing, landscape water management, education, replacement of high water using plumbing fixtures, promotion of more efficient washing machines, residential and commercial water use audits, and other conservation practices.

A statewide council of signatories was formed in 1991 and has been meeting quarterly for over nine years. The SBCWA is an active participant in this group and promotes participation in the Council to all local water purveyors. As of early 2000, five local water purveyors have become signatories to the MOU. Implementation of the urban BMPs is required by state and federal law for some local purveyors.

U.S. Bureau of Reclamation (USBR)

The USBR owns two local reservoirs: Lake Cachuma and Twitchell Reservoir (see Surface Water section in Water Supply Chapter). These reservoirs supply urban and agricultural water supplies to local contracting water purveyors. The SBCWA is the master contractor for both projects. All agencies contracting for water provided by a USBR facility are required to prepare and implement a water efficiency plan. For the Cachuma Project contractors, comprehensive water efficiency plans have been in place since 1994 when the contract with the USBR was renewed. The plans must be updated annually, and incorporate water efficiency measures for both urban and agricultural water users. For urban agencies one of the primary components is implementation of the best management practices (BMPs) contained in the statewide urban water conservation MOU (see above). The regional water efficiency program conducted by the SBCWA addresses many of those BMPs.

Urban Water Management Plans

In 1985, statewide legislation (AB 797) was passed requiring all water purveyors with 3,000 customers, or serving over 3,000 acre-feet of water for urban uses, to prepare an urban water management plan. These plans must be updated every five years. An urban water management plan is a comprehensive plan that addresses past, current and future water supplies for each affected district. These plans must include a water shortage contingency plan for droughts and other water shortage emergencies, a plan for using recycled wastewater if feasible, a comprehensive assessment of all water sup-

plies within the district, a plan for meeting future water needs, and a water efficiency plan which includes a description of how best management practices (see urban water conservation MOU described above) will be implemented. The urban water management plans are submitted to the Department of Water Resources where they are reviewed and summarized in a report to the legislature.

Some local water purveyors are affected by this legislation, and are in the process of preparing updates to their plans, which are due in December of 2000. There is significant overlap in the requirements for these plans (for USBR, DWR and the Urban Council). Purveyors often submit portions of one plan for partial satisfaction of the requirements of other plans, to eliminate duplication of effort.

Drought Planning

Periodic droughts, like wet-cycles, occur throughout California and are an expected event in a semi-arid climate. Water managers plan for droughts by obtaining ample water supplies to meet normal needs and holding a reserve, or "buffer", aside for periods of shortage. More severe droughts, particularly those occurring over multiple years, provide a challenge to water managers. The prolonged drought of 1986-91 is an example of a sustained shortage resulting from six years of below-average rainfall and corresponding decline in the replenishment of local water supplies. By the end of that six-year drought, water supplies on the south coast of Santa Barbara County were drastically reduced. Residents and businesses were asked to cut back their use to essential levels. Water purveyors adopted penalties for excessive use (through water rates), implemented rationing programs, prohibited wasteful use and the City of Santa Barbara actually banned lawn watering (Aston, 1992).

County farmers need to be assured of a reliable water supply

There are two ways that water purveyors can prepare for droughts or other water supply shortages: 1) hold enough water supplies in reserve to draw on during shortages; and 2) prepare water demand management contingency plans to reduce demand during shortages. One water supply solution includes developing additional or supplemental water sources such as the State Water Project and desalination. Both of these supplemental supplies were developed after the last drought and have helped extend local supplies to meet existing and future demand. The water purveyors contracting for State Water Project water have set aside a reserve for shortages. The City of Santa Barbara's desalination plant, which is now decommissioned, will be brought on line when there is a need, such as a drought that affects both southern and northern California (the source of State Water Project water).

