

Irrigation of Native Plants vs. Popular Landscape Plants: A Head-to-Head Comparison

Background

In 2003 the City of Santa Monica examined its outreach efforts toward the encouragement of landscaping which features climate-appropriate, water-efficient plant materials. It was found that, although the City had a very popular demonstration garden prominently located at City Hall, very few City property owners were actually installing such landscapes on their own property.

After some research it was concluded that there were two main obstacles:

~ The inability of residential property owners to see the demonstration garden at a large, public building as representing something that could be done on their property.

~ The inertia within the landscaping community to continue recommending and planting the plants that they were already familiar with rather than the native plants which had become, for practical purposes, “exotic” in their natural territory.

The Idea

To overcome these obstacles the City conceived the idea of a *comparison garden* composed of two adjacent, residential front yards typical of the City’s primarily residential character.

One front yard would feature California-native plants, a water-efficient drip irrigation system, a weather-sensitive irrigation controller, permeable paving, mulch and a system for capturing storm water runoff for groundwater recharge.

The other front yard would represent the typical front yard garden found in Southern California. It would feature the style of garden that has traditionally been planted in Santa Monica in modern times: Exotic plants from Northern Europe and the Eastern United States, a standard, user-controlled sprinkler irrigation system and no provision for runoff mitigation.

Costs, labor hours, plant growth, water consumption, greenwaste production and other environmental factors would be tracked and compared for both gardens.

Installation

We found an ideal site for the *comparison garden* in a group of bungalow houses, acquired some years back by Santa Monica College, and used by the college for offices. Two houses, side-by-side at 1718 and 1724 Pearl Street, were offered by the college for our project. The front yards of these two houses became the project area. Each yard is approximately 1900 square feet.

A professional landscape designer was hired to design both gardens and an IA Certified Irrigation Designer on the City staff designed the irrigation systems. LiveArt Plantscapes, a Los Angeles landscape contractor, was awarded the installation contract.

The installation in both yards called for the complete demolition of the existing landscape, export of the waste for recycling, application of soil amendments appropriate for the plant material, irrigation system installation, purchase of plants and planting. Construction was completed in March 2004. Construction cost for these activities was \$16,700 for the native garden portion (NG) and \$12,400 for the traditional garden (TG). The overall project was named *garden\garden*.

Additional work in the NG (not included in the above costs) included demolition and replacement of an existing access ramp, installation of permeable paving and installation of a rainwater recovery system.

Soil

Soil tests of both gardens revealed that the soil type was sandy loam (moderate permeability), poor in organic matter and highly compacted from decades of turf. The tests also indicated high alkalinity and high levels of heavy metals including zinc and copper. Preparation of the soil before planting included aeration with pumice, tilling to a depth of approximately 15 inches throughout all planting areas, and addition of non-deactivated sludge composted organic matter. Turf areas in the TG were tilled with pumice and organic matter to a depth of 6 to 8 inches.

Plant Selection

Plant lists for both gardens and material sources for other components are listed in Appendix 1.

Native Garden

For the NG only California natives were selected. It was felt that a key factor in keeping the native plants in scale with the small size of an urban front yard was the use of cultivars which do not become too big as they mature.

Traditional Garden

This garden includes a selection of plants that are commonly planted in Santa Monica and other areas of Southern California. Although this is the type of landscaping traditionally planted in Southern California, they are almost all exotics and not naturally equipped to thrive in Santa Monica's coastal Mediterranean climate.

Planting

Native Garden

The ideal time to plant California native plants is in late fall so they utilize the winter rainfall to grow healthy roots and leaves that will help them survive summer heat and drought. With irrigation backup, they can be planted through winter and spring. A key factor in planting is adequate plant spacing to accommodate mature plant growth and provide a natural appearance. Mulch is used in the NG to retain moisture in the soil, reduce weed growth and provide cover for the irrigation tubing.

Traditional Garden

Bedding areas are designed to provide a formal and full appearance within a relatively short time. Sod provides instant green. The optimum time to install these plants is the Spring. In their native regions, spring and summer rains help them grow in order to survive the fall and winter when they naturally become dormant. Although it would help keep weeds down, mulch was not applied as it is not normally used in this type of garden in Santa Monica.

