Waterwise gardening, a factor in Sustainable Water Management.

ISS Fellow Wendy Hallinan 2004

TABLE OF CONTENTS

Front page photo: A 'natural wash' at the desert demonstration garden, Las Vegas Valley Water District, Las Vegas, Nevada.

Acknowledgements

1.1 Awarding bodies
Awarding body: International Specialised Skills Institute
Fellowship sponsor: Office of Employment, Training and Tertiary Education (OTTE)

1.2 Special thanks
I would like to thank the following people for their time, support and encouragement.
Damian Hallinan
Special thanks to Ms.Jenny Collins Head of Centre, PIES Sunraysia Institute of TAFE, who suggested I apply for the ISSF and encouraged me throughout the process. Both Jenny and Mr.Ross Robertson helped to verify the skills gaps I investigated overseas.
Ms.Carolynne Bourne CEO ISS Institute
Dr. Ron Wild CEO SIOT.
Mr.Lawrence Burt Director of Corporate Services SIOT
My colleagues in the department of Primary Industries and Environmental Science.
Mr.Keith Thomson Lower Murray Water.

1.3 Supporting organisations
Without the following supporters, I would not have been able to complete my Fellowship tasks. I am extremely grateful for both their financial support and encouragement.

Sunraysia Institute of TAFE was my major supporter and is also my employer. In keeping with its 'Investors In People' policy Sunraysia Institute of TAFE embraced my award and responded generously by supporting me both financially and personally in my endeavours. The opportunity to advance our knowledge in water sustainability coincides with the establishment of the National Centre for Sustainability, of which Sunraysia Institute of TAFE is a partner. Land and Water Sustainability is our role in this co-operative and managing water as a resource in domestic circumstances is an important part of that role.

My second supporter was the local domestic water supplier, Lower Murray Water.
Over the last two years a partnership has been forged between Sunraysia Institute of TAFE and Lower Murray Water.
In that time we have co-operatively created a waterwise public garden on the LMW site. Here the public can come and get realistic ideas about planting a large variety, (over one thousand species) of plants with low water needs. As well as hard landscaping ideas, which are also featured in the garden.
LMW also sponsored the participating students by assisting financially in their annual educational tour.
In 2003 we embarked on Phase II of the gardens. Several smaller and one huge demonstration nature strip were established at the LMW site. Students again are benefiting from the experience of a major project, of which they are a part of the planning, research and development team.

The LMW is a company with commendable forward thinking. It is attending to the job of presenting to the public a fine example of how to save considerably; not just on their water bills, but also to save a scarce and valuable resource as water for many practical needs.

1.4 Individuals and organisations participating in the Program in the USA

I would like to thank the following people and their organisations in the United States of America
Mr. James Patterson Atascadero Mutual Water Company
Drs.Ken and Gabby Levine, San Luis Obispo Botanic Gardens
Professor Thomas Eltzroth, Cal Poly University, Leaning Pine Arboretum
Mr. Bradford Munroe Cuyamaca College and Steven Maranhao 'The Garden'
Ms. Judy Woods San Diego Zoo
Ms. Kathy Puplava Balboa Park
Mr. Jim Gibbons Wynn resorts
Ms. Denise McConnell Las Vegas Valley Water District
Ms. Helen Stone Southwest Trees and Turf
Ms. Sue Jerrems Las Vegas Northern Water District.
During my visit to the United States I was overwhelmed with the generosity and graciousness of my hosts who went out of their way to help me with my research. I will be forever grateful to very talented people who shared their time and friendship with me.

2.0 Introduction

2.1 International Specialised Skills Institute Inc.

The International Specialised Skills Institute Inc. (ISS Institute) fills gaps in industries and enterprises where the means of doing so are not available through government programs or Australian TAFE institutes and universities. Since 1999, the Victorian government, though OTTE, has financially supported ISS Institute, as its major sponsor.

The ISS Institute explores opportunities in 'design' and skills (traditional and leading-edge). It identifies experts in diverse areas of design, master level trades and professional occupations in established and emerging industry sectors with the intent to affect their services to visit Victoria to conduct a range of education and training activities such as workshops, lectures and exhibitions.

The way in which this is achieved is by building global partnerships through the Fellowship program, then the fellow sharing what he/she has learnt overseas through education and training activities – one fellowship; many benefits.

ISS Institute's operations are directed towards bringing knowledge and leading –edge technologies to Australian industry, business and education/training institutes, rebuilding specialised skills and knowledge, which are disappearing, or have been lost in order to build the capabilities of industry and business and maximize opportunities in the global and local market place.

The result of their work has been highly effective in the creation of new business enterprises, the development of existing business and the return of lost skills and knowledge to the workforce, thus creating jobs.

Enormous benefits can be gained from working with ISS Institute through their overseas Fellowship program, education and training activities. Since 1999, the Victorian government, through OTTE, has financially supported ISS Institute, as its major sponsor.

2.2 Supporters

Sunraysia Institute of TAFE

Established in 1979, Sunraysia Institute of TAFE is the major provider of vocational education and training in North Western Victoria, offering students up-to-date and relevant courses that are a combination of theoretical and practical learning. The Institute aims to provide quality, effective and accessible education for the regional community; links with industry advisory groups further strengthen abilities to continue lifelong learning.

Quality vocational education courses enrich the lives of students by providing access to lifelong learning and developing relevant, flexible and adaptable skills that enhance employment opportunities, increase productivity and create a more dynamic economy.

The provision of vocational education and training is now a highly competitive business with many private providers, industry training organisations and institutes of TAFE in the market place. In this environment, Sunraysia Institute is moving ahead as a responsible, flexible and customer-oriented organisation. We are an internationally certified quality organisation, have won a major State award for ethical management practices and are accredited to the British quality standard Investors in People.

In this rapidly changing world characterised by increasing global competition, we have to work differently by working smarter, maximising our partnerships and adopting world best practice. We are on that journey.

Sunraysia Institute comprises four campuses situated across North West Victoria, (Mildura, Swan Hill, Robinvale and Ouyen). The campuses offer a range of courses in traditional learning environments as well as incorporating delivery modes such as: distance education, flexible learning, outreach programs, on-line learning and text based correspondence studies.

The Institute has four centres – Business, Computing and Hospitality; Arts and Community Education; Primary Industries and Environmental Science; Industrial Technology, offering a vast array of courses from Certificates to Diplomas, Apprenticeships, Traineeships, Access and Bridging programs to short and enrichment courses.

Affiliations with La Trobe University, Riverina Institute of TAFE and Murray Institute of TAFE allow Sunraysia Institute of TAFE to also present greater access to educational and career pathways.

Sunraysia Institute of TAFE aims to be the outstanding provider in the region committed to meeting the needs of our customers.

Lower Murray Water

Lower Murray Water supplies urban water and waste water to townships along the Murray River in Victoria from Kerang to Mildura .LMW operates eight separate water supply systems that pump

and treat water from the river and deliver it to approximately 48,000 customers in 14 towns. They provide wastewater collection, treatment and effluent disposal services to ten towns, via nine treatment plants.
The LMW mission is to be recognised as an excellent, effective, community focused urban water and waste water service provider.[1]

2.3 The Australian Context, Nature and current situation of waterwise gardening.

Waterwise gardening in Australia is a relatively new concept. Historically our significant National Gardens and common streetscapes and parks have been built after the European model where water abounds. '*The love of field and coppice, of green and shaded lanes,*' [2]
Plane trees, camellias, ferns, hydrangea and other thirsty plants filled our gardens, and survived with adequate water. Our first European settlers were fooled by the years of high rainfall they experienced, thinking Australia had abundant rain to mirror the life they left in the northern hemisphere.

We have had times of drought in the past, when certain stop gap measures kept plants alive (or not) through a summer of heat. But the same plants replaced the dead ones, and as rain returned water saving measures were forgotten.

Now, however there is a change in our thinking about water as a resource. Previously it was seen as an infinite resource, as recently as 1997 meteorologists were unaware of the extent of El Nino and its effect on our weather patterns. In 2002/2003 we experienced a drought which has left water storage dams well below their average levels, instigating level 2 restrictions in Melbourne as early as August.
Australia is the driest continent on earth (excluding Antarctica), but we are the greatest consumers of water per capita.[3]Today, as the price of water increases with the demand, and the availability is not as certain, people are looking toward new, efficient ways of using the water we have, so that this finite resource is made adequate for many needs.

The reality is that we have *'a sunburnt country, a land of sweeping plains, of ragged mountain ranges, of droughts and flooding rains'*[2]
And while Dorothea Mackellar had this foresight in 1904, it has taken almost a century for us to realise the nature of our country and the volume of water we will have to live with. We can no longer cling to old practices and continue to waste water in our gardens, on our crops, in our households, and as part of our industry.
We need to grow plants suitable to our environment, not change the environment to suit the plants.

Global water consumption has risen almost tenfold since 1900, and many parts of the world are now reaching the limits of their supply. World population is expected to increase by 45% in the next

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[1] LMW annual report 2001/2002
[2] 'My Country' by Dorothea Mackellar
[3] savewater.com.au

thirty years, whilst freshwater runoff is expected to increase by 10%. UNESCO has predicted that by 2020 water shortage will be a serious worldwide problem.[3]

In Australia there was a move towards native planting in the 1980's. When any exotic plant was seen to be a weed and low maintenance of natives was cited as the answer to our needs. However, despite the huge range of native species in our ecosystems the variety of plants available to gardeners was low. Many suburban gardens and country retreats remind us with a remnant legacy of lanky *Melaleucas* and scrawny *Grevilleas* over a dead understorey and inadequate mulch.

Today, thankfully, this is changing. We have reached the point where mixed plantings are acceptable. We can now enjoy succulents and *Salvias* in the same garden. Pottager gardens have made a timely return, where edible plants can be grown for their beauty and bounty amongst others grown for their flowers, foliage or fruit, and **where climate is considered in plant choice.**

There are thousands of waterwise plants. They range in styles from "Tropical" (looking), cottage, native, annuals, succulents, ornamental grasses and more. With a small but significant change in our habits, we can decrease the use of water in our garden by 20-30%. Simply by cutting down on lawn area, or changing the variety of grass used for lawn.

Both government and private water provider are changing their focus. Water is a precious commodity worth conserving. Conflicts of interest abound with conservationists and irrigators alike pondering the outcomes of The Living Murray discussion paper[4]. When it comes to water use, we are all stakeholders and we are all concerned with how these proposals might affect us.
One third of the world's population is already facing problems due to water shortage and poor drinking water quality. Effects include massive outbreaks of disease, malnourishment and crop failure. Excessive use of water has seen the degradation of the environment costing the world billions of dollars.
Water wise gardening is a simple but extremely effective way to save water. It is not a way of life in Australia, a few good books and CD-ROMs have been written, and websites are starting to appear. But there seems to be no coordination in research and advances in this area. Coordination would lead to more efficient and directed advances, and minimize duplication of effort.

2.4 Organisations which could be effected by this research.

Organisations, which could be effected by research on water use in gardens:
Government bodies such as the Department of Environment and Sustainability,
Water providers like Lower Murray Water, Landscape Architects, Universities and their students, Nurseries, wholesale and retail , researchers, horticulturalists of all types, city councils and their planners, garden suppliers, irrigation manufacturers and designers, professional associations, The Murray Darling Basin Committee, Southcorp Wines, BRL Hardy and other local wineries, Murray Basin Titanium, Sunraysia Area Consultative Committee, Mildura Rural City Council,

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[4] The Living Murray: a discussion paper on restoring the health of the River Murray by the Murray Darling Basin Commission.

Catchments Management Authority, Lower Murray Darling Catchment Board, First Mildura Irrigation Trust, Sunraysia Rural Water, and Small Business Victoria.

2.5 Fellowship aims

The aims of my fellowship are

- To learn about best practice water conserving irrigation for amenity horticulture. (Gardening, landscape and Nursery industries.)
- To find new plants useful for waterwise gardening in Australia.
- To find out about different water conserving techniques used in landscaping in the arid regions of the USA.
- To investigate education in the area of waterwise gardening at botanic gardens, water providers, in the amenity horticulture media and educational institutions.

2.6 Skills gaps

This initiative seeks to expand and enhance training opportunities related to sustainable land and water conservation, use and management throughout the North Western region of Victoria. It is an opportunity to fill skill and knowledge gaps not presently available in Australia. Sunraysia Institute of TAFE is currently constructing a Centre for Sustainable Land and Water Management to provide world-class examples of, and an educational focus for, sustainable management of land and water resources in the economic, social and cultural context of the region.
This unique development will showcase TAFE/VIC courses and community education programs in land and water utilisation.
This multidisciplinary education Centre will promote the interconnectedness of our land and water systems and play a vital role in the social, cultural and economic structure of our community .The Centre will have an education focus on the currently mutually exclusive relationships that exist between the techniques used to prevent land and water degradation and those needed to increase productivity.

The rapid expansion of irrigated horticultural plantings along the Murray Valley is increasingly putting pressure on our natural resources. The economic value of water is increasing inline with this development and the transfer of water rights has created the need for efficient use of our water resources. The environmental impact of water used in irrigation is becoming evident throughout the region and there is now competing demands for water in urban, agricultural and environmental usage.
Whilst production horticulture has a significant history in irrigation management at Sunraysia Institute of TAFE, training provided to the region in amenity horticulture has to date been uncoordinated and haphazard in its approach. Previous educational programs have taken a reductionist approach, segmenting environmental issues from land and water usage. This Centre will provide a focus for training organisations, taking a holistic approach with emphasis on the synergy that must exist between environmental sustainability and land and water utilisation. As regional environmental health indicators decline we need to engage the community in investing in our catchment's health through new and innovative education programs that the market place is demanding.

Melbourne and regional Victoria, along with much of NSW and southern Queensland are presently experiencing a significant drought. Water restrictions were imposed over the summer, and as storage dams and rivers continue to decrease in capacity rather than fill, as would be expected in winter, Level 2 restrictions have been imposed on the Melbourne populace.

The local domestic water provider in Mildura, Lower Murray Water, has declared that water availability has been cut to 16% of the norm for the month of July. As a result Water restrictions will be introduced in Sunraysia in September. Level 1 restrictions will remain, as a permanent indicator of the water scarcity in our part of the state. Even if there are significant spring inflows particularly in the catchment areas of the Dartmouth and Hume dams, which will result in an increase in the percentage of water availability, these restrictions will stay in an attempt to educate the community about wise and sustainable use of water.
Victorian educators need to be able to meet these needs, to educate the community in irrigation, landscaping techniques, plant selection, design, scheduling, and knowledge to save water. This is where the skills gaps lie. This is what I was aiming to learn.

3.0 The Fellowship Program

3.1 Introduction, the nature of my overseas program.

My overseas program was based on one month touring and study in the U.S.A.
My first destination was San Luis Obispo, a 'University town' about 300 kms north of Los Angeles in California. Here I spent two and a half weeks studying at the Designer /manager School of Irrigation at Cal Poly University. During my time at San Luis Obispo I took the opportunity to visit some nearby gardens and education centres: I then traveled to San Diego and Las Vegas to visit demonstration gardens, public and private, and educational institutions of relevance.

3.2 Educational Institutions and Host Organisations

ITRC
The Irrigation Training and Research Centre is part of Calpoly University and is co-sponsored by the U.S. Bureau of Reclamation.
The school aims:

- to bring instruction to landscape professionals,
- to give practical information on key irrigation design and management projects,
- to work with state-of-the art management software and
- to encounter hands–on technical experience with both indoor and outdoor facilities.

Atascadero Mutual water Company is a not for profit educational organisation which provides water for the City of Atascadero and adjacent unincorporated areas within the original Atascadero colony boundary. It has a total service area of 38 square miles. The Atascadero Lake Pavillion Demonstration Garden has Californian native plants surrounding the Pavillion, to demonstrate variety in color, type, uses and adaptability to garden environment.

The Colony House Water Conserving landscape represents several features of a typical water conserving residential landscape including: plant selection and grouping, turf alternatives, subsurface drip irrigation, mulching, composting and several examples of hardscaping. On-site retention of surface water run-off is also featured. James Patterson is my contact. James is also a member of a local conservation group, water preservers.

The **San Luis Obispo Botanic Garden** is a garden in its infancy. The Preview Garden has been completed and showcases plants from the Mediterranean climate regions. The future 150-acre garden is to display the diverse plant life from five of these climate areas including Australia. The award-winning master plan will help the gardens provide opportunities for education, recreation conservation and research.