Most local water purveyors have prepared water shortage contingency plans that identify how they will reduce demand during a shortage. These plans address water savings over and above ongoing water efficiency practices that are now an integral part of customer demand management. Ongoing (long-term) efficiency measures include the best management practices described above (pricing, education, efficient landscapes and irrigation, efficient

plumbing fixtures and appliances). Short-term water shortage contingency measures include steeply tiered (penalty) water rates, prohibitions against certain unnecessary uses of water (i.e., car washing), water rationing programs, restricted landscape irrigation (i.e., designated days for watering) and public information campaigns. Typical contingency plans are based on scenarios of shortages, such as 10%, 20% and 30% reductions in supply. The demand reduction contingencies are planned according to the severity of the water supply reduction, with the most severe restrictions being carried out during the most severe shortage. In the last local drought water demand was actually reduced by over 50% during the peak of the shortage. For more information regarding water shortage plans, see the urban water management plans prepared by each water purveyor.

For More Information

Goleta Water District: http://www.goletawater.com/

City of Santa Barbara: http://www.ci.santa-barbara.ca.us/departments/public_works/water_resources/

Montecito Water District: http://www.montecitowater.com/

Department of Water Resources; California Water Page: http://www.dwr.water.ca.gov/

California Urban Water Conservation Council: http://www.cuwcc.org/

Santa Barbara County Water Agency: http://www.publicworkssb.org/water/

Public Demonstration Gardens in Santa Barbara County

The following is a list of the public demonstration gardens in Santa Barbara County that provide living examples of resource efficient landscaping.

Streetside section of the Goleta Water District Demonstration Garden

Goleta Water District

4699 Hollister Avenue
(corner of Puente Street),
Santa Barbara

(805) 964-6761

Features many native California plants and other non-native low-water using plants. Open 8:00 a.m. to sunset every day. **Admission is free**.

Santa Barbara City College Lifescape Garden/ Chumash Point Ethnobotanic Preserve

721 Cliff Drive, Santa Barbara

(805)965-0581

The Lifescape Garden features a variety of low-water using and edible plants, as well as composting systems and efficient irrigation. Chumash Point emphasizes native plants from the range of the Chumash Indians. These plants have medicinal, nutritional and spiritual importance to the Chumash. Open sunrise to sunset every day. **Admission is free**.

Santa Barbara Botanic Garden's Home Demonstration Garden

Santa Barbara Botanic Garden

1212 Mission Canyon Road, Santa Barbara

(805) 682-4726

A 65-acre garden of native plants of California, representing a variety of plant communities and important botanical and horticultural collections. The Home Demonstration Garden at the Botanic Garden is a working model of water efficient California native landscaping for residential settings.

The Garden is open Monday-Friday from 9:00 a.m. - 6:00 p.m. and on weekends from 9:00 a.m. - 5:00 p.m. **Small admission fee**.

Alice Keck Park Memorial Garden, Santa Barbara

Alice Keck Park Memorial Garden

City block bounded by Arrellaga, Santa Barbara, Garden and Micheltorena Streets, Santa Barbara

A 4.6-acre informal park emphasizing exotic flora. The planting areas are separated according to cultural conditions, ranging from boggy to arid, with a special section on low-water using plants. Plant directory is near center of the park, above the pond, and a list of low-water using plants is available. Open 8:00 a.m. to sunset every day. **Admission is free**.

Firescape

2411 Stanwood Drive / Route 192 (corner of Mission Ridge Road) Santa Barbara

(805) 564-5703

Located across the street from Fire Station #7, this 1.7-acre labeled garden demonstrates how risks of wildfire can be reduced through appropriate planting of low-water using plants, irrigation, and management. Open 8:00 a.m. to sunset every day. **Admission is free**.

