PALISADES GARDEN WALK + TOWN SQUARE

Sustainable Landscapes Workshop | January 29, 2010

prepared by james corner field operations

SUSTAINABLE LANDSCAPES

1 What is an Environmentally Sustainable Landscape? - Bob Perry

2 Context for Sustainable Landscapes in Santa Monica:
A Legacy of Great Plants + People - John Greenlee

3 Palisades Garden Walk + Town Square:
A Case Study in Sustainable Park Design -James Corner Field Operations

1 WHAT IS AN ENVIRONMENTALLY SUSTAINABLE LANDSCAPE?

1 WHAT IS AN ENVIRONMENTALLY SUSTAINABLE LANDSCAPE?

ECOLOGICAL SUSTAINABILITY

"Sustainability" is defined as meeting the needs of the present without compromising the ability of future generations to meet their own needs. - Brundtland Comission

- **To preserve and restore a site's ecological sustainability is to preserve and restore its ecosystem services and help reduce energy and resource costs.**
- **Modeling Park Landscapes after healthy ecological systems increases the ecosystem services provided.**
- **Interconnected systems key to ecological sustainability:**
- Vegetation: Selection + Abundance + Diversity
- Soils
- Climate and Water

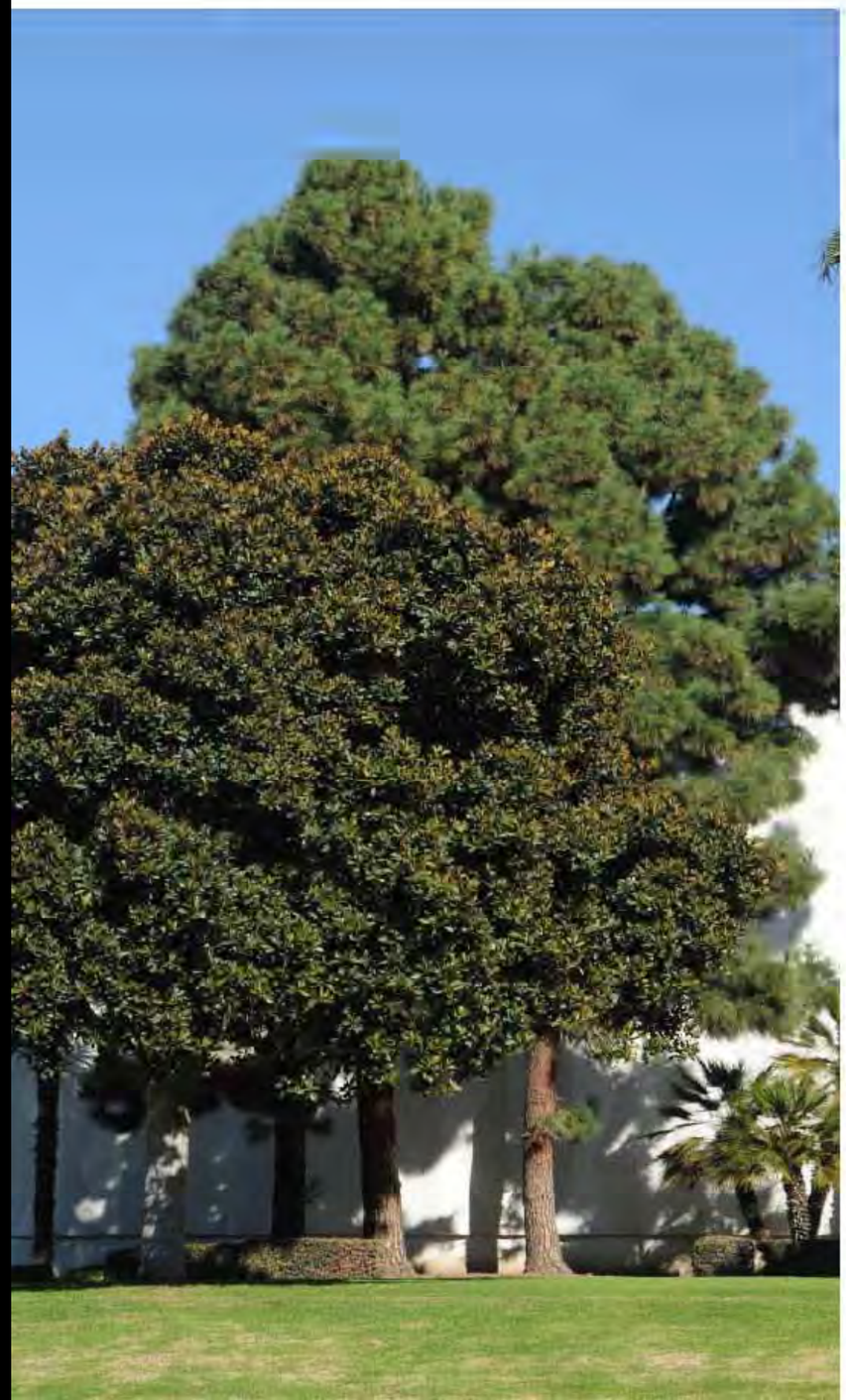
COST BENEFITS

Considering plants and plant communities, a sustainable landscape is achieved as long as there is more energy accrued in the biomass of plants than is consumed in the process of designing, installing, and maintaining the landscape.