Thomas E. Eltzroth, M.S. teaches plant materials and plant propagation at the Cal Poly Agriculture Department. He is the Department's coordinator of internships in the area of Arboreta, botanical gardens, and public gardens.
He oversees the department's **Leaning Pine Arboretum**, and is a member of several professional and trade organisations including the American Association of Botanical Gardens and Arboreta.
Mr. Eltzroth has coauthored five horticultural books and his professional work appears in numerous plant publications, slide sets and CD-ROMs. He is also interested in Horticultural photography.

Balboa Park affords the status of a Nationally Significant Historic Place in the US.A. The land, 1400 acres was set-aside in 1868 by the town of only 2,500 people. Over time such an extravagance has shown to be a wonderful foresight, as it has been rapidly transformed into a major civic asset. It boasts many gardens, theatres, museums, a zoo and sports facilities. The gardens include a Japanese Garden, Alcazar garden, a formal Spanish garden, and a Desert Garden amongst many others.
The City of San Diego Park and Recreation department manages the park.

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'The Garden' is a US$3.5 million construction. Built in cooperation between Cuyamaca College and the Helix Water District, The Garden demonstrates plants, irrigation, and landscaping techniques that are innovative in the gardening industry. The college also teaches related water conserving gardening subjects.

The **San Diego Zoo** is a world-renowned zoo. It is probably less well known for its acres of display gardens. Gardens, which need to provide the appropriate environment for animals from all over the world. The Zoo gardens are listed amongst the best in the United States of America.

Wynn Resorts is a large company headed by the billionaire Steve Wynn. Jim Gibbons is the head horticulturalist who is landscaping the new Wynn casino and hotel in Las Vegas. It is a multi million dollar project.

Helen Stone is the publisher of "**Southwest Trees and Turf**" a monthly publication dedicated to education and professional horticulture in the arid Southwest.
Articles included in the magazine range from 'Irrigation Smarts' to 'Desert Arborist' and 'Plants at a Glance'. In her position Helen has a large range of contacts, and a great insight into the water culture of the district.

3.3 Program Content

Irrigation and training research centre.

San Luis Obispo is the home of Cal Poly University touted as being in the top six universities in the U.S.A., and it is here where the ITRC (Irrigation Training and Research Centre) is located. A permanent faculty of Cal Poly, the IRTC draws students from across the United States as well as overseas.

Several instructors taught classes while I was there, Dr Stuart Styles, Mr. Bob Walker and the 'irrigation guru' of the U.S., Dr Charles M. Burt. All of these lecturers were involved in the development of the modules I studied and the establishment and continuation of the IRTC.

The course I took was exceptional; it was as if it was designed especially for me.

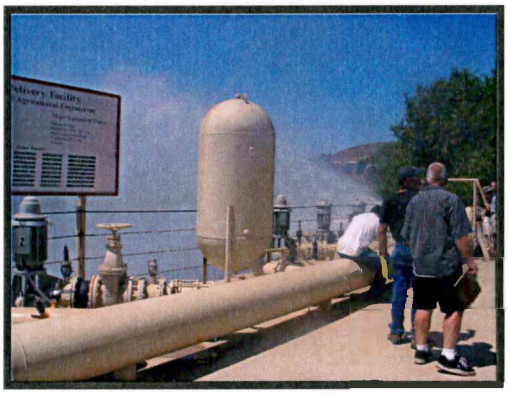
We started at fundamental plant /soil/water relationships and advanced through hydraulics, pumps and pipelines and finally to auditing and designing irrigation systems.

Checking Pressure

Stocktaking Auditing Kits

The beginning classes helped me by drawing together the threads of knowledge I had picked up along the way in my gardening, studying, and teaching experience. They helped me to consolidate my ideas and understand the following classes in a theoretical, as well as practical way.

ITRC pumps



Changing pressure and flow

Four days of study at Cal Poly[4], including auditing, distribution uniformity, backflow, prevention, friction, flow, and calculations to find suitable scheduling programs made up most of the first two days. Then finally on the last two days of class came the design component for both drip and spray irrigation systems.

My auditing class set out collection cups, stands and flags.

On days without classes I was able to visit local gardens and their creators as arranged before I left.

Atascadero

On Thursday 21st August I caught the bus to the town of Atascadero. There I met Jim Patterson and a group of people who belonged to "Partners in Water Conservation" at The Colony House. The "Partners" are a diverse group of people from several surrounding local towns.

They work for water providers, local government, and are also teachers and educational designers.

The "Partners" meet regularly to discuss and organise ways to promote water conservation in their area. They distribute a newsletter, run stalls at the local fairs with exhibits and information, and advertise in the newspaper, especially when there is a

[4] Fo

change of weather or season, which requires alteration to home irrigation scheduling.

Jim Patterson Colony House

Partners in Water Conservation BBQ at Colony House

They have also sponsored the weather forecast on the radio so listeners can associate the evapotranspiration changes with community weather conditions and apply this knowledge to their own gardens. The "Partners" run seminars for the public, which are sponsored by their employers and local businesses as well as visit local schools, from p-12 and college with relevant water lessons and messages to promote water conservation.

Colony House Gardens

The members of the PWC give a lot of their own time to keep this group going and successful. I was grateful to be able to address the meeting that day. It gave me an opportunity to tell them about the ISSF and its roll in Australian education, and a history of my own experience with water wise gardens.

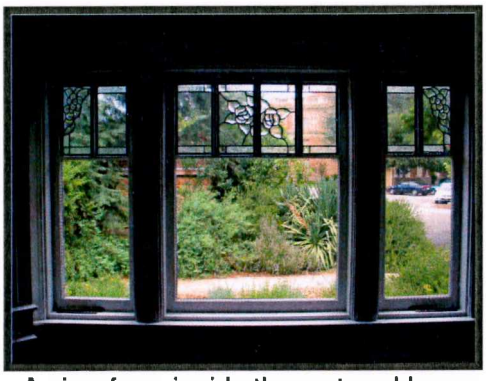
The Colony House is a project of the PWC. It is an historically significant house that has been restored by the local historical society. The Atascadero Mutual Water Company saw it as a great

opportunity to combine the house restoration with the rehabilitation of the garden into a water-wise demonstration garden. A deal was made with the historical society where the AMWC would match their fundraising efforts up to $7000. They were successful in restoring both.

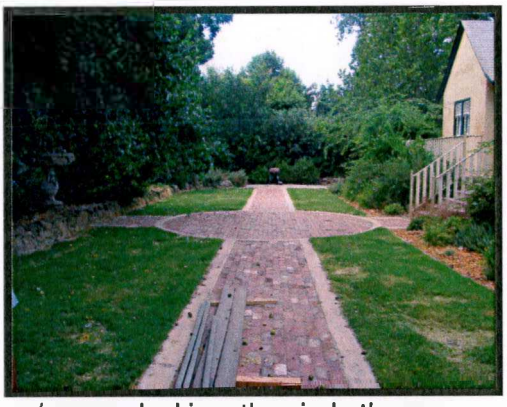
Colony House Gardens

The Colony House garden has been planted with large array of plants suitable for a low water regime, a viewing platform made from recycled materials, and other landscape features, paths and paving constructed from recycled pavers, rocks and bricks.
There is a continuing theme of a circle with a cross though the middle culminating in an archway for wedding ceremonies.
The garden is both stylish and realistic for the regular house gardener. The idea of a whole house garden is a novel but exciting idea which I would like to use in the future if I have the opportunity. It shows the householder a complete picture that requires less modification to their existing garden than a regular demonstration garden. It is easier for the less experienced gardener to apply to his or her own situation. Many of the plants used are common to our gardens today, some Australian plants featured too.

Colony house gardens.



A view from inside the restored house.



Gardens at Colony House, the recycled timber / epoxy decking, the circle theme repeated in the paving.

Irrigation at Colony House is subsurface to lawn areas and drip on other plants. Regular maintenance of the irrigation system is a high priority to keep the efficiency at a maximum.

In Line Drip Irrigation at Colony House.

Members of the Water Protection Group stand under the Wedding Arch at Colony House.

A mixture of plants from the Mediterranean (left) and local areas Deer Grass, *Muelenbergia sp.* (right)

One of the water protection group members, Ken, worked for Atascadero water district and his job involved doing free to the public irrigation audits for water district customers. This involved visiting the residence and checking the maintenance and efficiency of an irrigation system. Often he could save a large % of water simply by programming the irrigation controller more effectively.[5] This is a service which could be taken up by local councils and water authorities.

After The Colony House I traveled with Jim Patterson to The Lake Pavillion Garden. The garden is constructed around a large pavillion on the edge of a man made lake in Atascadero. It is contained within a large park/playground complex. The Lake is used mainly for recreation.
The garden comprises all Californian native plants.

[5] See brochures Appendix 2

The Lake Pavillion

Christmas berry

Lake Pavillion Garden

This was my first look at a strictly native Californian garden. Several of the plants were familiar and are used in our gardens, but many were new to me and would be useful additions to a waterwise garden in Australia. [1]
As with Australian natives, some plants lend themselves to landscaping whilst others don't exhibit many of the qualities of an attractive landscaping plant. Some are too straggly, don't cope with pruning, flower rarely or not at all, and require such a specialized environment that they are not suitable. Water use is not the only limiting factor when it comes to plant selection.

California fuchsia

Californian Oak

[1] See plant list Appendix 1

Californian Salvia

Californian Berry

Jim was a gracious and thoughtful host with a real enthusiasm for conserving and managing the environment. He is currently running for public office.

Leaning Pine Arboretum

On the 22nd of August I met Professor Emeritus Thomas Eltzroth for breakfast. This was a good opportunity to discuss our particular backgrounds and goals, as well as the chance to tell him about the ISSF.
Tom Eltzroth is semi retired and works for Cal Poly on a part time basis, his main focus and responsibility is the Leaning Pine Arboretum. The Arboretum is part of the Environmental Horticultural Science Unit at Calpoly. It is 5 acres of gardens with sweeping views of the Santa Lucia Mountains. The collection is displayed by place of origin, featuring the five main Mediterranean climate regions of the world: California, South Africa, southwestern Australia with some New Zealand plants, Chile and the Mediterranean Basin.

Striking foliage of an *Aloe*

With a plant list from these naturally dry garden areas it was a bounty of plants to suit the waterwise style garden. A collection of *Aloes* and *Agaves* were a highlight amongst the recognised collections of *Ceanothus* (California), *Rosmarinus* (Mediterranean), *Quercus* (California), *Phlomis* (Mediterranean) and *Proteas* (South Africa)

Thirsty lawn areas make way for garden beds

The primary mission of the Arboretum is education. It is used as a laboratory for students, in identification and maintenance classes, as well as independent research and project studies. Students as volunteers, in classes and as paid interns, maintained the garden. The internship is a new concept to me. It is like a long period of work experience, usually suited to students who have graduated, often sponsored by local business or special interest groups. There appeared to be a lot of internship happening in the Horticultural industry in all the places I visited.

Lawn areas have been reduced and more gardens beds planted.

Attractive, whimsical features of the Leaning Pine Arboretum were the seating nooks around the garden. Each was a reflection of the culture of the associated garden. As part of my association with Tom, he asked me to contribute my ideas towards the Australian seating area, which had not been constructed. I was thrilled to be asked, and suggested a bush campsite setting. I am following this up for Tom, and will be sending some photos and sketches as reference materials.

Tom and I discussed a range of problems associated with public gardens, signs, theft, vermin (rabbits vs. deer) pest control, mulch, irrigation, lawn areas, and special plants to name just a few. It was exciting to speak with some one so knowledgeable who was on the same 'wavelength' it was a thoroughly enjoyable time. Tom was leaving for a tour of the Western Australian wildflowers run by the Pacific Horticulturalists Society in September.

Mallows and succulents both have their place at Leaning Pine

San Luis Obispo Botanic Gardens

On the warm windy afternoon of Friday August 22nd I had they joy of meeting Gabby and Ken Levine. Both retired veterinarians, they are docents (talented volunteers) at the new San Luis Obispo Botanic Gardens.

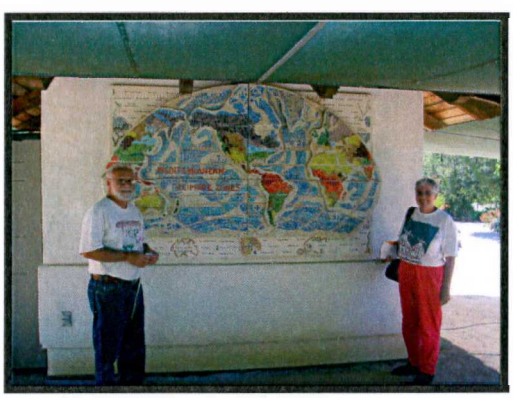
San Luis Obispo preview garden

These enthusiastic gardeners showed me around the one-acre preview garden located in El Chorro Regional Park about 7kms from SLO. Once again the garden is divided into five bio-geographic zones corresponding to the world's five mediterranean climate regions, California, Chile, the Mediterranean Basin, Western and South Australia, and South Africa. The collection from Chile is smaller but these plants are hard to source and would not be readily available to home gardeners.

The SLOBG is only in its infancy. One acre has been planted while there are both plans and space for further development on the 150 acres, which rise above the preview garden. *'The future garden will include a visitors' centre, educational facilities, a green house complex, a large amphitheatre, and about 125 acres of plantings. The garden will provide the opportunity to educate visitors about the ecological, historical, and landscaping value of these mediterranean plants.*

Numerous docents magnificently support the present preview garden in many, varied ways. They provide educational workshops about the plants accompanied by ethnobotanical studies of the local species used by the Chumash tribe in California. In the preview garden there was a grass dwelling constructed, surrounded with plants used by the tribe.

Gabby and Ken Levine beside a Chumash style dwelling.



Mediterranean areas highlighted on a mosaic.

Stunning *Crocosima* in full bloom

Propagation of seeds and cuttings and the growing on and sales of plants are all done onsite. One challenge in the polyhouse is to keep the mice from eating the newly germinated seedlings. This is tackled with the use of a mouse deterrent noisemaker, which rattles along as we chat. Gabby has dealt with the problem of labeling plants correctly by creating adhesive labels of plant names, botanical and common, which go onto small plastic tags inserted into the potting mix of a plant.

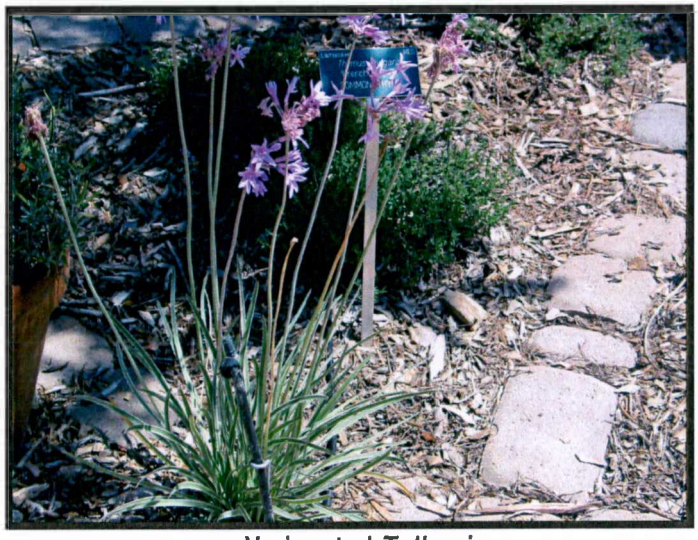
Some colourful water wise flowers at SLOBG

While they both spend their Wednesday in propagation activities, Ken also takes classes of visiting school children and other groups for the educational program. Other current events include 'Saturday at the Garden', a monthly program of tours, lectures, demonstrations, plant and garden shop sales. This happens from April through to November (during the growing season).
In May an annual Garden Festival attracts gardeners, (taxi drivers) families and craft people from a large region. Food, music, craft, family activities, and especially a large plant sale catch the attention of a broad range of the community. Funds raised from these activities are important in the survival and growth of the garden.

The gardens' future plans are well underway. The master plan for the garden has already won a design award. Apart from the main plant collections there are plans for a battery-operated tram to take visitors along the loops of garden path. A large amphitheatre suitable for weddings and concerts will be located within a protected SE facing slope. Education and Research will take place in a building located near the Visitors Centre. Here there will be laboratories, classrooms, a library, an herbarium, and administrative offices. Many more features are previewed in the printed information.

This sort of forward thinking and planning is invaluable information for the Australian Inland Botanic Gardens located just over the river from Mildura, in NSW. I have since been elected to the board of the AIBG and look forward to using this information where it is needed at the AIBG.

Aloes and *Lampranthus* enjoy the hot, dry, summer.