Firescape, Santa Barbara

Montecito Water District

583 San Ysidro Road (above East Valley Road), Montecito

(805) 969-2271

A labeled, low-water using garden featuring a variety of Mediterranean plants. Open 8:00 a.m. to sunset every day. **Admission is free.**

Santa Maria Valley Sustainable Garden, Santa Maria

Santa Maria Valley Sustainable Garden

Curtis Tunnel Center
624 West Foster Road, Santa Maria

This demonstration garden features low-water using plants, efficient irrigation, composting, mulch, lawn alternatives, and use of paved areas. Brochures and plant lists are available on-site. Open every day during daylight hours. **Admission is free**.

City of Lompoc Drought Tolerant Garden

1801 West Central Avenue, Lompoc
(805) 736-5083

The 1/4-mile garden path features native California plants, mulch, granite pathways, and is irrigated with reclaimed water. Open sunrise to sunset every day. Call ahead to arrange group tours. **Admission is free**.

Cloud Seeding

Basics

Since as early as 1948 Santa Barbara County has participated in weather modification activities in order to augment local water supplies. Weather conditions are "modified" by seeding clouds with condensation nuclei to increase the amount of rain that falls. There are a number of benefits from doing this, which is supported by statistical analysis. The most significant benefit is that in some years up to 15% more rain falls in areas where clouds have been seeded than in control (unseeded) areas. Other benefits include:

- Infiltration of significant amounts of water into groundwater basins;
- Runoff into reservoirs;
- Irrigation effects on grasslands and crops.

To understand how cloud seeding works, it is important to understand clouds. Clouds are composed of droplets of water vapor of varying size and temperature. These cloud droplets form on microscopic particles of atmospheric dust, called condensation nuclei. Toward the top of the cloud formations, "supercooled" water vapor may exist. This means that the water vapor is suspended in the cloud at temperatures that are below freezing.

Precipitation forms when this vapor contacts a particle or "nucleus". The vapor freezes to the particle and forms an ice crystal. The crystal grows larger as more vapor contacts it. When it becomes large enough to overcome the forces of "uplift" in the cloud, it falls out as precipitation. This precipitation may reach the ground as hail or snow, or during its descent it may melt and reach the ground as rain. It may evaporate entirely on the way down and rejoin the cloud as vapor. The existence of supercooled water vapor constitutes the most opportune conditions to seed clouds for rainfall augmentation purposes. It is possible, though, to seed clouds without supercooled water vapor, under certain meteorological conditions.

In storms typical to Santa Barbara County, there is much more moisture available than there are condensation nuclei to act as 'bus' mechanisms to bring the cloud droplet from a high elevation in the atmosphere down to earth's surface. For this reason, Santa Barbara County's weather modification program focuses on adding more condensation nuclei to clouds to increase rainfall.

A number of substances have been shown to work for cloud seeding, including dry ice, but the most commonly used substance is silver iodide (AgI). There are two ways to inject silver iodide into clouds: aerial and land-based methods. In aerial seeding, silver iodide generators are mounted on the wing tips of an airplane which flies directly into the most productive part of the cloud. Land-based generators are placed at the tops of mountains where updrafts carry the silver iodide into passing clouds. The generators burn a solution of silver iodide and acetone which releases the seeding agent in a smoke form.

Aerial seeding utilizes silver iodide generators mounted on airplane wing tips

Local Program

Local aircraft generators are flown on planes leaving the Santa Barbara or Santa Maria Airports. This is a more precise method of seeding because the pilot can fly directly into precipitation bands, the most productive portions of the storm. These bands can be detected by radar and pilots can be directed to them by radio. Ground generators are located at the Refugio Pass and La Cumbre Peak in the Santa Ynez Mountains, and are independently activated by a meteorologist from the control center. A com-

puter model is used to predetermine the effects of seeding. The County cloud seeding program is only conducted in the upper Santa Ynez and Twitchell Reservoir watersheds. It is kept away from the county's urban areas, partly to avoid inundating populated areas with rain, and partly because runoff south of the mountains goes into the ocean.