Irrigation System

Native Garden

The system includes drip and microspray. There are three drip zones; one each for shallow, medium and deep-rooted plants. Subsurface PVC pipe brings water from each valve to Riser Units in appropriate parts of the

garden where it connects to 18mm poly tubing with inline emitters. The microspray zone operates on pop-up spray heads in two groups of native grasses. An early-model WeatherTRAK weather-based irrigation controller (WBIC) controls the system.

Traditional Garden

Pop-up sprayheads are used throughout with standard “head-to-head coverage.” There are six zones; three for turf and three for shrubs. Anti-siphon valves are used for both shrub and turf zones. An Irritrol Rain Dial controller was installed

Urban Runoff Control

Hazardous and toxic substances like fertilizers, pesticides, automotive fluids, pet wastes and trash are washed into the storm drain system and into Santa Monica Bay by rain, and dry weather flow from hosing paved areas and excessive irrigation. This liquid waste, called urban runoff, is the single largest source of water pollution in the Bay.

Native Garden

The drip irrigation system in this garden completely eliminates irrigation runoff. A dry creek bed in the garden and permeable pavement such as the decomposed granite in the parkway and the open-grid surfaces on the access ramp and driveway, allow water to return to the groundwater supply instead of running off the property. Rain gutters channel roof runoff into a decorative ceramic urn and then through a subsurface drainpipe under the dry creek bed into an infiltration pit located near the center of the garden.

Traditional Garden

Roof runoff flows mostly onto the landscape. Rainfall on the paved driveway and access ramp will flow to the street. The sprayhead irrigation system applies water at approximately three times the rate that the soil can accept it. Although multiple start times on the controller can mitigate this somewhat, runoff is inevitable. Runoff also occurs when the heads, placed at the edge of the planting area, adjacent to hardscape, become misaligned.

Maintenance Plan

Native Garden

After a one-year establishment period, maintenance in this garden was planned to consist of annual or semi-annual hand-pruning on selective plants

beginning after twelve months plus monthly checks of the irrigation system and trash removal. Additional mulch is to be added as necessary.

Traditional Garden

In this climate these plants require regular care with lots of water, fertilizers and pest management. Turf areas are mowed and edged weekly. Shrubs require monthly application of soil additives to acidify the soil. Annual plants will be replaced two to three times a year. Occasional treatments are required for diseases and insect attack.

The First Year (2004-05)

After expiration of the installing contractor's 90-day maintenance period, a landscape maintenance company was hired to maintain both landscapes. For the first year, both gardens were visited weekly. The company was asked to keep separate records of material cost, labor hours and greenwaste production for each garden and report that data monthly. Each garden is separately metered and water consumption, initially recorded at two-month intervals, was recorded monthly beginning in Nov 04. See <http://www.smepd.org/gardengarden> for details.

Irrigation

The WeatherTRAK WBIC installed in the NG did not have automatic settings appropriate for newly installed gardens. So the controller was set for "User with ET" with a program created by the landscape and irrigation designers. After three months the controller was reset to "Full Automatic."

Initially the Rain Dial controller in the TG was set to water every third day to establish the plants. After six weeks the controller was reset to a program based on a schedule generated at www.bewaterwise.com a consumer-oriented, zip code-based irrigation scheduler provided by the Metropolitan Water District of Southern California. It was decided to adjust the watering schedule every three months.

During the second month it was observed that the installation contractor had misplaced four out of the eight pop-up microsprays watering the two Carex beds in the parkway of the NG. Because Carex creates a tufted, uneven surface that does not show uneven watering the way turfgrass does, it was decided to delay relocation of the heads to see if the plant material could develop a root system that compensated for the poor irrigation distribution in this zone.

The controller program in the NG was fine-tuned once during the year for root depth. Unusually heavy rain during the winter of the first year resulted in the TG controller being shut off for a total of two weeks in a three-month period. The NG controller was not shut off for rain. The percent adjust feature was not used on either controller.

Comparative water consumption for the two gardens in Year 1 can be seen at <http://www.smepd.org/gardengarden> .

Plants

The plantings in both gardens fared well during the establishment period. During the first year four plants were lost in the NG and six in the TG. The NG losses were due to plants adjacent to the sidewalk being trampled and to theft. TG losses were due to foreground plants blocking irrigation from plants further back. Annual color in the TG was replaced once. Costs for plant replacement are shown at <http://www.smepd.org/gardengarden> .