Variegated *Tulbagia*

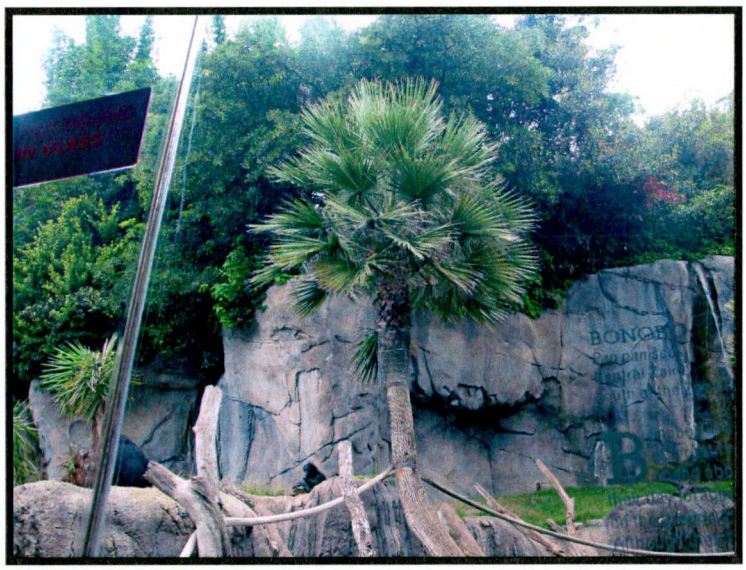
San Diego

Very humid conditions greeted me in San Diego, but it could not overshadow the amazing, world famous San Diego Zoo. My host and guide Judy Woods had the incredible history of a recent holiday in Mildura!

A large Ficus recently transplanted by horticulturalists at the San Diego Zoo.

Horticulture in the setting of a zoo is one of the most challenging and skillful occupations. The focus of the animals as a showpiece relegates the intelligent plantings and designs to a backdrop, yet their maintenance is surely one of the most difficult in the world of horticulture.

Very few landscapers have to cope with clever, quick, hungry, herbivorous garden visitors 24 hours a day. Not only that, some of these residents weigh over a ton and are stronger than several men combined. Considering this as a major part of the gardener's brief, the horticulturalists at the San Diego Zoo are true magicians.



Monkeys play havoc with donated palms; subtle protection of plants is a key to their survival.

The zoo is recognised as a botanic garden because of the collections of *Aloes, Erythrinas* and *Eucalyptus* (approximately 60 species) among others. The Eucalypts are suffering from an invasion of leaf sucking lerp insects. With no natural predators, this has become a serious problem.

A 'Sausage tree' is an unusual addition to the Zoo Gardens.

Judy Woods my guide at the San Diego Zoo. A bamboo screen in the background is one of many which separate people, paths and animals. These Same plants can be seen in both photos doing their screening from either side.

A 17-acre browsing farm provides fresh food daily to the Zoo. Some of this material is also exported to zoos overseas (imagine trying to grow *Ficus,* or *Eucalyptus* suitable for Koalas in Nth Scotland!). Contracted workers also cut fodder from zoo plants on a daily basis. The Wild Animal Zoo located not far from San Diego, is dependant on both the browsing farm for food, and the Zoo for financial support. So the financial commitment is a big one for the San Diego Zoo.
Plants are used for many tasks in the Zoo. Screening is a really important feature, this creates the feeling of space and separation from exhibits, which are actually very close, but meant to be viewed from a different perspective. It screens animals from each other as well as people.

Using the right plants, those that are indigenous to the place of origin of the animal, creates habitat. This solves several dilemmas. The environment is changed to suit the animal, the exhibit is realistic, and conditions, which are imposed to suit the animal, also suit the plants.
But providing these plants can be difficult due to their source and because they are costly to maintain, often because the animals feed on them too.
The Zoo has its own nursery constantly growing replacement plants. It also supplements the browsing farm.
Other difficulties faced by the horticulturalists involve the changing face of the Zoo. As with Australian zoos the San Diego Zoo is moving towards a more animal friendly environment. Their new gorilla exhibit is a classic example where the clever use of layered landscaping gives the impression of a much larger exhibit beyond the initial viewing area.

A privacy area for primates improves their health and well being. The gorilla exhibit immediately reminds me of the Melbourne exhibit. In fact consultants from the Melbourne and Taronga Park Zoos were involved in the Gorilla exhibit development in San Diego, and Paul Grimes from Melbourne Zoo was visiting the San Diego Zoo during the same week. While gorillas can be seen through the glass at the front of their enclosure, the area behind appears to go on for ever. A privacy area for primates improves their health and well being.

Imaging the challenge of installing sprinklers into the Gorilla compound (even without the gorillas there) they are very intelligent animals that would investigate any changes to their environment as soon as they arrive. Even hidden/popup sprinklers are quickly dismantled.
In fact puzzles and challenges are placed in the compounds regularly to stimulate the animals, so this was just another test for the gorillas. Sprinklers are just another challenge for them.
Concrete enclosed, plant camouflaged pop up sprinklers are the solution at the moment, but only until the gorillas decide differently.

Irrigation is slowly being refitted to dripline and microsprays, with all new plantings on these emitters. Older style irrigation systems still exist in a large proportion of the zoo. But the move to new technology is a significant one. Bubblers are also installed on any new or relocated trees. Very close to the entrance is one such tree, which has been moved to accommodate a change in the exhibits and some major hard landscaping and construction of a new focus area that will be carried out by contractors. Undertaking such a large tree transplant is very difficult in a space where members of the public visit in large numbers daily. Much of the reconstruction has been held over until the autumn when numbers drop off considerably. The tree is doing well.

Sometimes the plants themselves create the problem when it comes to irrigation. The extensive use of the *Ficus* genus in displays means that the irrigation is often squeezed into failure by a vigorous fig! Maintenance in such a huge area, with limited time in an animal free enclosure means the horticulturalists are truly challenged.

Plants are used as barriers for people too they can safely separate paths from roads.

Elephants enjoy ripping trees and bark to shreds as they do in their natural environment. This takes a high toll on the trees in their enclosure, but is very important for the elephants' well being.

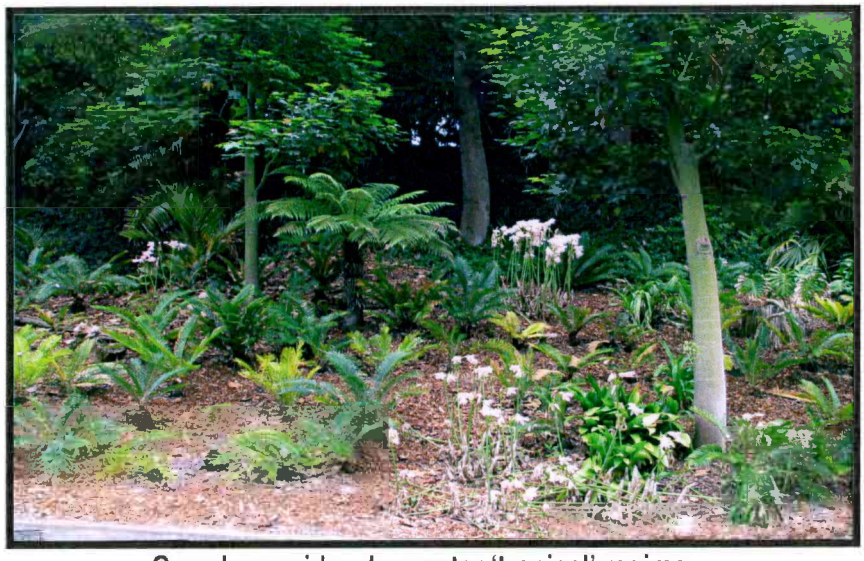
A stunning *Spathodea campanulata*
African tulip tree

Mulch is an important part of the Zoo's philosophy. It is regularly replenished and instrumental in the conservation of water, as well as aesthetically pleasing.

Water is a very expensive part of the Zoo's budget. Proposals have been made towards reducing the water use of the zoo by 30% but although Judy recognises this would be a beneficial outcome, she acknowledges that the staff is already very busy and unlikely to find the time to do an audit right now. There is also the problem of the historical mix of irrigation systems, controllers and emitters that really should be uniform to enable efficient scheduling and improve reliability.

In March and April each year the zoo has a garden celebration. This involves celebration of spring, with garden tours, both on the huge double decker buses and walking tours with the horticultural staff. Book signings are part of the celebration; Kathy Puplava (who I met the next day) signed her book *Trees and Gardens of Balboa Park.*

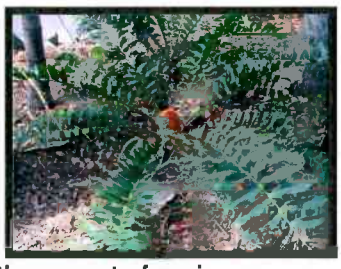
I was happy to be able to contribute to the planning of a garden bed that needed restoration. The gardener in charge asked me about my experience with waterwise plants, and I gave him a copy of the brochures I developed for the Lower Murray Water Waterwise Garden. The brochures contain over 1000 species used in several styles of garden created in 2002.



Cycads provide a low water 'tropical' regime.

Cycads are a special part of the plant display at the Zoo. A particular favorite of one of the leading gardeners, there is a considerable range and collection, including Australian examples. Our use of Cycads has really only just begun in recent years as they became more available to the public. They are very useful low water use plants, which give the appearance of a tropical environment. I will try to establish a bigger range of species for use in landscaping.
Judy Woods was a delightful, enthusiastic and knowledgeable host. I thoroughly enjoyed our time together. It is no wonder that the San Diego Zoo is such an exemplar with staff like Judy.





A range of Cycads and a very believable mock tree complete with concrete fungi.

A rock garden with low water use plants divides the landscape and screens another enclosure.

Balboa Park

Balboa Park Horticulturalist Kathy Puplava was my host for today. Kathy's devotion to her job meant a long commute daily, but she gladly did this for the opportunity to work in one of the premier parks of the USA.

Balboa Park was first established in 1868 as a 1400 acre parcel known as City Park. During its history the park was renamed Balboa Park after the first Spanish explorer to see the Pacific Ocean. A number of events, such as the 1915 Panama-California Exposition, to commemorate the opening of the Panama Canal, in 1935 the California Pacific International Exposition, and the Second World War caused the construction of a several buildings, which are now used as museums and cultural venues. Some of these older buildings are constructed with lathe, plaster and horse hair. They were meant to be temporary but many have been restored or reinforced to maintain their integrity. The military hospital established during WWII has been expanded and still exists within the Park's boundary.

Many acres within the park's now 1000acre allotment is independent of the Park control. This includes the San Diego Zoo. The remaining area comprises urban space gardens, a native coastal strip of natural, original sage scrub (100 acres). A mix of areas used for sporting activities, soccer baseball etc. There are also style or plant specific gardens: a rose garden, a desert garden, The Japanese Friendship Garden, and a garden planted with 'Trees for Health'. The nursery also uses some area of the park, on the site of an old landfill.

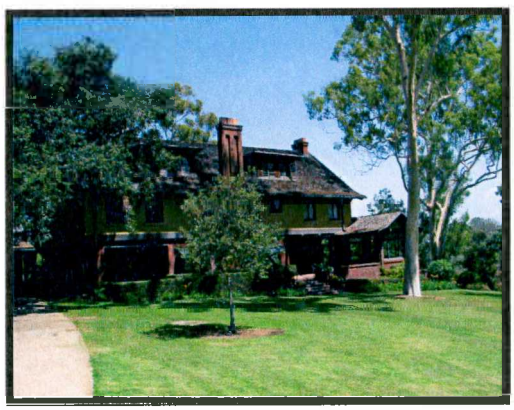
Kathy took me on an extensive tour of the park, focusing on the trees (her specialty) and plants for dry gardens. She has co-authored a book *Trees and Gardens of Balboa Park* and graciously gave me a copy. The Marston House Garden was the original house of Anna Gunn Marston and her husband. She was part of the team and funded the first master plan for Balboa Park.

The house has a formal garden which doubles as a venue for weddings. It has more than 600 blooming annuals and perennials, and provides some income to Balboa Park in hire fees.
The Alcazar garden redesigned in 1935 is based on Alcazar Castle in Seville. Box wood hedges surround a yearly planting of over 7,500 annuals and perennials.

The Botanical Building is a novel conservatory because its wooden and steel framework is not covered by glass, or any other material. The air is free to move between the slats. The original glassed area was too hot to maintain plants in the San Diego climate. It has been recently fitted with misting jets. These have improved the health of the plants and their resistance to disease. The lotus and water lily garden is the most photographed view in the park.

We visited the nursery. Due to its location on top of an old land fill the nursery road recently subsided several metres and there is a methane burner to cope with excess gas, which seeps out of the ground daily. People often donate collections to the gardens. Sometimes they are a part of a deceased estate, or in the case of this cactus collection, they were coming between a collector and his wife! So he gave them to the gardens. Such a collection needs to be treated carefully; each one of these cacti is a different species. Another collector may hear or see them planted in the dry garden and decide they would go well in their own private collection.

Steel and lathe was used to construct this conservatory. Many buildings were built for the 1935 expo. The Lotus pool.



Marston House with lemon scented gums, a formal rear garden for weddings.

The Alcazar Garden

Kathy Puplava and the formal Alcazar Garden.

The Lotus Pool and Botanical building.

In times of low water availability (California imports 90% of its water) the Park concentrates on its tree collection. Lawn areas are decreased where it is practical and mulch spread under trees. Irrigation of the lawn is on a different schedule to the trees and the lawn is allowed to die if necessary, but here the trees are a priority. Kathy has a vested interest in the trees; she sees them as a really valuable asset and has put many hours into their well being. Trees are like antiques, the older they get the more priceless they become. Kathy showed me a lot of these magnificent treasures and gave me a copy of her terrific book, *Trees and Gardens of Balboa Park.*

A magnificent specimen of *Ficus nitida.*

As with all government funded facilities Balboa Park has many stakeholders. The City of San Diego wants the park to look at its best at all times. For many people this means a large display of annuals, generally Balboa Park plants 15,000 annuals a year. It is a premier tourist destination and brings visitors and income into the city. I was in San Diego for Labour Day and the population swelled by 800,000 people. Accommodation was booked out across the city. Of course the management of the park can't always provide what the City wants in the face of budget cuts and water restrictions. A tax imposed on tourists as they stay in local accommodation goes towards the maintenance of the garden.

Horticulturalists understand that not all gardening is roses! It is a challenge to meet the needs of the City, the people, and the garden harmoniously.
Clever horticultural ideas were an essential part of keeping the garden looking good. Here the road appears to be planted with the same palms either side. But even within such a short distance the microclimate is significantly different with one side being hotter drier and sunnier than the other. Instead two species of very similar looking palms were planted each with different climate needs. Both do very well on their own side of the street.

Clever planting gives comfortable consistency in the streetscape.

Desert garden Nursery

Donated collection of Cacti

The desert garden was established in 1976. It has over 1400 plants in its 2.5 acres. Xeriphytic plants from all over the world are located here. Kathy is a great ambassador for her Park. She showed me the beauty and the challenges with the enthusiasm of a committed manager. I enjoyed her company thoroughly and I'm very grateful for her time and efforts on my behalf.

Cuyamaca College

Cuyamaca College is located 20 kms east of San Diego in the suburb of El Cajon. Brad Munroe is head of the Department of Ornamental Horticulture. The College offers a broad range of subjects in horticulture form arboriculture to xeriscape gardening. It has extensive grounds including a retail nursery with glass and shade houses, a plant identification garden, a BBQ and entertaining area, a tree lot for advanced trees, an irrigation testing area, and a floriculture compound.

Brad has been at Cuyamaca for several years, in that time he has made extensive improvements to the Ornamental Horticulture Department, both in educational innovations and building up the department to a very successful, thriving facility, with many opportunities for students.
Brad also suggested (way back in March) I meet with two of his colleagues in Las Vegas and both proved to be very useful contacts.

Probably the most exciting venture for Brad over the last six years has been the development and construction of The Water Conservation Garden at Cuyamaca College.
The Water Conservation Garden is a joint effort funded by the Cuyamaca College, which gave the 4.2 acres as their contribution, and the financial support of the Helix and Otay Water Districts. Other organisations have since joined in the job of funding maintenance and wages at the garden.

I went through the garden with Steve Maranaho, an ex student of Cuyamaca, has been employed as the garden manager. He works with another full time gardener on maintenance and has been employed since the first sod was turned. Steve knows the garden in detail and I was lucky enough to have him as my guide.
The garden has the wonderful combination of art and education, with several whimsical structures related to the aims of the garden. This of course is the advantage of a three million dollar budget. Clear descriptive signs are a regular feature throughout the garden with a range of information at each.