The effectiveness of cloud seeding has been evaluated to demonstrate its benefits. Recent statistical studies suggest that seeding results in a maximum increase in precipitation of about 15% over one rain season. This translates to thousands of acre-feet (AF) of additional water captured for storage in local reservoirs. For example, in a wet year such as 1992-93, approximately 20,000 AF of water was generated through cloud seeding, and this figure does not include infiltration into groundwater basins.

The local cloud seeding program is operated between December 1 and March 30 of most years. Seeding is only possible during those months if there are clouds present that might produce rain. During drought periods, cloud seeding is not as effective. Conversely, in large storms, seeding operations are suspended in order to avoid contributing to flooding problems. The most effective seeding occurs during moderately wet years such as 1992 and 1993, although some level of cloud seeding is conducted most years.

The current cloud seeding program in Santa Barbara County uses state-of-the-art technology to reduce the associated risks of excessive rainfall or rainfall occurring in areas not intended. County hydrologists use a network of rain and stream flow gages together with predictive computer models to prevent potential problems. A set of suspension criteria is established every year which specifies conditions under which seeding may be conducted. For example, all seeding is suspended in the areas recently burned by wildfires (such as the Marre Fire in Santa Ynez Valley) because those areas are sensitive to excessive soil erosion which can lead to landslides and downstream sedimentation. Seeding can resume when geologists and others have determined that there is no longer any danger of

Silver iodide generators placed on mountaintops release condensation nuclei into passing clouds

landslides or other adverse erosion impacts. The program is under the constant supervision of a certified meteorologist who uses real-time radar and satellite imagery to monitor storm progression and rainfall.

Costs

The cost of the annual cloud seeding program is shared among the County and the water districts which receive a benefit from it. The cost is well justified when compared to its benefits. The average cost of water produced by cloud seeding is less than $100 per AF. By comparison, the cost of State Water Project water on the South Coast is roughly $1,200 per AF. Desalinated seawater costs approximately $1,100 per AF. Groundwater and water from Lake Cachuma average between $75 and $250 per AF. Thus cloud seeding is one of the least expensive sources of water available to us.

For More Information

Weather Modification, Inc.:
http://www.wmi.cban.com/

Santa Barbara County Water Agency. 1977. *Potentials for Yield Augmentation through Weather Modification.*

McGurty, B.M. 1999. Turning Silver into Gold: Measuring the Benefits of Cloud Seeding. *Hydro-Review 18(2)*, 40, 42, 55-57.