- This guideline is commonly measured by the amount of energy sequestered in the biomass of plants relative to the energy use required for design, installation, and maintenance.

Life Sustaining Benefits of Plants

Energy capture, Carbon sequestration, Oxygen release



Each pound of biomass contains enough energy to sustain one person for one day.

1,930 Calories worth of food energy

7,655 Btu's worth of heat energy

2.25 kilowatt hours of electrical energy

Every pound of biomass stores approximately 1/2 pound of Carbon.

Every pound of biomass produced releases approximately 1 pound of oxygen into the atmosphere.

Costs Associated with Maintaining Landscapes
Energy Use for supplying water, mowing, fertilizing, vehicles

Water Needs of Plants:

C_3 Plants (Most Plants) use 50-110 gal. of water for 1# of Biomass
C_4 Plants (Warm S. Grasses) use 30-42 gal. of water for 1# of Biomass
CAM (Succulents) require 6-7 gallons of water to produce 1# of Biomass

Operating Energy to provide water:

Approximately 9.2 Btu's of energy are required per gallon to supply spray irrigation systems at 60 gallons per minute at a pressure of 80 psi

Approximately 4.1 Btu's of energy are required per gallon to supply drip irrigation systems at 60 gallons per minute at a pressure of 35 psi

Embodied Energy for fertilizer:

1 pound of 16-6-8 fertilizer requires approximately 35, 950 Btu's of energy
1 application of 16-6-8 fertilizer requires 34.5 Btu's of energy/square foot.

Embodied Energy for Gasoline/Diesel:

1 gallon of gasoline contains 124,000 Btu's of energy
1 gallon of diesel contains 140,000 Btu's of energy

1 Gallon of gasoline/week = 52 x 124,000 Btu's = 6,448,000 Btu's of energy
2 Gallons of gasoline/week = 52 x 248,000 Btu's = 12,896,000 Btu's energy

Landscape Benefits: Benefits to Costs

Turf Grass + Spray Irrigation

1 Acre of turfgrass

Biomass after 10 years Growth:

Turf grass biomass value: 10,890#/Acre

10,890# x 7,655 Btu's = 83,362,950 Btu's

(Turf grass in Santa Monica needs 44 inches of supplemental water per year).

Energy Costs per Year:

Irrigation: 3.5 a.f./year = 10,526,250 Btu's
Fertilizer: 2x/year = 3,127,650 Btu's
Mowing: 20 gal/year = 2,480,000 Btu's
Vehicles: 60 gal/year = 7,440,000 Btu's

23,573,900 Btu's

After 3.5 Years of maintenance - costs exceed turfgrass benefits

(83,362,950/23,573,900 = 3.56 years)

Landscape Benefits: Benefits to Costs

Plant Native & Adapted Plant Species - 1.5 A.F. Water + Drip Irrigation

1 Acre of coastal landscape

Biomass after 10 years Growth:

Trees:	10,500#
Shrubs/Succulents:	2,890#
Ground covers:	200#
	13,590#

13,590# x 7,655 Btu's = 104,031,450 Btu's

Energy Costs per Year:

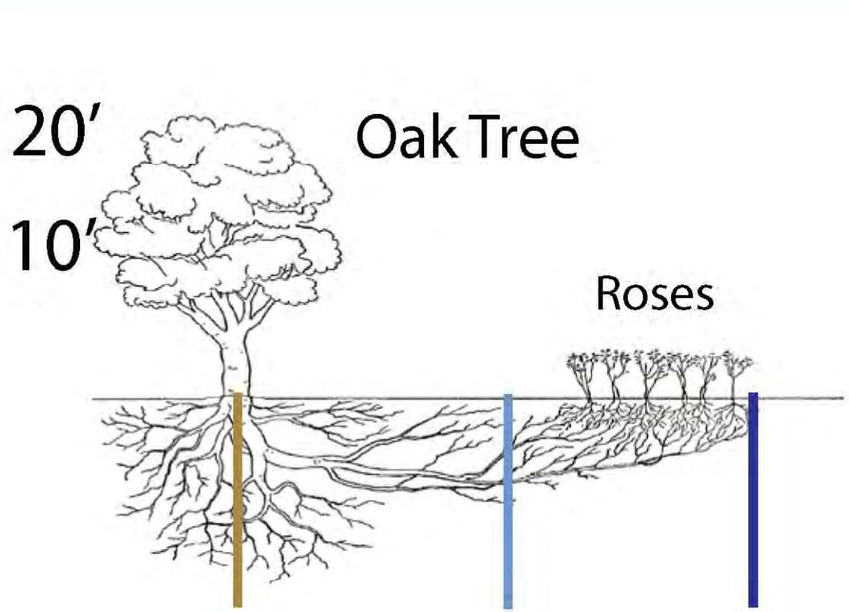
Irrigation: 1.5 a.f./year =	2,255,650 Btu's
Fertilizer: 0/year =	0 Btu's
Mowing: 0/year =	0 Btu's
Vehicles: 25 gal/year =	3,100,000 Btu's
	5,355,625 Btu's