The entrance to the garden is a stark concrete area, which represents the land without water. I've got to say that I was not impressed with the entrance at first. It had an impact but was too subtle for me to see it was to contrast the options of if we do nothing vs. if we do.

There is no water flowing out of the pipe and the concrete pipe has a very effective mister at its mouth. It is important to know that 90% of the water used in California is imported from other states.

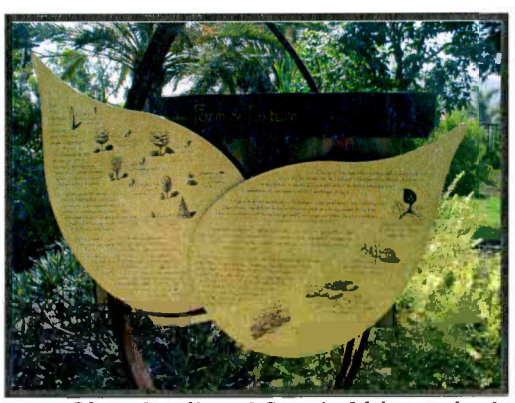
A range of clear descriptive signs is a regular feature and an expensive one. They contain a lot of information in a small space and are very informative
The sign on design has information on Balance, symmetry, textures, focal points, proportion, privacy, views, screens, physical barriers, climate control, and erosion control.
More information is found on these topics as you move through the garden.

The Water Conservation Garden.

Garden entrance; no water, no plants.

Robust, informative and clear, the garden's signs are excellent.

The plants are mostly from the five areas of Mediterranean climate in the world; Australian plants, some from the Mediterranean basin, Chile, California and South Africa. Plants from these areas were the most used in the gardens I visited, although Chilean plants were difficult to source.



Sign detail and South African plants with the security fence and wide path.

The garden was totally fenced and locked outside hours with cameras, security personal and lighting. Having constructed gardens in public spaces I can really appreciate the cost of fencing and that of not fencing. Some times it is more expensive not to fence.

This *Meterosideros*, which appears to be nearly planted, has been in this bottomless pot for 4 years. In truth the bottom has been cut off the pot and the tree is watered from two drippers under the plant. I loved this. The great news about these gardens is that you can steal every idea there and there's no copyright, in fact you are encouraged to take and use these ideas

Not quite as it seems, this tree has been 'planted' for 4 years.

The mulch displayed showed a variety of mulch types, with or without weed mat. And they were available as a touch and see in the concrete bins.

Mulch display and bins.

Mulch contrasts used as a design tool.

A variety of mulches was used in the display .Here standard crepe myrtles contrast with *Phormium species* each with mulch of its own. Some plants were not from the Mediterranean areas but used for their own special characteristics.

This simply and cleverly displays the difference between having a ground cover (or not) as a weed suppressant.

A soil profile through Perspex sheets.

Other signs, which add to the information at the design station, give ideas about climate control for your house, car, and different aspects of the garden.
Information in another display relates to balance; it takes a look at combinations of plant heights and how they work or not with each other.
There are other examples of weed suppression tools in the bins. Burlap, Weed mat etc.
For all those people who have dug a hole and coerced students into it to see the profile, this display was the answer to a lot of hard work. Unfortunately the individual highlights weren't priced separately and I don't know what it cost, but I really think this one is excellent and plan to use it . And the soil profile is complimented by the *Pennisetum seticeum* 'Rubrum' which is used extensively through out the state as a landscape plant.

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Often one of our least efficient areas as far as water is concerned is the vegetable garden. The main problem often being that we water everything but the veggies. This problem was solved using inline drip hose instead of sprinklers.
A range of clear descriptive signs is a regular feature and an expensive one. They contain a lot of information in a small space and are very informative

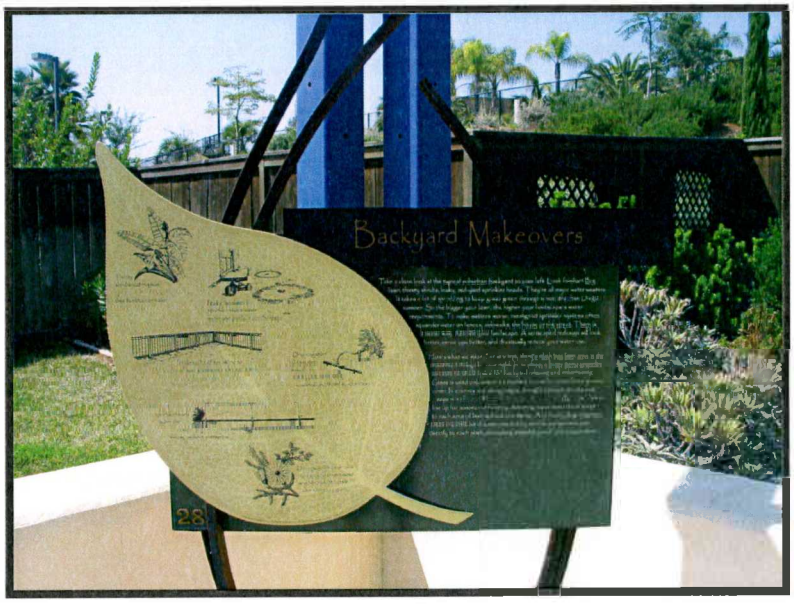
The sign on design has information on Balance, symmetry, textures, focal points, proportion, privacy, views, screens, physical barriers, climate control, and erosion control. More information is found on these topics as you move through the garden.

Set inside a "pretend" house with a frame, door and fake windows is the make over site. There are so many of these auto fix it gardens have great designs which have a major need for maintenance or a total disregard for the Kikuyu they planted over! Here design hints point out ideas before you get started, highlighting the problems in the before garden. There was poorly spaced irrigation with variation in sprinkler heads, which needed adjusting and aligning.

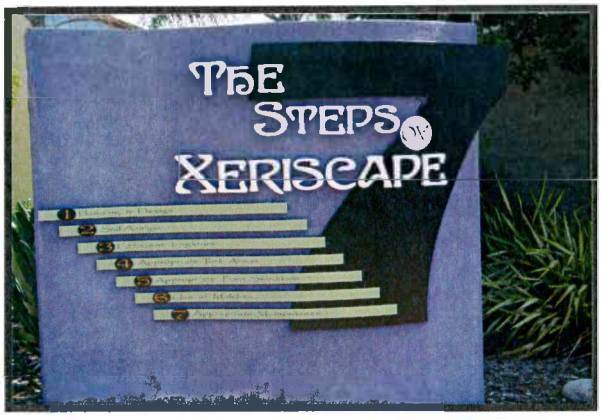
The unattractive before garden has water thirsty plants, a large proportion of lawn, a barren boring landscape, rings of green in the grass, and basically unattractive.
The make over garden is the same size and uses 50% less water. A range of waterwise plants, less lawn, mulch, and a drip irrigation system transforms the view and provides a much more attractive picture out the window.

Before the makeover....

And after.



With instructions on how to go about it.



The seven steps to Xeriscaping are:
Planning and Design
Soil analysis
Efficient Irrigation
Appropriate turf areas
Appropriate Plant selection
Use of Mulches
Appropriate Maintenance

A large display showed a range of grass types which were used as lawns and the amount of water each received over the month. It indicated the way the grasses respond to a range of water regimes and suggests what you might be happy with. i.e. a lawn that will recover at the end of a dry season or a green one with a higher water bill year round. And while there are people prepared to live with the yellow lawn, there are mixed messages being delivered in California. In some water districts, the water providers are encouraging their customers to reduce their lawn area by actually paying them to do so. The Atascadero water district visits a home to advice on irrigation and design. Then the adviser returns when the garden has been completed and pays the owner per square foot for the lawn reduction. All of these services are free.

On the other hand there are areas where neighborhood groups will send home owners a 'notification of fault' because their lawn is not green, and they have to comply with the local corporate rules.

The garden did have a cactus area, which would suit some people, but this is extreme option and although fairly fashionable at the moment, it could be due to its fashion that it is perhaps less likely to remain or even to appeal to the average gardener.

A range of ground covers, including Cape weed were displayed for use. Also a variety of pavers, bricks, pressed and plain concrete.

I really enjoyed the artwork in the garden and the old irrigation tools were no exception, while I appreciated it, I was concerned that it might boggle a few visitors who didn't recognise it as artwork.

While the garden at Cuyamaca was extraordinarily expensive, it was thoroughly useful for me. It is a place where you can walk in and 'steal' any idea you wish, without repercussions, and then take it home and do a cheaper and maybe even better version.

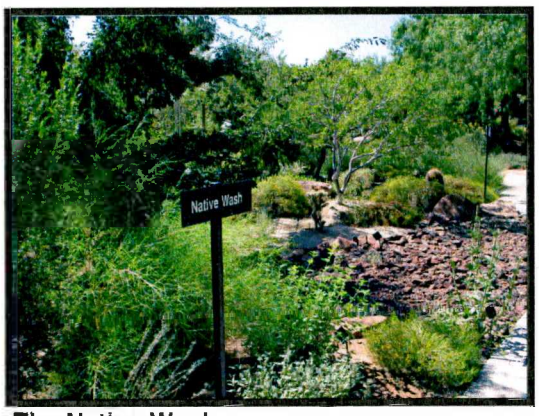
Some whimsical art work at 'The Garden'

The amphitheatre is much cooler when the seats are interplanted with shrubs rather than concrete.

The Demonstration desert Gardens at the Las Vegas Springs Preserve

Denise McConnell works for the Las Vegas Valley water district. She is the education officer at the Desert Demonstration Garden.

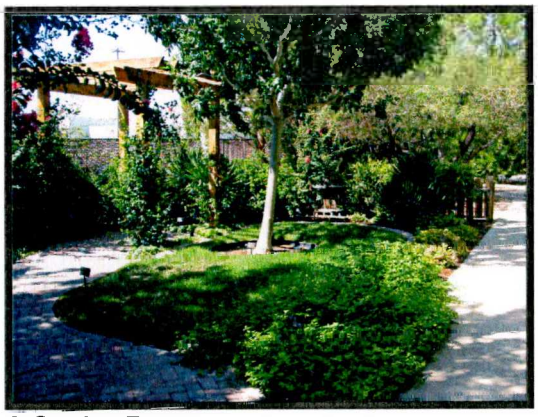
The garden is a show piece of possibilities for gardeners in dry areas. It includes turf plots where the water schedule needs for each type is highlighted, showing some using 30% more water in the same conditions. A native wash, which reproduces a typical scene in the Nevada indigenous desert area, is enhanced by the maturity of the plants, giving shade and dappled light. The various levels fashioned in the garden create a realistic, harmonious scene.



The Native Wash

More features include a vegetable and fruit garden, with a bountiful grape vine arbour. A compost demonstration area is located nearby.

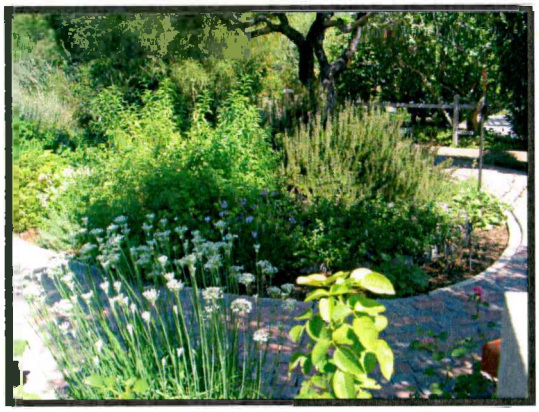
Native Wash

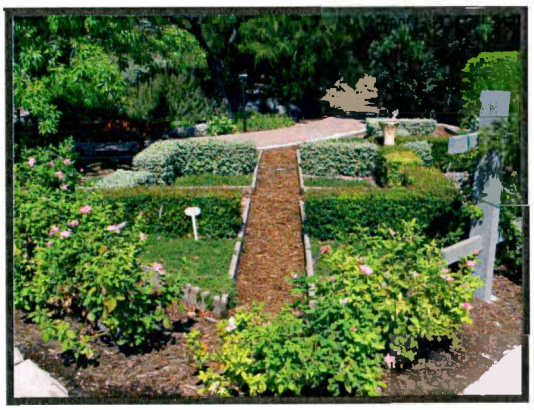


A Garden Room

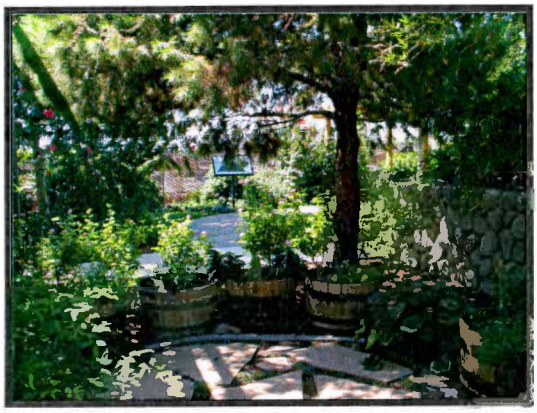
A series of suggested 'back yards' help the novice gardener to select a package of plants which go together well. Suggestions for hard landscaping finish off the garden professionally. Wood, paving or concrete structures add variety and strength. The maturity of the plants gives the visitor a realistic idea of what their garden would look like in the future given the appropriate distance between plants.

Several herb area designs give gardeners plenty of options. There is a formal setting and a more relaxed design, each suits a different range of plants.





There is also a Japanese style garden. Clear, easy to read signs make plant recognition and selection easier. And for those with limited gardening space there is even a potted garden.



A small potted garden

The amphitheatre

Stone walls, crazy paving and crusher dust paths add to the myriad of textures. An amphitheatre with wooden benches and shade cloth make a pleasant setting for outdoor classes.
Removing excess areas of thirsty lawn is a theme that continues throughout the gardens.

Classes run through out the year in a well equipped classroom, or at suitable sites through the garden. The classes of up to 55 people are free because it is subsidized by the wealthy water provider, Las Vegas Valley Water District. There are also many volunteer teachers which helps keep the price down. She runs mid week or evening classes as well as weekends to reach a range of people.

The classroom

With Sue Jerrems and Linn Mills

Hundreds of people take a range of courses. Linn Mills a well known author is also on the team. Linn gave me a signed copy of his book *"Nevada gardener's guide"*.

Clear labels make plant identification easy.

In the garden there was a range of ecosystems, not labeled as such, but distinct. I really liked it because it had many different levels of plants and also quite a bit of dappled shade. The canopy wasn't very tall but it was nicely undulating and with rocks in the path and a dry creek bed. Irrigation was drip and inline was use where possible.
There was an area which recommended we ...PULL OUT THE GRASS,NOT THE TREES!

Here inline dripper line skirted the trees to reach the root zone. The suggestion was to try to replace the grass with an alternate understorey or rocks, or both.
It was an excellent demonstration garden which included useable ideas for the average garden.

A new, much larger garden and historical centre will open over the road from the present site. It will be called Las Vegas Springs Preserve and will include information on the native people and settlement of the area by Europeans.

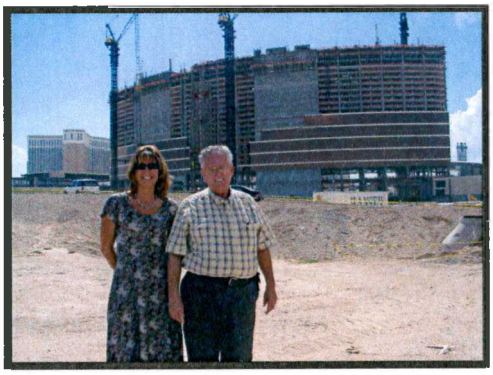
Wynn resorts at Las Vegas

Jim Gibbons is the head Horticulturalist for Wynn Resorts. Steve Wynn, head of the Wynn Company is building a multibillion casino/hotel on the site in Las Vegas, as well as the total reconstruction of an eighteen-hole golf course. Steve Wynn is a visionary who also happens to be extremely wealthy. He has many original and exciting ideas for landscaping and gardening which Jim and his assistant Teresa must turn in to a finished product. The pair have to overcome design and practical problems to find the solution, fortunately they have unlimited funds to make this happen.
Jim and Teresa previously worked as a team to install and maintain the displays at both the Bellagio and Mirage Casinos in Las Vegas, also Wynn projects. At this current construction site they have 30 acres of landscaping and a further 120 acres of golf course to complete.
Their next project is in Macau, China.

The new hotel/casino in Las Vegas involved ripping up an 18-hole golf course and totally reconstructing it. Where it was once flat there are now hills, valleys, rivers, and lakes. The course has been designed so players cannot see surrounding buildings as they play to give them the feeling of being at a secluded site, quite a challenge as some of these buildings are over forty stories high.