Labor and Greenwaste

During the first year, both gardens were maintained weekly. Labor hours and greenwaste production are shown at <http://www.smepd.org/gardengarden> .

Chemicals and Fertilizer

In conformance with Santa Monica City policy, no chemical herbicides or insecticides were used on either garden. Blood meal was occasionally applied in the TG.

The Second Year (2005-06)

At the beginning of the second year the steering committee met and considered several possible alterations to the garden. It was decided to make no changes and simply gather one more year of data with the gardens fully established. Each garden continued to be separately metered and water consumption recorded monthly. See <http://www.smepd.org/gardengarden> for details.

Irrigation

The WeatherTRAK WBIC installed in the NG continued in *Full Automatic* mode and the TG controller was adjusted quarterly as before. Neither controller was shut off for rain. The percent adjust feature was not used on either

controller. Comparative water consumption for the two gardens in Year 2 can be seen at <http://www.smepd.org/gardengarden> .

Plants

The plantings in the NG garden grew well during the year with some loss of Heucheras due to wind and trampling from nearby sidewalk traffic. One Ceanothus Dark Star was lost to an insect infestation. Campanula and Rhododendron plants in the TG continued to suffer from irrigation distribution problems with one Rhododendron lost. Parkway turf in the TG continued to suffer from foot traffic near the entrance to the building. Annual color in the TG was replaced once. Costs for plant replacement are shown at <http://www.smepd.org/gardengarden> .

Labor and Greenwaste

During the second year, both gardens continued to be maintained weekly. Labor hours and greenwaste production are shown at <http://www.smepd.org/gardengarden> .

Chemicals and Fertilizer

In conformance with Santa Monica City policy, no chemical herbicides or insecticides were used on either garden. Blood meal was occasionally applied in the TG.

The Third Year (2006-07)

At the beginning of the third year the steering committee once again met and considered several possible changes in the garden. It was decided to make three changes:

1. Reduce the monthly maintenance at the NG to quarterly.
2. Install a WBIC at the TG.
3. Install Run Time hour meters on one valve in each garden.

It was also decided to look into the possibility of recording the carbon output of the two gardens.

Irrigation

A Toro Intellisense WBIC was installed in the TG in June 2006. It was initially set to *Full Automatic* mode. With the coming of unusually hot, humid weather in July the turf zones began to show severe stress. The Toro hotline was called and a technician suggested several programming adjustments which were followed.

Because both gardens would now have WeatherTrak WBICs which do not have any historical tracking ability, hour-meters were installed on one shrub zone in each garden. The idea being to have some record of actual total run time for a give month. Due to technical difficulties, these devices were not installed until Mid July. See <http://www.smepd.org/gardengarden> for data collected thus far.

As of this writing (Aug 06) no adjustments have been made to the NG controller and neither controller has been shut off for rain. The percent adjust feature has not been used on either controller. Each garden continued to be separately metered and water consumption recorded monthly. See <http://www.smepd.org/gardengarden> for details.

Plants

The plantings in the NG garden grew very well during the year with loss of one Dudleya due to unknown causes. One Arctostaphylos and two Iris's due to trampling. There were problems with the parkway turf in the TG related to weather and the change in the irrigation controller (see above). Some portions of the turf recovered and others did not. The steering committee decided to leave the turf as-is rather than overseeding or patching with sod.

A significant renovation was done in the TG including replacement of annual color and Companula groundcover. Costs for plant replacement in Year 3 are shown at <http://www.smepd.org/gardengarden> .

Labor and Greenwaste

Maintenance of the NG was reduced to quarterly visits at the beginning of the second year. The TG continues to be maintained weekly. Labor hours and greenwaste production are shown at <http://www.smepd.org/gardengarden> .

Chemicals and Fertilizer

In conformance with Santa Monica City policy, no chemical herbicides or insecticides were used on either garden. Organic fertilizer, blood meal and soil conditioner were occasionally applied in the TG.

Measuring Net Carbon Output

As of this writing (August 2006), research into methods of measuring the carbon emissions of the two gardens is being conducted with the aim of measuring the output of the plants and well as the people and machines that maintain them. See <http://www.smepd.org/gardengarden> for data collected thus far.