Water Reuse

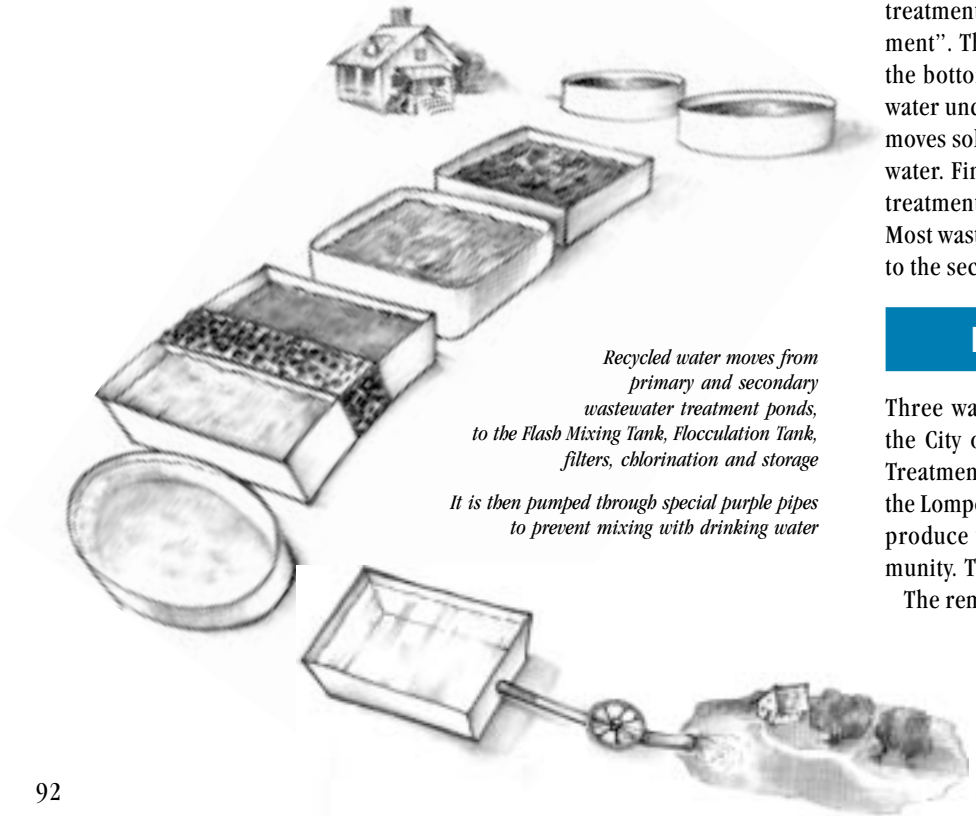
Recycled Wastewater

Wastewater refers to water that has been used and then released into the sewer. Wastewater can contain sewage, urban street runoff or industrial or agricultural waste products. Wastewater enters sewers where it is carried to wastewater treatment plants. During the treatment process solids are removed from the water. Chemicals are added to disinfect the water before it is released into the ocean, neighboring river, other water body or spreading grounds. If treated to an advanced level, wastewater (or "effluent") can be reused for such purposes as irrigation of pasture grasses, landscaping, and even some crops.

Properly treated wastewater can provide a cost effective alternative to potable (drinking) water for a wide variety of uses. The process of treating wastewater for reuse is called recycling. Water recycling is becoming a more important resource as local water purveyors seek ways to stretch their existing water supplies. Because recycled water can be safely and legally substituted for potable water in agriculture and landscape irrigation, flushing toilets, as well as dust control and compaction on construction sites, it replaces potable water and makes it available for other uses. This effectively creates a new water source.

Recycled water must meet rigorous water quality standards before it can be reused, with the standards varying depending on the type of use. The process of treating water to a high enough level so that it may be recycled is complex and somewhat expensive, so not all wastewater treatment plants can produce recycled water.

There are several steps to the wastewater treatment process. Water is transported from sewers into the treatment plant, where it receives "primary treatment". This involves removing solids that settle to the bottom, as well as floating materials. Next the water undergoes "secondary treatment", which removes solids that are suspended or dissolved in the water. Finally, some treatment plants use "tertiary treatment", which filters and disinfects the water. Most wastewater in Santa Barbara County is treated to the secondary level.



Recycled water moves from primary and secondary wastewater treatment ponds, to the Flash Mixing Tank, Flocculation Tank, filters, chlorination and storage

It is then pumped through special purple pipes to prevent mixing with drinking water

Recycled Water Use

Three wastewater treatment plants in the county, the City of Santa Barbara's El Estero Wastewater Treatment Plant, the Goleta Sanitary District, and the Lompoc Regional Wastewater Reclamation Plant produce water that is directly reused in the community. These are discussed in more detail below. The remaining treatment facilities produce water that flows into ponds, which allow the water to percolate into the groundwater basin, or they release the treated wastewater into the ocean.

Wastewater Treatment Plants in Santa Barbara County

There are twelve wastewater treatment (also called "sanitation") plants in the county. This table contains a list of each of the sanitation plants and describes the level of treatment and the wastewater flow capacity of each plant. Most sanitation plants are operated by public entities such as cities or the County. Several are special districts not affiliated with city or county operations.