Twelve hundred trees from the original golf course have been lifted using the big and little "spades". Small spade trees are put into wire baskets 3m across and then into huge wooden pots. These were being hand watered as I drove around the site.

The larger trees, lifted by the 6m (diameter) spade have their root ball wrapped in clear plastic wrap and the bottom and sides under the wrap are covered with a fibrous sheet made from coconuts.
A further 6,000 mature trees, will be planted. They ship the trees from all over the country, mostly California.
Mature palms are used especially due to their relatively small root ball and they transport well. Jim and Teresa have, in the past, offered to remove palms from people's yards. At no cost to the owner!!!! These trees can be worth several hundred dollars each.



Jim and Teresa in front of the casino showing 26 of 56 storeys built.

No expense spared as test waterfalls find the best surface for water ripples.

Thousands of cubic metres of soil have been moved.

A new lake is born.

Small spade! Only 3m diameter.

Lifted trees are hand watered.

The large spade with 6m diameter moves enormous trees.

The front of the hotel faces towards the famous Las Vegas strip, Sunset Boulevarde and there is a building over the road known as the "spaceship". It is a shopping mall with futuristic styling, made out of silver materials. The team at Wynn doesn't like the look of it, so they plan to build a 50 m high 'mountain' with trees all over it to block the view. They aim to terrace the hill and place the trees in huge planters.
Other features of the complex will include roof gardens, many with huge planters that can be shifted by a crane overnight to replace a landscape / style/ celebration .e.g. 4th July or Christmas theme.

1200 trees await replanting.

At Wynn resorts, money is no object and water wise gardening is a totally laughable concept. The whole aim is to attract high flyers to spend their money gambling, for them there is no

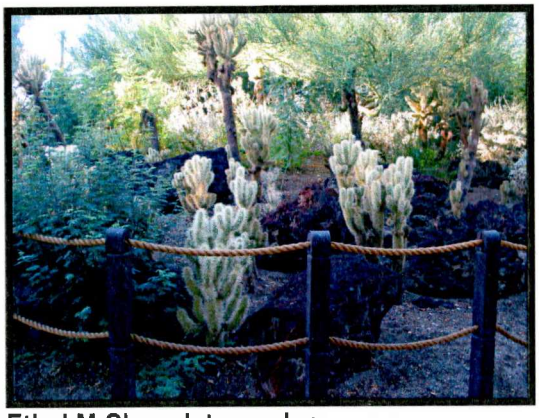
accommodation expense as they relax in the Villas each with their own private roof garden. But they might spend $3 million in a week or weekend at the casino.
The people of Las Vegas fight an uphill battle to control water use when there are wealthy people and businesses developing landscapes with huge water needs. The average citizen experience water restrictions like ours, with watering only available on certain days of the week. But the Wynn Resorts and others like it seem to have a law unto to themselves.

South west Trees and Turf

I made contact with Helen Stone through Brad Munro at Cuyamaca College. She was a past student and had worked for several horticultural publications before finally starting her own "South west trees and Turf". Helen took me to see her friend Alice Bolton who ran the nursery for Lake Mead National Park. Here new plants are grown to revegetate the national park. Alice also fills contracts outside the national park to keep her staff employed year round and to maintain the size of the nursery.
The nursery assistants are usually interns paid by another body eg conservation groups.
The publication South West Trees and Turf is published monthly and provides information on a range of subjects. It is influenced by local trends, such as the current fashion for water features in a home garden. But it also tries to be a voice for water and land conservation in the district.

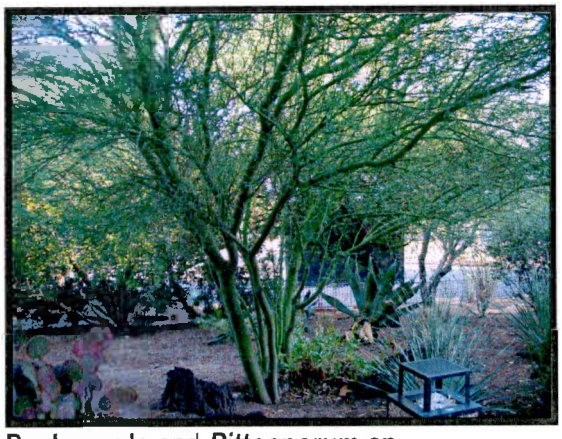
Sue Jerrems

I met Sue Jerrems at the IRTC classes on auditing. Sue works for the North Las Vegas council as a gardener and had come to do the course as part of her professional development. We arranged to meet again when I arrived in Las Vegas.



Ethel M Chocolate garden

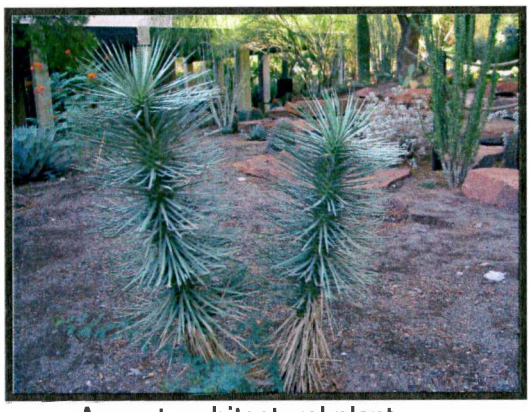
Sue took me to the Ethel M Chocolate Garden. It was a desert demonstration garden with really dry plants, many of which were cacti and may not appeal to many people. But it did have some great plants. Plants which should be watered VERY little or not at all in summer. The native plants of Nevada and California are adapted to survive in hot dry summers, watering them during that time can kill them!



Paolo verde and ***Pittosporum sp.***

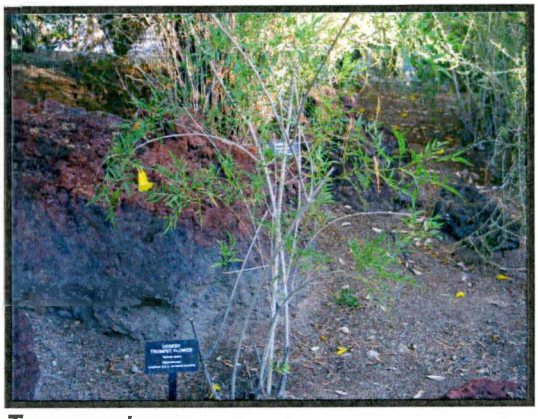
Plants I felt would be useful for landscaping in Australia if they are available would be 'Paolo verde', 'Baja Fairy', the great Saguaro as an architectural plant, as well as being very unusual it could be used as a divider or as a 'mean' hedge or even as part of a piece of art work. The garden contained several Australian plants including one beautiful Pittosporum which I hadn't seen before and quaint, furry local cactus called rabbit ears.

A 'Texas Ranger *Leucophyllum frutescens*



A great architectural plant

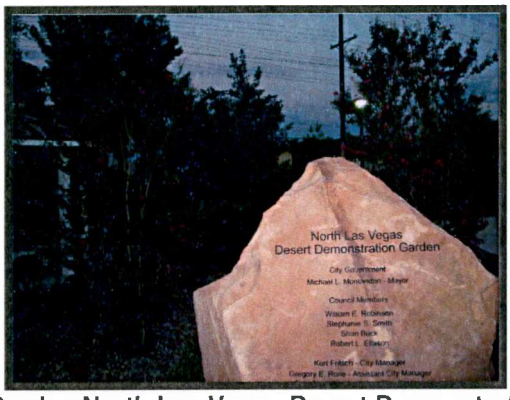
Sue took me to her pride and joy, a demonstration garden in North Las Vegas. It had been planted very recently and was not quite established. Due to the proverbial red tape it had been built in a 2 weeks in really hot weather which resulted inevitably in some deaths.
Plants which featured were 'Texas rangers' and cultivars of Baja Fairy. Also desert willow with many cultivar colours available and also yellow trumpet flowering *Tecoma stans* .



Tecoma stans

Sue uses bubblers attached to PVC.

Due to continual vandalism Sue doesn't like to use poly pipe, she prefers PVC with flexible joints to bubblers.



Sue's Garden North Las Vegas Desert Demonstration Garden

The Opportunity

To have the opportunity of visiting several people and organisations that have spent many years and literally millions of dollars researching and implementing ways of saving water was nothing short of overwhelming and for this I am extremely grateful.

Australia is renowned for its arid landscape, and whilst some of our settlements occur in wetter conditions, with population growth and the increasing water use that accompanies it, we need to use our water resources more wisely in any climate zone.
After fishing, gardening is the most common recreation amongst Australians. It is a hobby that creates beauty, satisfaction, well being, involves physical activity, and social interaction. So as an activity it renders many benefits for its participants, and to society as a whole.
It is important that we continue reap the benefits of gardening. As we are an aging population and more people will take up this pastime, we must be able to provide to gardeners, both professional and recreational, the information that can help them cut their water use substantially, while still enjoying their activity.
This is the information that I have gathered, many years of work by other people, who are only too pleased to share their findings.
Whilst the information I've gathered is not exhaustive, it is realistic and useable. It would be costly and irresponsible not to use this information to save significant amounts of water across the state.

The solution

The principles of Xeriscape or Water wise gardening are a good summary of practices which can decrease our use of water in the garden.

1. Sound Planning and Design

Planning and design helps to put plants of equal water needs together. If this doesn't happen, a single plant with greater water needs could determine the watering time for a particular bed, one that is unnecessary. Choosing a theme garden such as a Mediterranean poolside or patio area, a native garden, or a striking desert grass landscape will ensure that plants with similar water needs will be planted together.

Planting which improves the house climate. A deciduous row of plants on the northern side of the house can help it remain cooler in summer and allow sun through in winter. This technique can also be used to protect cars, swimming pools or children's play areas.

When renovating an existing garden, you have the benefit of having some mature plants as a basis to your planting. Water hungry plants can be replaced with more water wise options.
Colour and texture are considered, along with hard landscaping components. Just because the garden is saving water it doesn't mean you can't bring your own individual style and taste into the garden. Seasons for blooming, year round colour, or times of foliage dominance are all considered.

Needs and wants in the garden, such as entertaining area, play areas, bird or wildlife habitats, screening plants, hedges or barriers can all be included in the plan.

Other important design concepts include balance and scale. Are plants grouped in an eye pleasing natural way? Will the plants grow to suit proportions of the garden or surrounding buildings? Is one side of the garden dominant or has a balance been set?

Movement through the landscape such as pathways, entrances and exits, gates and walls all need to be placed. Slope, views and soil types need to be considered. And very importantly irrigation needs to be established to deliver water where it is needed accurately and efficiently.
Planning and design can save a lot of money, effort and time as well as water.

2. Appropriate turf areas.
It goes without saying that turf is a highly useful landscaping feature. It is best for sports and activity areas and should be planted for that purpose. But it requires more water than most other ground covers, and its irrigation is usually by spray which can lose a lot of water through evaporation and wind drift.
So; appropriate turf areas need to be considered. Use a water efficient grass. Install a suitable water system that waters evenly, and doesn't have overspray in ground irrigation such as inline tape could be used instead. In fact you can shape the grassed area to suit the sprinkler pattern.
If you are upgrading a garden make sure the irrigation system suits the new turf area.
Alternatively, you could plant a ground cover on a nature strip or under trees; these can give you a colour splash, or green, lush foliage without the water needs of grass.

3. Appropriate water-efficient plants.
Water efficient plants really are the basis for the water wise gardens. They include a range of plant types, perennials, trees, flowering plants, grasses, many of which even look tropical, but use a lot less water than their rainforest counterparts.
Grouping plants together so they have similar water needs is important. If you do have two or three higher water use plants, have them on the same watering schedule. Don't put them with lower water users which you would have to water to excess, just to suit the water hungry inhabitants.
Over watering drought tolerant plants is detrimental to their health, they can get diseases such as root rot, and collar rot. Water logging can be their downfall.
There are thousands of plants with low water needs imagination is the only limitation.

4. Irrigate efficiently
An efficient irrigation system, without leaks and well maintained can save considerably on water use in the garden. Firstly plants grouped with similar water needs can have a watering schedule delivered which suits them. Drip irrigation is highly recommended in this situation. It delivers water to the root zone of the plant, minimizing the loss through evaporation (sprays) and wind drift (sprays).
Lawns could be watered using overhead sprays or undersurface tapes or inline drip hose. My reluctance to use the subsurface drip is related to the dilute herbicide which is added to water to prevent root penetration of the hose. As technology advances, so will the likelihood of this system improving, with alternate ways of delivering water without the use of chemicals.
Lawns should be watered separately from other plants, their shape could coincide with the sprinkler delivery. Long narrow strips of lawn are harder to irrigate without over spraying and wastage, circular or circle sections are easier to irrigate more efficiently. Matched components are important to minimize over spraying and misting.

Drippers and sprays should not be on the same solenoid. They have different volume delivery and time requirements. Individual drippers can be added to as plants grow and have a greater water requirement. Some water supplies will need to be filtered. Using inline drip hose is another option especially around existing trees or where there are a lot of ground covers or flower beds.
Existing sprinklers can be converted to drip. A filter may need to be added, and flush out valves. More drippers can be added to a line, or another line added in.
Watering times and rates should alter, depending on the climate, season and specific weekly weather. Early morning watering decreases the evaporation rate and cuts down on fungal attacks as any wet foliage has a chance to dry off during the day.
Where possible a multi-program irrigation controller should be used this allows predetermined programmable times to be set for each solenoid station. These can be either reprogrammed or switched to 'rain saver' for temperature or precipitation changes or events.

5. Mulches

Often purchased by the cubic metre mulch is a worthy investment. It can be inorganic material such as rocks, pebbles, or crushed granite. It ties the landscape together, somehow visually attaching the garden to the house and the earth. Perhaps because our natural landscapes are strewn with leaf litter and bark and mulches mimic this appearance.
Organic mulches have the added attraction of contributing nutrients to the soil. Slowly decomposing to add nitrogen and other nutrients, they encourage soil fauna and flora which are needed for a healthy soil and healthy plants. Whilst spreading organic materials is a lot easier, it needs to be repeated as the decomposition takes place.
Mulches decrease evaporation from the soil, reduce weed growth, cut down on erosion and provide a cooler soil for the plants' roots. A 10 cm layer of mulch is a good depth. Irrigation laid under the mulch makes much more sense as the evaporation is less under the cool layer and the water is directed from the dripper onto the root ball.

6. Soil improvement

Sandy and clay soils can both be improved by the addition of organic material. For sandy soils it adds to the structure of the soils, and slows down the drainage as water moves quickly through the air spaces between the large sand grains. In clay soils organics material helps to break up the strongly bonded particles to improve drainage thus decreasing the chance of water logging. Only rarely does organic material have a negative effect. Some desert native cacti are not improved with its addition.
Other soil ameliorants include gypsum for breaking down clay, blood and bone, home made compost, manures, sand or loam. The pH of soil is another factor to recognise in the selection of plants, and while this can be altered to some extent it is easier in the long run to install plants which suit the conditions. There is a much better chance of success.

7. Maintenance.

No garden looks good after a time without maintenance. Low water use gardens can survive for longer without water from irrigation, but it still needs to be checked on a regular basis. Drippers need to be in the right place or they are inefficient. Sometimes they get clogged, or invaded by ants, or damaged by machinery and need to be replaced or flushed out.

Pruning, such as deadheading or pruning to shape needs to happen just like it does in a regular garden. So do fertilizing, harvesting, pest and disease control, and general plant care. Regular weed control needs to take place although this should be less with the use of decent, thick mulch.

These seven steps can be used as a basis for a booklet available to professional and hobby gardeners, as well as botanic gardens and city councils. An accompanying list of selected, water wise plants would be helpful , as well as a few photos or diagrams of suggested garden plans for guidance.

What Now?

After having met with such inspirational people and having the opportunity to see what they have done in California and Nevada, I feel it is time to act to educate Australians, living in areas where water is precious and rainfall is unreliable, about how we can use it more wisely.

There are a number of ways that this could be addressed.

- **Water wise demonstration gardens** could be planted in a variety of places such as Botanic Gardens – there are many throughout the state, Ballarat, Albury–Wodonga, St. Kilda and the Australian Inland Botanic Gardens (just over the river form Mildura) to name a few.
  These could be planted by local TAFE colleges or City Councils or by the body governing the particular botanic gardens. Or, they could be established by a separate governing body which could design and set up the garden, and then leave it in the hands of an education officer, and hopefully a local gardener who was part of the team which planted it. Local knowledge would be a useful additional tool to add to the construction.
  Where no local Botanic gardens exist city councils could make them part of their town plantings in parks or streetscapes. To this end I would like to write a booklet with guide lines which could be followed in establishing these areas.
  I could even visit local city councils and botanic gardens to give supplementary advice on local projects if it was required.