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NOTE: This document was written in August 2006. *garden\garden* is an ongoing project. For the latest information and more comprehensive data, visit us on line at <http://www.smepd.org/gardengarden> Or write to *garden\garden*, City of Santa Monica Environmental Programs Division, 200 Santa Monica Pier, Suite K, Santa Monica California 90401

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Appendix 1

Native Garden Plant List

1. *Arctostaphylos densiflora* 'Howard McMinn'

A moderate size, four to five foot mounding shrub with shiny, green leaves and delicate white to pinkish, urn-shaped flowers and exceptionally attractive smooth, reddish bark.

2. *Arctostaphylos uva-ursi* 'Point Reyes'

Prostrate groundcover, 18 inches to two feet high with tightly spaced dark green leaves and pinkish flowers.

3. *Carex praegracilis*

A meadow sedge with six to eight inch high, bright green, tufted leaves. This sedge spreads by root running.

4. *Carex tumulicola*

A sedge with shiny, dark green leaves forming an eighteen inch mound.

5. *Ceanothus* 'Concha'

A moderate size, four to five foot mounding shrub with medium sized, dark green leaves and spring blooming cobalt blue flowers.

6. *Ceanothus* 'Dark Star'

A moderate size, four to five foot rigidly mounding shrub with small, tight, dark green leaves and spring blooming dark, violet blue flowers.

7. *Ceanothus* 'Snowball'

A five to six foot tall, upright shrub with large, bright green leaves and spring blooming white flowers.

8. *Deschampsia caespitosa* 'Northern Lights'

A cultivated variety of California native grass with bright golden variegations along six to eight inch long, clumping leaf blades.

9. *Dudleya hassei*

A native succulent with clustered, silver and purple tinged, pointed, rounded leaves and tall, thin flower stalk.

10. *Dudleya lanceolata*

A coastal succulent with dark green, fleshy leaves and yellow or red flowers on long stems.

11. *Dudleya pulverulenta*

A twelve to fifteen inch wide, coastal succulent rosette of gray, glaucous leaves and a thick flower stalk.

12. *Encelia californica*

A three foot high shrub with dark green leaves and spring blooming, yellow daisy flowers. Winter deciduous.

13. *Epilobium californicum*

A perennial with gray-green leaves and bright orange to yellow, fall blooming tubular flowers. Hummingbirds love this plant.

14. *Heuchera* 'Wendy'

A hybrid variety of *Heuchera* with tall clusters of peachy-pink flowers. All *Heucheras* are very attractive to hummingbirds.

15. *Heuchera maxima*

A Channel Islands native perennial with clumping, heart-shaped dark green leaves and tall clusters of small whitish to pinkish flowers from spring into summer.

16. *Iris* 'Pacific Coast Hybrids'

A hybrid of California native iris with dark, evergreen, clumping strap leaves and assorted colors of flowers which bloom in spring.

17. *Juncus effusus* var. *Pacificus* 'Quartz Creek'

A Pacific Coast Rush with three to four foot tall, dark green leaves.

18. *Juncus patens* 'Elk Blue'

A hybrid variety of Gray Rush. This is a two foot high clump with a distinct bluish tint to the green foliage.

19. *Lyonothamnus floribundus asplenifolius*

A Channel Islands native twenty to thirty foot tall evergreen tree with scallop-edged leaves and unusual red-brown, shredding bark.

20. *Muhlenbergia rigens*

A native grass, four feet tall with bright green, clumping leaf blades and six foot tall yellow-purplish flower spikes in the fall.

21. *Nasella pulchra*

A needle grass with four inch long, silky, golden bristle flower heads which blow gracefully above two foot high, bright green leaf blades. Summer dormant.

22. *Penstemon centranthifolius*

A coastal native, three foot tall perennial with gray-green, long-shaped leaves and tall spikes of spring/summer blooming, bright red tubular flowers.

Penstemon

flowers are a particular favorite of hummingbirds.

23. *Penstemon heterophyllus* 'Bluespray'

A hybrid variety of the California native; two foot tall perennial with glossy, bluish-green irregular shaped leaves and spikes of reddish purple to deep blue flowers in spring.

24. *Penstemon spectabilis*

A four foot tall perennial of grayish-green, stem hugging leaves and rose to purplish flowers which bloom in spring and summer.