TREATMENT PLANT	TOTAL PLANT CAPACITY (acre-feet per year)	LEVEL OF TREATMENT	RECYCLED WATER USES
Buellton Wastewater Treatment Plant	728	secondary	groundwater recharge
Carpinteria Sanitary District	2,240	secondary	treatment plant landscape irrigation
Goleta Sanitary District and Goleta West Sanitary District	14,562	blended secondary/ tertiary	landscape irrigation, toilet flushing
Guadalupe Wastewater Treatment Plant	1,344	secondary	pasture irrigation
Laguna County Sanitation District	3,584	secondary	pasture irrigation
La Purisima Wastewater Treatment Plant	448	primary	groundwater recharge; pasture/crop irrigation
Lompoc Regional Wastewater Reclamation Plant	5,600	advanced secondary	sewer line cleaning; dust control and compaction; city street tree irrigation
Montecito Sanitary District	1,680	secondary	none
El Estero Wastewater Treatment Plant (City of Santa Barbara)	12,321	secondary/ tertiary	landscape irrigation; toilet flushing
City of Santa Maria Wastewater Treatment Plant	8,737	secondary	groundwater recharge; pasture irrigation
Solvang Wastewater Treatment Plant	1,120	secondary	groundwater recharge
Summerland Sanitary District	336	tertiary	none

City of Santa Barbara

The City of Santa Barbara's water recycling project was implemented in two phases. Phase I, completed in 1989, included upgrading the El Estero Wastewater Treatment Plant to treat the water to the tertiary level. This recycled water is then distributed to user sites through a completely separate distribution system to ensure that there is no cross connection into the potable system. Phase I provides recycled water for landscape irrigation. Sites that use water from this phase include Montecito Country Club, the Red Lion Inn, Santa Barbara Zoological Gardens, Santa Barbara City College, and several schools and city parks.

Phase II, which extended the reach of the recycled water project, was completed in 1991. Sites irrigated by Phase II water include landscaping along Highway 101, Arroyo Burro Beach Park, the Municipal Golf Course and additional schools and parks. Since 1991, new development along the recycled water distribution system has been added including Chase Palm Park Extension and the Garden Street median.

Some irrigation sites receive recycled water from a 600,000 gallon storage tank at the wastewater treatment plant. For the remaining sites, recycled water is pumped to the new 1.5 million gallon storage reservoir at the Municipal Golf Course, and then distributed at night to irrigate those sites.

In 1995, the City began using recycled water to flush toilets and now many of the sites irrigated with recycled water have also converted their public restrooms to flush with recycled water.

Although the total capacity of the recycled water project is 1,200 acre-feet per year (AFY), current total project use is 850 AFY.

Goleta Valley

The water recycling project in Goleta is a joint effort between the Goleta Water District and the Goleta Sanitary District. The Goleta Sanitary District Plant features a blended secondary process, in which primary treated water is mixed with secondary treated water to safely meet all discharge requirements. This effluent is discharged into the ocean. Excess secondary water is then treated to the tertiary level to create usable recycled water.

This recycled water is used to irrigate landscaping at the University of California, local parks, golf courses, school grounds, and business parks. The project has the capacity to produce 1,500 AFY of recycled water, replacing potable water which then becomes available to the community. Several locations in Goleta now use recycled wastewater for toilet flushing.

In this cooperative project, Goleta Sanitary District added the tertiary stage of water treatment to the plant, and continuously monitors the quality of the water produced. The Goleta Water District constructed a separate pipeline to distribute the recycled water to customers. Special sprinkler systems were also designed to use the recycled water. The Goleta Water District also developed a user's manual containing strict guidelines for usage of the water.

For More Information

City of Santa Barbara:
http://www.ci.santa-barbara.ca.us/departments/public_works/water_resources/

Goleta Water District:
http://www.goletawater.com/

Boyle Engineering Corporation. 1971. *County of Santa Barbara Water and Sewage Facilities Plan.* Santa Barbara County, Cities Area Planning Council.

WateReuse Association:
http://www.watereuse.org/