- **Garden Workshops**
  But the gardens would not be enough on their own.
  Several workshops and classes could be presented either as individual subjects or a series
  Drip irrigation workshops.
  Design your landscape.
  Using Solar screens.
  Designing with plants.
  Efficient irrigation.
  Irrigation maintenance.
  Plant selection.
  Lawns and their maintenance.
  The seven steps of Xeriscape.

Mulching
Landscape lighting,
Garden Art, just to name a few.

While the type of classes and demand would vary from location to location, other visitors may enjoy a tour of the garden by someone who has been part of its construction, and who has ownership. TAFE students, studying horticulture across the state would be great candidates for this role.
Courses like these are offered free of charge in Nevada.

- **Irrigation auditors**.
  City councils are very important purveyors of information. They can introduce ideas into the community by using best practise examples and promoting them to the public.
  There is a vast array of opportunities for local councils and water providers to promote wise water use. One especially effective tool is the use of garden irrigation auditors who visit and advise home gardeners on the use and efficiency of their irrigation system. This practice is used effectively in many of the districts I visited and it is offered free of charge for the relevant water users.
  Another method is to demonstrate these principles in their own gardens and to increase public awareness with publicity.

- **Brochures for rate payers** could be part of the plan to deliver waterwise information to the public.

- **Incentive schemes** for house holders to cut down on unused lawn areas could be adopted by councils or water providers. Before and after visits, with assistance in planning the changes to lawn area size could cut down on 'water down the drain'. Rebates of water bills are granted per square metre of lawn reduced.

- **Efficiency in industry**
  Nurseries use a large amount of water, and often not efficiently. Auditors from councils or water providers can be used to check water use and advise on how to be more efficient.

- **TAFE institutes**, in collaboration with local councils could offer courses to the public which improve home water use in the garden. This could also be extended to general home sustainability including using grey water in the garden, cutting energy use in the household, and encouraging styles of house construction which save large amounts of energy with small differences. I am constantly amazed that home builders continue to use gas or electric hot water in my home town when solar systems can provide free hot water for more than six months of the year.

- **The National Horticultural Training Package** does not contain a module specifically focused on waterwise or Xeriscape gardening. I would like to develop one to include in this nationally accredited training package.
  For serious water wise followers, qualified gardeners and unqualified mowing / gardening businesses a recognised TAFE course which gives the operator an equivalent to the five

ticks type standard could encourage those in industry to get up to date with best practice in waterwise information.
Irrigators, too, could be educated in the same way to improve the systems they install, and make an impact on the choices they offer clients when designing new garden systems.

- There is a great opportunity to pass this information on by implementing new modules in the National Training Package. This way there can be changes to techniques and practices straight away. Students and apprentices can pass this information on to their colleges and eventually their employees. This then has a flow on effect on a variety of industries; plant supplying nurseries will have to provide the plants which are in demand, irrigation part manufacturers, too, will need to improve on their products to suit the purpose.

- **State Level.** The state minister for water Mr. Thwaites has been encouraging the public to save water as our storage levels went down. This is an opportunity to encourage sensible water use at a sustainable level, to make the best of what water storage we have.

- **The Melbourne International Garden and Flower Show** would be a good venue to 'spread the word' about using less water in the garden. A demonstration low water use garden with associated brochures, pamphlets,
plant lists and samples, design tips etc. would reach a large number of gardeners.

- **Money savings.**
Finally for those who are influenced by savings, a way of showing gardeners what they could save in $$$ by making changes to their garden. This would vary from water district to the next, but could become a fixture on the water bill we all receive.

- **Coordinated Approach**
While there are many commendable and serious attempts to save water in Victoria, I suggest the need for a coordinated approach to ensure a sharing of vital information and a state wide effort to conserve our water and use it in an intelligent and sustainable manner.

With this knowledge we are able to make a difference to the way we use water. We have the ability and the technology, we now need to spread these skills to others who can use them and improve our efficiency of water use and management.

Wendy Hallinan at ISSF awards ceremony Government House.

Appendix

Plant list from Atascadero Mutual Water Co.
Plant List form Las Vegas Valley Demonstration Garden.
Certificate of achievement IRTC. Cal Poly

References

Books
Websites
Brochures
Newsletters

Water Smart Landscapes Program Plant List

Common Name	Genus	Species	Variety / Cultivar	Size (HxW)	Plant Coverage Value (Square Feet)
Plant Type: Cactus					
Beavertail Cactus	Opuntia	basilaris		1 x 4	13
Beehive Cactus	Coryphantha	vivipara	'var. bisbeena'	1 x 1	1
Black Spine Prickly Pear	Opuntia	violacea	'macrocentra'	3 x 4	13
Bunny Ears	Opuntia	microdasys		2 x 5	20
Common Pincushion Cactus	Coryphantha	vivipara		1 x 1	1
Compass Barrel	Ferocactus	acanthodes		5 x 2	3
Cow's Tongue/Angel's Wing	Opuntia	linguiformis		6 x 8	50
Diamond Cholla	Opuntia	ramosissima		5 x 5	20
Fishhook Barrel	Ferocactus	wislizenii		3 x 2	3
Fishhook Cactus	Mammillaria	tetrancistra		6 x 2	3
Golden Barrel Cactus	Echinocactus	grusonii		2 x 3	7
Indian Fig Prickly Pear	Opuntia	ficus-indica		15 x 10	79
Mojave Prickly Pear	Opuntia	phaeacantha		2 x 6	28
Old Man Cactus	Cephalocereus	senilis		2 x 4	13
Old Man of the Andes	Oreocereus	celsianus		6 x 2	3
Old Man Prickly Pear	Opuntia	erinacea	'erinaceae'	1 x 3	7
Pancake Prickly Pear	Opuntia	chlorotica		5 x 5	20
Peruvian Apple	Cereus	peruvianus		8 x 3	7
Purple Pancake	Opuntia	violacea	'santa rita'	3 x 6	28
Saguaro	Carneglea	gigantea		20 x 2	3
Saguaro (with arms)	Carnegiea	gigantea		20 x 6	28
San Pedro Cactus	Trichocereus	pachanol		20 x 6	28
Silver Cholla	Opuntia	echinocarpa		2 x 5	20
Strawberry Hedgehog	Echinocereus	engelmannii		1 x 3	7
Teddy Bear Cholla	Opuntia	bigelovii		6 x 4	13
Plant Type: Groundcover					
Annuals	Genus	sp.		2 x 2	3
Asparagus Fern	Asparagus	densiflorus	'Sprengeri'	2 x 4	13
Blue Carpet Juniper	Juniperus	horizontalis	'Wiltonii'	1 x 6	28
Boothill Eupatorium	Eupatorium	greggii	'Boothill'	2 x 2	3
Buffalo Juniper	Juniperus	sabina	'Buffalo'	1 x 8	50
Creeping Mahonia	Mahonia	repens		3 x 5	20
Four O'clock	Mirabilis	multiflora		3 x 3	7
Gazania	Gazania	rigens		1 x 1	1

Common Name	Genus	Species	Variety / Cultivar	Size (HxW)	(Square Feet)
Plant Type: Groundcover					
Hearts and Flowers	Aptenia	cordifolia		1 x 3	7
Japanese Garden Juniper	Juniperus	chinensis procumbens		3 x 8	50
Lamb's Ear	Stachys	byzantia		1 x 2	3
Lantana (Bush)	Lantana	camara		4 x 6	28
Lantana (Bush)	Lantana	camara	'Radiation'	4 x 6	28
Lantana (Trailing)	Lantana	montevidensis		1 x 6	28
Peruvian Verbena	Verbena	peruviana		1 x 3	7
Prostrate Indigo Bush	Dalea	greggii		1 x 8	50
Prostrate Myoporum	Myoporum	parvifolium		1 x 8	50
Prostrate Rosemary	Rosmarinus	officinalis	'prostratus'	2 x 4	13
Purple Iceplant	Drosanthemum	cooperi		1 x 4	13
Pyracantha or Firethorn	Pyracantha	fortuneana	'Santa Cruz'	2 x 5	20
Raspberry Fuzzies	Acalypha	monostachys		1 x 1	1
Red Iceplant	Drosanthemum	speciosum		1 x 4	13
Rock Cotoneaster	Cotoneaster	horizontalis		2 x 15	177
Scarlet/Texas Betony	Stachys	coccinea		1 x 2	3
Shore Juniper	Juniperus	conferta		2 x 8	50
Sierra Gold Dalea	Dalea	capitata		2 x 3	7
Sierra Sundrop	Calylophus	hartwegii		1 x 2	3
Snow-in-Summer	Cerastium	tomentosum		1 x 3	7
Spurge (Gopher Plant)	Euphorbia	rigida		2 x 5	20
Stonecrop	Sedum	album (brevifolium)		1 x 2	3
Vinca (Dwarf Periwinkle)	Vinca	minor		2 x 2	3
Plant Type: Orn.Grass					
Autumn Glow	Muhlenbergia	linheimeri	'Autumn Glow'	5 x 5	20
Bear Grass	Nolina	microcarpa		3 x 2	3
Bigelow's Nolina	Nolina	bigelovii		4 x 4	13
Blue Fescue	Festuca	ovina	'Glauca'	1 x 1	1
Blue Grama Grass	Bouteloua	gracilis		3 x 2	3
Bull Grass	Muhlenbergia	emersleyi	'El Toro'	3 x 3	7
Canyon Prince Wild Rye	Elymus	condemsatus	'Canyon Prince'	3 x 2	3
Deer Grass	Muhlenbergia	rigens		6 x 6	28
Fountain Grass	Pennisetum	setaceum		5 x 3	7
Golden Bamboo	Phyllostachys	aurea		8 x 6	28
Mexican Feather Grass	Stipa	tenuissima		2 x 2	3
Mexican Grass Tree	Dasylirion	longissimum		8 x 8	50
Nashville	Muhlenbergia	rigida	'Nashville'	2 x 2	3
Pampas Grass	Cortaderia	selloana		8 x 15	177

Common Name	Genus	Species	Variety / Cultivar	Size (HxW)	(Square Feet)
Plant Type: Orn.Grass					
Purple Threeawn	Aristida	purpurea		2 x 2	3
Red Fountain Grass	Pennisetum	setaceum	'Rubrum'	5 x 3	7
Regal Mist	Muhlenbergia	capillaris	'Regal Mist'	3 x 3	7
Treebear Grass	Nolina	matapensis		3 x 6	28
Variegated Maiden Grass	Miscanthus	sinensis	'Variegata'	5 x 4	13
Plant Type: Palm					
California Fan Palm	Washingtonia	filifera		60 x 15	177
Canary Date Palm	Phoenix	canariensis		60 x 35	962
Date Palm	Phoenix	dactylifera		40 x 20	314
Japanese Sago Palm	Cycas	revoluta		5 x 8	50
Mediterranean Fan Palm	Chamaerops	humilis		15 x 15	177
Mexican Blue Palm	Brahea	armata		25 x 15	177
Mexican Fan Palm	Washingtonia	robusta		100 x 15	177
Pindo Palm	Butia	capitata		25 x 15	177
Queen Palm	Syagrus	romanzoffianum		40 x 10	79
Windmill Palm	Trachycarpus	fortunei		40 x 10	79
Plant Type: Perennials					
African Bush Aster	Aster	filifolius		3 x 4	13
African Trailing Daisy	Ostespermum	fruticosum		1 x 4	13
Alyssum (Sweet)	Lobularia	maritima		1 x 1	1
Angel's Hair	Artemisia	schmidtiana	'Silver Mound'	1 x 3	7
Angelita Daisy	Hymenoxys	acaulis		1 x 2	3
Bearded Iris	Iris	germanica		3 x 2	3
Black-eyed Susan	Rudbeckia	hirta		3 x 3	7
Blackfoot Daisy	Melampodium	leucanthum		1 x 2	3
Blanket Flower	Gaillardia	aristata (grandiflora)		2 x 2	3
Butterfly Iris/African Iris	Dietes	iridioides	'vegata'	2 x 1	1
California Poppy	Eschscholzia	californica		1 x 1	1
Canna	Canna	hybrids		6 x 3	7
Cape Plumbago	Plumbago	auriculata (capensis)		6 x 8	50
Coarse Verbena (Sandpaper)	Verbena	rigida		1 x 4	13
Cuphea (Bat-faced)	Cuphea	llavea		2 x 3	7
Cuphea (Firecracker/Cigar Plant)	Cuphea	ignea		2 x 3	7
Dahlberg Daisy	Dyssodia	tenuiloba		1 x 2	3
Daylily Hybrids	Hemerocallis	hybrids		2 x 2	3
Desert Marigold	Baileya	multiradiata		1 x 2	3
Desert Zinnia	Zinnia	acerosa		1 x 1	1
Dwarf Ruellia (Desert Petunia)	Ruellia	brittoniana		1 x 2	3

Common Name	Genus	Species	Variety / Cultivar	Size (HxW)	(Square Feet)
Plant Type: Perennials					
Evening Primrose (Angel Wing/White)	Oenothera	caespitosa		1 x 2	3
Evening Primrose (Mexican)	Oenothera	berlandieri		1 x 3	7
Evergreen Candytuft	Iberis	sempervirens		1 x 2	3
Fairy Lily (Rain Lily)	Zephyranthes	sp.		1 x 1	1
Fern Leaf Yarrow	Achillea	millefolium		2 x 4	13
Fortnight Lily (African Iris)	Moraea	iridioides		2 x 2	3
Fortnight Lily (Evergreen Iris)	Dietes	bicolor		2 x 2	3
Gaura	Gaura	lindheimeri		3 x 4	13
Globe Mallow	Sphaeralcea	ambigua		3 x 3	7
Golden Dyssodia	Dyssodia	pentachaeta		2 x 2	3
Goldeneye	Viquiera	deltoidea		3 x 3	7
Lavender	Lavandula	sp.		2 x 3	7
Lily of the Nile	Agapanthus	africanus		2 x 3	7
Lily Turf	Liriope	muscari		1 x 1	1
Lupine (Big Bend Bluebonnets)	Lupinus	havardii		4 x 1	1
Lupine (Coulter's Lupine)	Lupinus	spasiflorus		4 x 1	1
Mexican Hat	Ratibida	columnifera		1 x 2	3
Morning Glory (Bush)	Convolvulus	cneorum		2 x 4	13
Morning Glory (Ground)	Convolvulus	mauritanicus		1 x 3	7
Mountain Marigold	Tagetes	lemmonii		4 x 4	13
Paper Flower	Psilostrophe	cooperi		2 x 3	7
Paper Flower (Wooly)	Psilostrophe	tagetina		2 x 3	7
Penstemon (Canyon {rose})	Penstemon	pseudospectabilis		2 x 4	13
Penstemon (Del Rio {red})	Penstemon	baccharifolius	'Del Rio'	3 x 3	7
Penstemon (Firecracker {red})	Penstemon	eatoni		3 x 3	7
Penstemon (Foxglove {white})	Penstemon	cobaea		2 x 2	3
Penstemon (Parry {pink})	Penstemon	parryi		2 x 3	7
Penstemon (Rocky Mountain {blue})	Penstemon	strictus		2 x 2	3
Penstemon (Scented {light pink})	Penstemon	palmeri		5 x 2	3
Powis Castle Wormwood	Artemisia	arborescens	'Powis Castle'	2 x 3	7
Prairie Sage	Artemisia	ludoviciana		3 x 3	7
Prairie Zinnia	Zinnia	grandiflora		1 x 1	1
Purple Coneflower	Echinacea	purpurea		3 x 2	3
Russian Sage	Perovskia	atriplicifolia		3 x 2	3
Silver King Artemisia	Artemisia	ludoviciana albula	'Silver King'	3 x 3	7
Society Garlic	Tulbaghia	violacea		3 x 2	3
Sunray	Coreopsis	lanceolata		2 x 1	1
Plant Type: Shrub					