25. *Philadelphus lewisii*

A five foot tall, fountain shaped shrub with dark green leaves and white blooming flowers in spring. Winter deciduous.

26. *Rhamnus californica* 'Mound San Bruno'

A hybrid variety of native Coffeeberry is a six foot tall mound of broad, flat, dark green leaves. Flowers are fairly insignificant in summer but large, red berries are a special treat for local bird populations in the fall.

27. *Ribes sanguineum glutinosum* 'Tranquillon Ridge'

A hybrid variety of native Currant. Ten foot tall, shrub with maple-like, dark green leaves and drooping, deep pink flower clusters in spring and summer. Winter deciduous.

28. *Salvia apiana*

A four foot tall shrub with extremely aromatic, silvery-gray leaves and spring blooming lavender-tinged white flowers. This sage has been historically used by California Native Americans for sweat lodge ceremonies.

29. *Salvia clevelandii* 'Whirly Blue'

A hybrid variety of Blue Sage it is a three foot, compact shrub with gray-green, fragrant leaves and dark blue flowers. All California native sages are a bountiful food source for bees and hummingbirds.

30. *Salvia clevelandii* 'Winifred Gilman'

A hybrid variety of native Blue Sage is a three foot arching shrub of gray-green, toothed, very aromatic foliage and dark violet-blue whorls of flowers in summer.

31. *Salvia leucophylla* 'Frankensense'

A hybrid variety of native prostrate Gray Sage, it has gray leaves and pinkish-purple flowers in spring.

32. *Salvia spathacea*

An eighteen inch high, mat-forming perennial of large, fuzzy, dark green leaves and eight to twelve inch spikes of purplish-blue flowers in spring. More shade tolerant than other sages. Extremely attractive to hummingbirds.

33. *Sisyrinchium bellum* and *Californicum*

A California native, one foot high, grassy perennial with bluish green leaves and either purplish-blue or yellow flowers on tall stems.

Naturalizes – Freely colonizes itself through seed.

34. *Sphaeralcea* 'La Luna'

A white flowering cultivar of native perennial Mallow with gray-green, scalloped, fuzzy leaves and a classic apple blossom shaped white flower.

Native Garden Materials List

Item	Type / Model	Brand / Source	Address
Planting			
Trees / Shrubs / Groundcover	California Native*	Theodore Payne Foundation	www.theodorepayne.org
		FK Nursery, Inc.	Trade only
Mulch	Xerimulch	Kellogg Supply	www.kelloggarden.com
Dry Creek			
Boulders	Malibu	Bourget Brothers	www.bourgetbros.com
Gravel	Del Rio aggregate	Bourget Brothers	www.bourgetbros.com
Decomposed Granite		Bourget Brothers	www.bourgetbros.com
Accessway			
Paving	GravelPave2	Invisible Structures	www.invisiblestructures.com
Bridge	ChoiceDek II	Advanced Environmental Recycling Technologies, Inc.	www.choicedek.com
Rain Catchment			
Infiltration Pit	D-Raintank	Atlantis Water Management	www.atlantiscorp.com.au
Rain chain	Copper Rain Chain	Susan Herbert Imports	503/248-0886
Furniture			
Concrete bowl	Garden Maker	San Marcos Growers	www.smgrowers.com
Pottery planters and urns		World of Pottery	626/961-4768
Plastic lumber for sign post	Trex	Trex Company	www.trex.com
Plastic lumber for sign placard	Codemo	Priema Plastics	www.codemo.com
Irrigation Equipment			
Controller	WeatherTrak	Hydropoint Data Systems	www.hydropoint.com

Master Pressure Regulator	Model 600	Wilkins	www.zurn.com
Filter	T-007C-XXX-E	API	www.agproducts.com
Valves	PGV-101A	Hunter Industries	www.hunterindustries.com
Zone Pressure Regulator	PRV075	Bermad	www.bermad.com
Microspray Heads / Nozzles	1806 / O-Jet	Rain Bird / Olson Industries	www.rainbird.com www.olsonirrigation.com
Drip Tubing	SFPC-BR-7212-01	Agrifim	www.agrifim.com
Drip Tubing Connectors	Easy Fit	Rain Bird	www.rainbird.com

* California-friendly garden resources

Rancho Santa Ana Botanic Garden	www.rsabg.org
Theodore Payne Foundation	www.theodorepayne.org
Tree of Life Nursery	www.treeoflifenuresery.com
California Native Plant Society	www.cnps.org

Additional resources

City of Santa Monica	www.smped.org/landscape	
Metropolitan Water District	www.bewaterwise.com	Virtual garden tours

Traditional Garden Plant List

1. Acer palmatum 'Atropurpureum'

A native of Japan and Korea, small scale tree to 20 feet with purplish-bronze to bronze leaves. Insignificant flower, winged seed capsule. Winter deciduous.