Common Name	Genus	Species	Variety / Cultivar	Size (HxW)	(Square Feet)
Plant Type: Shrub					
Apache Plume	Fallugia	paradoxa		6 x 4	13
Arborvitae	Thuja	occidentalis		10 x 12	113
Arizona Mescal Bean	Sophora	arizonica		10 x 8	50
Arizona Rosewood	Vauquelinia	californica		15 x 10	79
Baja Fairy Duster	Calliandra	californica		6 x 6	28
Barbados Cherry	Malpighia	glabra	'Mariquita'	3 x 3	7
Blue Hibiscus	Alyogne	huegelii		6 x 6	28
Blue Point Juniper	Juniperus	chinensis	'Blue Point'	10 x 4	13
Box-leaf Euonymus	Euonymus	japonica	'Microphylla'	2 x 2	3
Brittlebush	Encelia	farinosa		4 x 4	13
Burford Holly	Ilex	cornuta		8 x 8	50
Butterfly Bush	Buddleia	davidii		8 x 6	28
Butterfly Bush (Wooly)	Buddleia	marrubifolia		8 x 8	50
California Buckwheat	Eriogonum	fasciculatum		3 x 3	7
Cape Honeysuckle	Tecomaria	capensis		10 x 10	79
Cascalote	Caesalpinia	cacalaco		10 x 10	79
Centennial Broom / Coyote Bush	Baccharis	sp.	'Centennial'	3 x 5	20
Chuparosa	Justicia	californica		3 x 4	13
Cliff Rose	Cowania	stansburiana		6 x 6	28
Coral Fountain	Russelia	equisetiformis		4 x 6	28
Crape Myrtle	Lagerstroemia	indica		10 x 8	50
Creeping Acacia	Acacia	redolens	'Desert Carpet'	2 x 12	113
Creosote Bush	Larrea	tridentata (divaricata)		8 x 6	28
Damianta	Chrysactinia	mexicana		2 x 2	3
Desert Cassia	Cassia	nemophila		6 x 6	28
Devil's River	Zexmenia	hispida		3 x 3	7
Dwarf Bottlebrush	Callistemon	citrinus	'Nana'	3 x 3	7
Dwarf Greek Myrtle	Myrtus	communis	'Compacta'	4 x 4	13
Dwarf Heavenly Bamboo	Nandina	domestica	'Nana'	4 x 3	7
Dwarf Mock Orange	Pittosporum	tobira	'Wheeler Dwarf'	2 x 4	13
Dwarf Oleander	Nerium	oleander	'petite'	6 x 5	20
Dwarf Pomegranate	Punica	granatum	'Nana'	4 x 3	7
Dwarf Yaupon Holly	Ilex	vomitoria	'Nana'	2 x 3	7
Ebbing's Silverberry	Elaeagnus	ebbingei		8 x 8	50
Euryops Daisy	Euryops	pectinatus		3 x 3	7
Evergreen Euonymus	Euonymus	japonica		5 x 6	28
Evergreen Sumac	Rhus	virens		12 x 15	177
Feathery Cassia	Cassia	artemisioides		6 x 6	28
Firethorn	Pyracantha	coccinea		6 x 8	50

Common Name	Genus	Species	Variety / Cultivar	Size (HxW)	(Square Feet)
Plant Type: Shrub					
Four-Wing Saltbush	Atriplex	canescens		5 x 8	50
Foxtail Fern	Asparagus	densiflorus	'Meyers'	2 x 3	7
Germander	Teucrium	chamaedrys		1 x 2	3
Glossy Abelia	Abelia x	grandiflora		5 x 5	20
Gold Spot Euonymus	Euonymus	japonica	'Aureo-Variegata'	5 x 6	28
Golden Arborvitae	Platycladus	orientalis	'Aureus'	3 x 2	3
Golden Dewdrop	Duranta	erecta	'Sweet Memory'	15 x 10	79
Goldenbush	Ericameria	cuneata		3 x 4	13
Gray Thorn	Zizyphus	obtusifolia		6 x 8	50
Green Santolina	Santolina	virens		2 x 3	7
Green Shrub Daisy	Euryops	pectinatus	'Viridis'	3 x 3	7
Heavenly Bamboo	Nandina	domestica		6 x 4	13
Hollywood Twisted Juniper	Juniperus	chinensis	'Torulosa'	15 x 10	79
Hummingbird Flower	Zauschneria	californica		2 x 4	13
Indian Hawthorn	Rhapiolepis	indica		4 x 4	13
Japanese Aralia	Fatsia	japonica		6 x 6	28
Japanese Boxwood	Buxus	microphylla	'Japonica'	6 x 6	28
Jojoba	Simmondsia	chinensis		6 x 6	28
Junipers - Large Shrub Species	Juniperus	sp.		20 x 10	79
Lady Bank's Rose	Rosa	banksiae		6 x 15	177
Lavender Spice	Poliomintha	maderensis		3 x 3	7
Leather Leaf Acacia	Acacia	craespedocarpa		10 x 8	50
Lemon Bottlebrush	Callistemon	citrinus		8 x 8	50
Lemonade Berry	Rhus	integrifolia		10 x 8	50
Little Leaf Cordia	Cordia	parvifolia		6 x 8	50
Littleleaf Ash	Fraxinus	greggii		18 x 15	177
Matilija Poppy (Fried Egg Poppy)	Romneyi	coulteri		6 x 6	28
Mexican Bird of Paradise	Caesalpinia	mexicana		10 x 6	28
Mexican Buckeye	Sapindaceace	ungnadia		8 x 6	28
Mexican Flame	Anisacanthus	quadrifidus-wrightii	'Mexican Flame'	3 x 4	13
Mexican Honeysuckle	Justicia	spicigera		3 x 4	13
Mock Orange	Pittosporum	tobira		8 x 8	50
Mormon Tea	Ephedra	viridis		3 x 3	7
Mountain Laurel	Kalmia	latifolia		8 x 8	50
Moy Grande	Hibiscus x	'Moy Grande'		5 x 5	20
Narrowleaf Rosewood	Vauquelinia	corymbosa	'var. heterodon'	20 x 15	177
Oleander (Standard Size)	Nerium	oleander		15 x 15	177
Oregon Grape	Mahonia	aquifolium		6 x 5	20
Pineapple Guava	Feijoa	sellowiana		15 x 15	177

Common Name	Genus	Species	Variety / Cultivar	Size (HxW)	(Square Feet)
Plant Type: Shrub					
Pink Desert Hibiscus / African Mallow	Anisodontea x	hypomandrum		3 x 2	3
Pink Fairy Duster	Calliandra	eriophylla		3 x 3	7
Pink Indigo Bush	Dalea	pulchra		4 x 5	20
Purple Hopseed Bush	Dodonaea	viscosa		12 x 6	28
Purple Rock Rose	Cistus	purpureus		4 x 4	13
Pyracantha or Firethorn	Pyracantha	sp.		10 x 8	50
Pyrenees Cotoneaster	Cotoneaster	congestus		3 x 3	7
Red Bird of Paradise	Caesalpinia	pulcherrima		6 x 6	28
Red Clusterberry	Cotoneaster	lacteus		6 x 6	28
Redtip Photinia	Photinia	fraseri		6 x 6	28
RockSpray	Cotoneaster	microphyllus		3 x 6	28
Rosemary	Rosemarinus	officinalis		2 x 6	28
Sage (Autumn {Sierra Linda})	Salvia	greggii	'Sierra Linda'	3 x 3	7
Sage (Autumn)	Salvia	greggii		2 x 2	3
Sage (Chaparral)	Salvia	clevelandii		5 x 6	28
Sage (Coahuilensis)	Salvia	coahuilensis		2 x 3	7
Sage (Desert)	Salvia	dorrii	'var. dorrii'	2 x 2	3
Sage (Lipstick Red Salvia)	Salvia	darcyi		4 x 4	13
Sage (Mexican Blue)	Salvia	chamaedryoides		2 x 2	3
Sage (Mexican Bush)	Salvia	leucantha		4 x 4	13
Sage (Purple)	Salvia	dorrii	'leucophylla'	3 x 3	7
Sage (Salvia x trident)	Salvia x	trident		3 x 3	7
Sage (Scarlet)	Salvia	coccinea		3 x 4	13
Sage (Texas Violet)	Salvia	farinacea		3 x 3	7
Sea Green Juniper	Juniperus	chinensis	'Sea Green'	6 x 6	28
Shrub Rose	Rosa	sp.		4 x 3	7
Silver Dalea	Dalea	bicolor	'argyraea'	3 x 3	7
Silver King Euonymus	Euonymus	japonica	'Silver King'	5 x 6	28
Silver Leaf Cassia	Cassia	phyllodenia		6 x 6	28
Snakeweed	Gutierrizia	sarothrae		2 x 2	3
Squaw Bush (Skunk Bush)	Rhus	trilobata		6 x 8	50
Sugar Bush	Rhus	ovata		12 x 12	113
Summertime Blue	Eremophila	Species	'Summertime Blue'	6 x 6	28
Sweet Broom	Genista	racemosa		6 x 6	28
Tam Juniper	Juniperus	sabina		4 x 10	79
Tecome x Sunrise	Tecoma x	Sunrise		8 x 8	50
Texas / Japanese Privet	Ligustrum	japonicum	'Texanum'	8 x 8	50
Texas Mountain Laurel	Sophora	secundiflora		15 x 10	79
Texas Olive	Cordia	boisierri		6 x 8	50

Common Name	Genus	Species	Variety / Cultivar	Size (HxW)	(Square Feet)
Plant Type: Shrub					
Texas Ranger (Blue Ranger)	Leucophyllum	zygophyllum		6 x 6	28
Texas Ranger (Chihuahuan Sage)	Leucophyllum	laevigatum		6 x 6	28
Texas Ranger (Cimarron Ranger)	Leucophyllum	zygophyllum	'Cimarron'	3 x 3	7
Texas Ranger (Compact Texas Ranger)	Leucophyllum	frutescens	'Compacta'	5 x 5	20
Texas Ranger (Green Cloud Ranger)	Leucophyllum	frutescens	'Green Cloud'	6 x 6	28
Texas Ranger (Rio Bravo Ranger)	Leucophyllum	langamaniae	'Rio Bravo'	5 x 5	20
Texas Ranger (Sierra Bouquet)	Leucophyllum	pruinosum	'Sierra Bouquet'	6 x 6	28
Texas Ranger (Silver Cloud Ranger)	Leucophyllum	candidum	'Silver Cloud'	5 x 5	20
Texas Ranger (Thunder Cloud Ranger)	Leucophyllum	candidum	'Thunder Cloud'	3 x 4	13
Turpentine Bush	Ericameria	laricifolia		2 x 3	7
Valentine	Eremophila	species	'Valentine'	4 x 5	20
Viburnum (Spring Bouquet Laurustinus)	Viburnum	tinus	'Spring Bouquet'	6 x 8	50
Wallflower	Erysimum	hieracifolium		2 x 4	13
Xylosma	Xylosma	congestum		10 x 10	79
Yellow Bird of Paradise	Caesalpinia	gilliesii		8 x 8	50
Yellowbells	Tecoma	stans	'Gold Star'	8 x 8	50
Plant Type: Succulent					
African Aloe	Aloë	saponaria		2 x 1	1
Aloe Vera	Aloë	barbadensis		2 x 2	3
Banana Yucca	Yucca	baccata		3 x 6	28
Blue Yucca	Yucca	rigida		8 x 3	7
Century Plant / American Agave	Agave	americana		6 x 8	50
Dark Green Agave	Agave	filifera		2 x 2	3
Desert Spoon	Dasylirion	wheeleri		5 x 6	28
Durango Delight	Agave	schidigera	'Durango Delight'	2 x 3	7
Giant Sword Flower	Hesperaloe	funifera		5 x 4	13
Gold Tooth Aloe	Aloe	nobilius		2 x 1	1
Green Desert Spoon	Dasylirion	acrotriche		5 x 6	28
Joshua Tree	Yucca	brevifolia		10 x 10	79
Lady's Slipper	Pedilanthus	macrocarpus		2 x 3	7
Mojave Yucca	Yucca	schidigera		6 x 8	50
Murphey's Agave	Agave	murpheyi		2 x 3	7
Ocotillo	Fouqueiria	splendens		10 x 6	28
Octopus Agave	Agave	vilmoriniana		4 x 4	13
Parry's Agave	Agave	parryi-huachucensis		2 x 3	7
Red Yucca	Hesperaloe	parvifolia		3 x 3	7
Soaptree Yucca	Yucca	elata		10 x 8	50
Spanish Bayonet	Yucca	aloifolia		10 x 8	50

Common Name	Genus	Species	Variety / Cultivar	Size (HxW)	(Square Feet)
Plant Type: Succulent					
Spanish Dagger	Yucca	gloriosa		10 x 8	50
Tap Aloe (Cape Aloe)	Aloe	ferox		12 x 5	20
Thompson's Yucca	Yucca	thompsoniana		10 x 8	50
Tree Aloe	Aloë	arborescens		3 x 6	28
Twin Flowered Agave	Agave	geminiflora		2 x 4	13
Weber's Agave	Agave	weberi		6 x 8	50
Weeping Yucca	Yucca	recurvifolia		6 x 6	28
Yellow Yucca	Hesperaloe	parvifolia	'Yellow'	3 x 3	7
Plant Type: Tree					
Acacia (Cat-claw)	Acacia	greggii		8 x 15	133
Acacia (Mulga Tree)	Acacia	aneura		20 x 15	133
Acacia (Shoestring)	Acacia	stenophylla		30 x 20	236
Acacia (Sweet)	Acacia	smallii		20 x 20	236
Acacia (Twisted)	Acacia	schaffneri		20 x 25	368
African Sumac	Rhus	lancea		20 x 20	236
Almond	Prunus	triloba		20 x 20	236
Apple Tree	Malus	sp.		20 x 20	236
Arizona Cypress	Cupressus	glabra		30 x 20	236
Ash (Arizona)	Fraxinus	velutina		30 x 30	530
Ash (Fan-Tex)	Fraxinus	velutina	'Rio Grande'	30 x 30	530
Ash (Modesto)	Fraxinus	velutina	'Glabra'	30 x 25	368
Ash (Raywood)	Fraxinus	oxycarpa	'Raywood'	30 x 20	236
Bay Laurel	Laurus	nobilis		12 x 10	59
Blue Atlas Cedar	Cedrus	atlantica	'Glauca'	30 x 20	236
Bottle Tree	Brachychiton	populneus		30 x 20	236
Bradford Pear	Pyrus	calleryana	'Bradford'	25 x 20	236
California Pepper Tree	Schinus	molle		30 x 30	530
California Sycamore	Platanus	racemosa		40 x 40	942
Carolina Laurel Cherry	Prunus	caroliniana		20 x 20	236
Chaste Tree	Vitex	agnus-castus		25 x 25	368
Chinese Jujube	Zizyphus	jujuba		25 x 20	236
Chinese Pistache	Pistacia	chinensis		30 x 30	530
Chitalpa	Chitalpa	tashkentensis		20 x 20	236
Citrus Tree	Citrus	sp.		15 x 15	133
Coolibah	Eucalyptus	microtheca		40 x 25	368
Desert Willow	Chilopsis	linearis		25 x 20	236
Desert Willow 'Lucretia Hamilton'	Chilopsis	linearis	'Lucretia Hamilton'	20 x 20	236
Dwarf Fruit Trees	Prunus	dwarf		8 x 10	59

Common Name	Genus	Species	Variety / Cultivar	Size (HxW)	(Square Feet)
Plant Type: Tree					
Fig Tree	Ficus	carica		30 x 30	530
Flame Sumac	Rhus	lanceolata		20 x 25	368
Forman's Eucalyptus (Feather Gum)	Eucalyptus	formanii		15 x 15	133
Fremont Cottonwood or Poplar	Populus	fremontii		40 x 40	942
Ghost Gum/Blue Ghost Eucalyptus	Eucalyptus	pauciflora		40 x 30	530
Glossy Privet	Ligustrum	lucidum		20 x 20	236
Golden Ball Lead Tree	Leucaena	retusa		20 x 20	236
Goldenrain Tree	Koereuteria	paniculata		30 x 30	530
Italian Cypress	Cupressus	sempervirens		30 x 5	15
Japanese Flowering Apricot	Prunus	mume		20 x 15	133
Lacebark Elm	Ulmus	parvifolia		40 x 40	942
Loquat	Eriobotyra	japonica		30 x 15	133
Maidenhair	Ginkgo	biloba		20 x 20	236
Mesquite (Argentine)	Prosopis	alba		30 x 30	530
Mesquite (Chilean)	Prosopis	chilensis		30 x 30	530
Mesquite (Colorado)	Prosopis	alba	'Colorado'	30 x 30	530
Mesquite (Screwbean)	Prosopis	pubescens		25 x 25	368
Mesquite (Texas Honey)	Prosopis	glandulosa	'glandulosa'	30 x 30	530
Mesquite (Western Honey)	Prosopis	glandulosa	'Torreyana'	20 x 20	236
Mulberry	Morus	alba		40 x 35	722
Navajo Globe Willow	Salix	matsudana	'Navajo'	40 x 35	722
Oak (Escarpment Live)	Quercus	fusiformis		30 x 30	530
Oak (Heritage Live)	Quercus	virginiana	'Heritage'	25 x 20	236
Oak (Holly)	Quercus	ilex		25 x 20	236
Oak (Red Rock)	Quercus	buckleyi	'Red Rock'	30 x 30	530
Oak (Southern Live)	Quercus	virginiana		25 x 20	236
Oak (Valley)	Quercus	lobata		40 x 40	942
Olive Tree	Olea	europaea		30 x 30	530
Palo Verde (Blue)	Cercidium	floridum		20 x 30	530
Palo Verde (Desert Museum)	Cercidium	parkinsonian	'Desert Museum'	25 x 25	368
Palo Verde (Foothills)	Cercidium	microphyllum		25 x 20	236
Palo Verde (Mexican)	Parkinsonia	aculeata		20 x 20	236
Pine (Aleppo)	Pinus	halepensis		25 x 25	368
Pine (Chir)	Pinus	roxburghii		30 x 20	236
Pine (Japanese Black)	Pinus	thunbergiana		10 x 15	133
Pine (Mondell)	Pinus	eldarica		30 x 30	530
Pine (Stone)	Pinus	pinea		40 x 40	942
Pomegranate	Punica	granatum		20 x 15	133
Purple Leaf Plum	Prunus	cerasifera		20 x 15	133