2. Alstromeria hybrid

Evergreen varieties of 18 to 24 inch high perennials with light green leaves and lily-like flowers of many colors.

3. Asplenium bulbiferum

A native fern from the rainforest regions of Australia and New Zealand with finely cut, light green fronds to four feet long.

4. *Astilbe x arendsii*

Short lived perennial with finely cut, bright green leaves and long-stemmed plumes of small pink, white or red flowers. Winter dormant.

5. *Azalea 'Fielders White'*

A Southern Indica Hybrid which is more sun-tolerant than the original Belgian Indica Hybrids of the east coast regions.

'Fielders White' has white flowers.

6. *Azalea 'Formosa'*

A Southern Indica Hybrid which is more sun-tolerant than the original Belgian Indica Hybrids of the east coast regions. 'Formosa' has rose-colored flowers.

7. *Begonia 'semperflorens'*

Six to eight inch high fibrous flowering bedding plants with very soft leaf, stem and flower in colors ranging from deep maroon to white. Bedding Begonias are treated as annual (seasonal) plants, which are replaced two to three times a year.

8. *Campanula poscharskyana*

A spreading, eight inch high perennial ground cover with deep green leaves and star shaped lilac-blue, lavender or white flowers in spring and summer. Spreads by root runners to cover soil.

9. *Eucalyptus globulus* (existing)

10. *Fuchsia x hybrida*

An evergreen hybrid variety of soft-woody, two foot high, loose shaped shrub with dark green leaves and pinkish-violet bell shaped flowers.

11. *Gardenia augusta 'August Beauty'*

A hybrid variety of a native shrub from China and Japan, growing to five feet high with shiny green leaves and highly fragrant white flowers in summer.

12. *Hemerocallis* (hybrids)

An evergreen, tuberous, clustering, perennial with 18 inch high green strap leaves and various colored lily-like flowers on tall stems.

13. *Hydrangea macrophylla* 'Nikko Blue'

A hybrid variety of the native shrub from Japan, it grows to six feet high with large toothed green leaves and large white to lavender blue flower clusters which bloom in the summer and fall. Winter deciduous.

14. *Impatiens* (Bedding)

Annual plant, six to 15 inches high with soft, fibrous green leaves and stems and various colors of flower during summer. Plant typically looks very poor in winter.

15. Marathon #1 Turf

16. *Rhododendron*

A hybrid variety of a six foot high shrub with large, thick, dark green leaves and large clusters of white to rose-red flower clusters throughout spring and summer.

17. *Rosa* 'Angel Face'

A lavender flowering *Floribunda* variety.

18. *Rosa* 'Iceberg'

An evergreen white flowering *Floribunda* variety.

19. *Rosa* 'Queen Elizabeth'

A pink-blend *Grandiflora* variety.

20. *Syringa vulgaris* 'Lavender Lady' (Lilac)

An Eastern Europe native, ten to 15 feet tall shrub with roundish green leaves and vertical clusters of pinkish to lavender, highly fragrant flowers in spring. Winter deciduous.

Traditional Garden Materials List

Item	Type / Model	Brand / Source	Address
Planting			
Trees / Shrubs / Bedding plants	Traditional / Seasonal	FK Nursery, Inc.	For sale to trade only. See your landscape professional for details.
Sod	Marathon I	Southland Sod	www.sod.com
Furniture			

Plastic lumber for sign post	Trex	Trex Company	www.trex.com
Plastic lumber for sign placard	Codemo	Priema Plastics	www.codemo.com
Irrigation Equipment			
Controller	Rain Dial	Irritrol	www.irritrolsystems.com
Pressure Regulator	Model 600	Wilkins	www.zurn.com
Valves	ASV-075	Hunter Industries	www.hunterindustries.com
Sprayheads	1804	Rain Bird	www.rainbird.com