Common Name	Genus	Species	Variety / Cultivar	Size (HxW)	Plant Coverage Value (Square Feet)
Plant Type: Tree					
Purple Robe Locust	Robinia	ambigua	'Purple Robe'	40 x 30	530
Red Flowered Mallee	Eucalyptus	erythronema		30 x 20	236
Ruby Lace Honey Locust	Gleditsia	triacanthos	'Ruby Lace'	30 x 30	530
Russian Olive	Elaeagnus	angustifolia		30 x 20	236
Sapphire Dragon Tree	Paulownia	tomentosa		15 x 15	133
Sawleaf Zelkova	Zelkova	serrata		30 x 30	530
Shademaster Honey Locust	Gleditsia	tracanthos	'Shade Master'	30 x 30	530
Silk Mimosa Tree	Albizia	julibrissen		30 x 40	942
Silver Dollar Gum	Eucalyptus	polyanthemos		40 x 30	530
Smoke Tree	Cotinus	coggygria		15 x 15	133
Strawberry Tree	Arbutus	unedo		15 x 10	59
Swan Hill Olive	Olea	europaea	'Swan Hill'	20 x 20	236
Texas Ebony	Pithecellobium	flexicaule		20 x 20	236
Texas Umbrella Tree (Chinaberry)	Melia	azedarach		30 x 30	530
Western Hackberry	Celtis	occidentalis		40 x 30	530
Western Redbud	Cercis	occidentalis		15 x 15	133
Yew Pine	Podocarpus	macrophyllus		20 x 10	59
Plant Type: Vine					
Arizona Grape/Fox Grape	Vitis	labrusca	'Native'	10 x 10	79
Bougainvillea	Bougainvillea	brasiliensis		10 x 10	79
Carolina Jasmine	Gelsemium	sempervirens		6 x 10	79
Cat's Claw	Macfadyena	unguis-cati		10 x 10	79
Grape Ivy/Arizona Grape Ivy	Cissus	trifoliata		10 x 10	79
Grape Vine	Vitis	sp.	'Domestic'	10 x 10	79
Hacienda Creeper	Parthenocissus	sp.		10 x 25	491
Hall's Japanese Honeysuckle	Lonicera	japonica	'Halliana'	6 x 15	177
Ivy (Algerian)	Hedera	canariensis		6 x 8	50
Ivy (Boston)	Parthenocissus	tricuspidata		6 x 8	50
Ivy (English)	Hedera	helix		6 x 8	50
Lilac Vine	Hardenbergia	violacea		10 x 10	79
Pink Jasmine	Jasminum	polyanthum		10 x 10	79
Potato Vine	Solanum	jasminoides		10 x 10	79
Primrose Jasmine	Jasminum	mesnyi		6 x 6	28
Silver Lace Vine	Polygonum	aubertii		10 x 10	79
Star Jasmine	Trachelospermum	jasminoides		10 x 6	28
Trumpet Creeper Vine	Campsis	radicans		10 x 15	177
Virginia Creeper	Parthenocissus	quinquefolia		10 x 15	177
Wintercreeper	Euonymus	fortunei		2 x 10	79

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1690

Water conserving plants for Northern San Luis Obispo County.

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PERENNIALS

Achillea sp.	Yarrow	
Artemesia sp.	Wormwood	
Centranthus ruber	Jupiter's Beard	
Ceratostigma plumbaginoides	Dwarf Plumbago	
Coreopsis sp.	several varieties	
Echinaceae Purpurea	Purple Coneflower	
Eriogonum sp.	Buckwheat	
Erigeron 'Wayne Roderick'	Fleabane	
Gaillardia grandiflora	Blanket Flower	
Gaura lindheimeri	Gaura	
Helianthemum nummularium	Sunrose	
Hemerocallis	Daylily	
Heuchera maxima	Island Coral Bells	
Hunnemania fumarifolia	Mexican Tulip Poppy	
Iris douglasiana hybrids	Douglas Iris	
Iris	Bearded Iris	
Kniphofia uvaria	Red-Hot Poker	
Lavendula sp.	Lavendar	
Mimulus aurantiacus	Monkey Flowers	
Nepeta faassenii	Catmint	
Oenothera berlandieri	Mexican Evening Primrose	
Penstemon heterophyllus purdyi	Blue Bedder Penstemon	
Perovskia atriplicifolia	Russian Sage	
Rudbeckia hirta	Gloriosa Daisy	
Senecio cineraria	Dusty Miller	
Sisyrinchium bellum	Blue-Eyed Grass	
Stachys byzantina	Lamb's Ears	
Tanacetum parthemium	Feverfew	
Teucrium chamaedrys	Germander	
Verbena sp.	Several varieties	
Zauschneria (Epilobium) sp.	Califoris Fuchsia	

ANNUALS & BIENNIALS

☼	Alcea rosea	Hollyhock
☼ 🦌	Calendula officinalis	Calendula
☼ 🦌	Centaurea cyanus	Cornflower, Bachelor's Button
☼ 🦌	Clarkia sp.	Godetia
☼	Cosmos	Cosmos
☼	Dimorpotheca sinuata	Cape Marigold
☼ 🦌	Eschschholzia californica	California Poppy
☼ 🦌	Helianthus annuus	Sunflower
☼ 🦌	Lupinus nana	Bi-color Lupine
☼ 🦌	Portulaca grandiflora	Moss Rose

Plants Compatible with California Native oaks

Poppy logo

CN California Native
Shade
Part Sun
Full Sun
Deer Resistant

Atascadero Mutual Water Company
5005 El Camino Real
P.O. Box 6075
Atascadero, CA 93423
(805) 466-2428

VINES

☼	Gelsemium sempervirens	Carolina Jessamine
🦌 ☼	Polygonum aubertii	Silver Lace Vine
☼	Rosa banksiae	Lady Banks Rose
☼	Rosa 'Cecile Brunner'	Cecile Brunner Rose
🦌 ☼	Wisteria sinensis	Chinese Wisteria

ORNAMENTAL GRASSES

🦅 🦌 ☼	Elymus condensatus	Giant Wild Rye
🦅 ☼	Festuca californica	California Fescue
🦅 🦌 ☼	Muhlenbergia rigens	Deer Grass
🦅 🦌 ☼	Stipa pulchra	Purple Needle Grass

BULBS

🦌 ☼	Amaryllis belladonna	Naked Lady
🦌 ☼	Crocosmia crocosmiflora	Montbretia
🦌 ☼	Narcissus	Daffodil
🦌 ☼	Watsonia	
🦌 ☼	Zephyranthes candida	Zephyr Flower

GROUND COVERS

☼ 🦌	Achillea tomentosa	Wooly Yarrow
🦅 ☼ 🦌	Arctostaphylos sp.	Manzanita
🦅 ☼ 🦌	Baccharis pilularis 'Pidgeon Point'	Dwarf Coyote Bush
🦅 ☼ 🦌	Ceanothus sp.	Ca.Wild Lilac
☼ 🦌	Cerastium tomentosum	Snow-In-Summer
☼ 🦌	Cistus sp.	Rockrose
☼ 🦌	Cotoneaster dammeri	Bearberry Cotoneaster
☼ 🦌	Festuca ovina glauca	Blue Fescue
☼ 🦌	Hypericum calycinum	St. John's Wort
☼ 🦌	Juniperus sp.	Juniper
🦅 ☼ 🦌	Ribes viburnifolium	Catalina Fragrance
☼ 🦌	Rosmariunus officinalis prostratus	Dwarf Rosemary
🦅 ☼ 🦌	Salvia sonomensis	Creeping Sage
☼ 🦌	Santolina sp.	Santolina
☼ 🦌	Sedum sp.	Stonecrop

SHRUBS

	Abelia grandiflora	Glossy Abelia
	Arbutus unedo 'Compacta'	Compact Strawberry Tree
	Arctostaphylos sp.	Manzanita
	Baccharis pilularis	Coyote Bush
	Carpinteria californica	Bush Anemone
	Ceanothus sp.	Ca. Wild Lilac
	Chaenomeles sp.	Flowering Quince
	Chilopsis linearis	Desert Willow
	Choisya ternata	Mexican Orange
	Cistus sp.	Rockrose
	Cotinus coggygria	Smoke Bush
	Cotoneaster sp.	Cotoneaster
	Dendromecon rigida	Bush Poppy
	Eleagnus pungens	Silverberry
	Feijoa sellowiana	Pineapple guava
	Fremontodendron californicum	Flannel Bush
	Garrya elliptica	Silk Tassel Bush
	Grevillea canberra	
	Grevillea noelii	
	Heteromeles arbutifolia	Toyon
	Ilex cornuta 'Burfordii"	Burford Holly
	Juniperus sp.	Juniper
	Lagerstroemia indica	Crape Myrtle
	Mahonia aquifolium	Oregon Grape
	Myrica californica	Pacific Wax Myrtle
	Nandia domestica	Heavenly Bamboo
	Nerium oleander	Oleander
	Prunus ilicifolia	Holly-Leaved Cherry
	Prunus lyonii	Caltalina Cherry
	Punica granatum	Pomegranate
	Pyracantha sp.	Firethorn
	Rhamnus alaternus	Italian Buckthorn
	Rhamnus californica	Coffeeberry
	Rhus ovata	Sugar Bush
	Ribes aureum	Golden Currant
	Ribes sanguinium	Pink Winter Currant
	Ribes speciosum	Fuschia Flowered Gooseberry
	Romneya coulteri	Matilija Poppy
	Rosa californica	Wild Rose
	Rosmarinus officinalis	Rosemary
	Salvia sp.	Sage - many varietieis
	Sambucus mexicana	Blue Elderberry
	Symphoricarpos albus	Snowberry
	Teucrium fruticans	Bush Germander

TREES

	Acacia baileyana	Bailey Acacia
	Aesculus californica	California Buckeye
	Arbutus menziesii	Madrone
	Arbutus unendo	Strawberry Tree
	Calocedrus decurrens	Incense Cedar
	Cedrus deodora	Deodar Cedar
	Cercis occidentalis	Western Redbud
	Chitalpa sp.	Chitalpa
	Cupressus forbesii	Tecate Cypress
	Cupressus glabra (arizonica)	Arizona Cypress
	Eriobotrya japonica	Loquat
	Ficus carica	Edible Fig
	Fraxinus velutina	Arizona Ash
	Ginko biloba	Maidenhair Tree
	Juglans hindsii	Ca. Black Walnut
	Lagerstroemia indica	Crape Myrtle
	Laurus nobilis	Grecian Bay
	Lithocarpus densiflora	Tanbark Oak
	Lyonothamnus floribundus asplenifolius	Catalina Ironwood
	Olea europea	European Olive
	Pistachia chinensis	Chinese Pistache
	Pinus coulteri	Coulter Pine
	Pinus sabiniana	Digger Pine
	Platanus acerifolia	London Plane Tree
	Platanus racemosa	California Sycamor
	Populus fremontii	Western Cottonwoo
	Quercus sp-Ca. natives	Oaks
	Quercus ilex	Holly Oak
	Quercus suber	Cork Oak
	Robinia ambigua	Idaho Locust
	Sequoiadendron gigantea	Giant Sequoia
	Umbellularia californica	Ca. Bay
	Zelkova serrata	Sawleaf Zelkova

California Native
Shade
Part Sun
Full Sun
Deer Resistant

Designer/Manager School of Irrigation

In Recognition of

Wendy Hallinan

For Participating in the 13th Annual Designer/Manager School of Irrigation
Held at the Irrigation Training and Research Center
California Polytechnic State University
San Luis Obispo, California

Basic Soil, Plant and Water Relationships (16 Continuing Education hours)	**August 14-15, 2003**
Basic Pipeline Hydraulics (16 Continuing Education hours)	**August 18-19, 2003**
Pumps I (8 Continuing Education hours)	**August 20, 3004**
Landscape Irrigation Auditor (16 Continuing Education hours)	**August 25-26, 2003**
Landscape Sprinkler Design (8 Continuing Education hours)	**August 27, 2003**
Microirrigation for Landscape (8 Continuing Education hours)	**August 28, 2003**

ITRC

U. S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

Dr. Stuart Styles, Director - ITRC

References

"My Country" a poem by Dorothea McKellar

Kathy Puplava and Paul Sirios *Trees and Gardens of Balboa Park*
Published by the City of San Diego Park and Recreation Department

Linn Mills and Dick Post *Nevada Gardener's Guide*
Published by Cool Springs Press

IRTC
Irrigation training and research centre California Polytechnic State University Handbooks for
Basic Hydraulics
Pumps I & II
Landscape Sprinkler Design
Basic soil, plant and water relationships.
Landscape Irrigation Auditor
Micro-irrigation for Landscape

The Living Murray
Published by the Murray – Darling Basin Commission

Lower Murray Water Annual Report 2001/2002

Plants for Water Management
Published by the Metropolitan Water District of Southern California

Water Smart Landscapes
Published by Southern Nevada Water Authority

Landscape Irrigation Water Conservation I
Protector Del Agua Program
Developed by Cal Poly ITRC

Gayle Weinstein *Xeriscape Handbook* Gayle Weinstein
Fulcrum Press

Warren Jones and Charles Sacamano *Landscape Plants for Dry Regions*
Published by Fisher Books

Darcy Aston and Alison Whitney *Sustainable Landscaping.*
Published by the Santa Barbara County

Sunset Drought Survival Guide
Sunset Publishing Corporation

How to water your garden

Wendy Hallinan 2004

Sunset Publishing Corporation

Websites
Savewater.com
www.cuyamaca.net
www.thegarden.org
www.awra.org
www.lvvwd.org
www.slobg.org
Brochures & newsletters.

"The Water Conservation Garden at Cuyamaca College."

"How to have a green garden in a dry state." Metropolitan Water District S.CA

"San Luis Obispo Botanical Garden: Preview Garden and Self-Guiding Map."
SLO Botanic Gardens
"San Luis Obispo Botanical Garden A new garden in the making"
SLO Botanic Gardens

"Free sprinkler system inspection and Lawn Water Audit"
Atascadero Mutual Water Co.

"Today's Landscapes"
City of SLO Water Conservation Office & Atascadero Mutual Water Co.

"The Salinas River Watershed"
Atascadero Mutual Water Co.

"Features of a Sustainable Landscape"
Partners in Water Conservation

"Leaning Pine Arboretum"
Environmental Horticultural Science Dept. Cal Poly University

"Spruce up SLO"
The City of San Luis Obispo

"The "Bear" Essentials of Mulch"
Atascadero Mutual Water Co.

"Colony House, water conserving landscape and demonstration garden".
Atascadero Mutual Water Co.

'Outdoor Water Conservation"
City of San Luis Obispo

"Drip Irrigation"
The City of San Luis Obispo

"Be the solution"
Southern Nevada Water Authority

"Self Guided walk "
Gardens of Balboa Park.

'The Gardens at Las Vegas Springs Preserve Summer Calendar of events."
"24 things you can do to save water."
San Diego County Water Authority

"Gardens at the Las Vegas Springs Preserve Pruning Clinic."
Las Vegas Valley Water District.

"Water Conservation News"
Department of water resources CAL.

"Cuyamaca College Ornamental Horticulture 102, Xeriscape – Water Conservation in the Landscape outline"

"The Urban Horticulturalist" Cuyamaca College Publication several volumes.