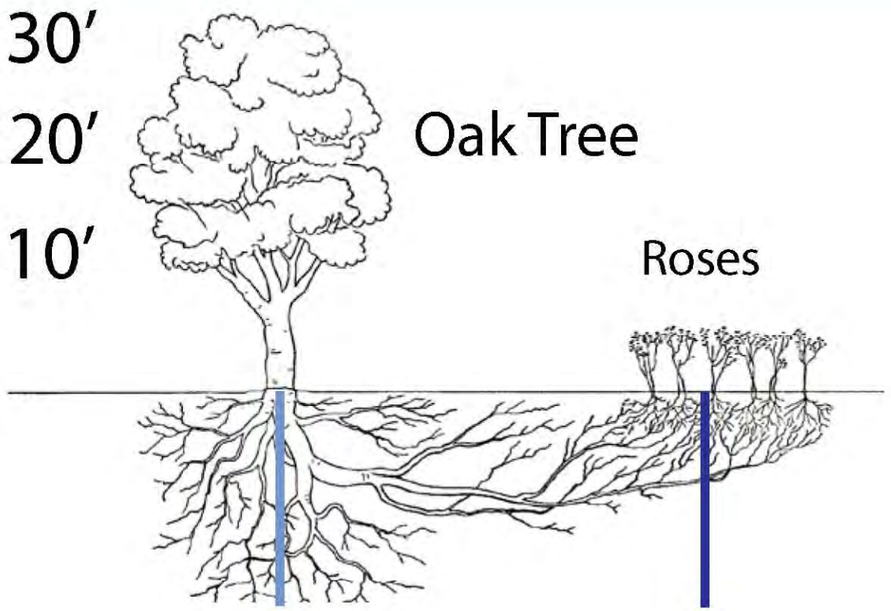
After 19.4 Years of maintenance - costs exceed landscape benefits

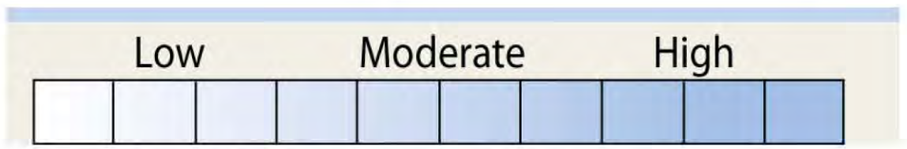
(104,031,450/ 5,355,625 = 19.4 years)

Water Use by Plants

Water Economy of Plants, H. L. Shantz







1. Plants grow to the limits of available moisture.
2. Plants grow well within a range of moisture availability.
3. Plants grow proportionally to the availability of moisture.
4. Plants will use water continuously as long as there is available moisture throughout the growing season.

Water Use by Plants

Water Economy of Plants, H. L. Shantz

5. C_3 plants use 50-114 gallons of water to add 1 pound of biomass; C_4 plants require 30-42 gallons to add 1 pound biomass and CAM plants require 6-7 gallons of water to add 1 pound of biomass.

SUMMARY RECOMMENDATIONS:

Select plants adapted to the zone - both native and adapted species.

Plant for optimum levels of biomass accrual and diversity.

Design to capture and infiltrate rainfall and/or use drip irrigation.

Reduce activities that use fossil fuels - gasoline and chemical fertilizers/pesticides.

Improve soil conditions through mulching and natural composting.

Native vs. Non-native

- The range of native plants common to coastal bluffs and slopes of Santa Monica is heavily of sage scrub composition. Occurrences of chaparral, oak woodland and riparian species are less common, and are often found on foothill topography and further from the coast.

- On-site soil conditions limit many native species that require well-drained conditions and that tolerate high pH levels and nutrient imbalances.

- A diverse palette of non-native plants, particularly from oth-er coastal habitats, can provide high levels of sustainable value as well adaptability to soil and climate conditions. These can be organized into associations and be combined with natives in ways that are modeled after healthy ecological systems.

Coastal Sage - Palos Verde Peninsula

Coastal Sage
Rhus integrifolia - Lemonade Berry

Coastal Sage
Encelia californica - Coastal Encelia

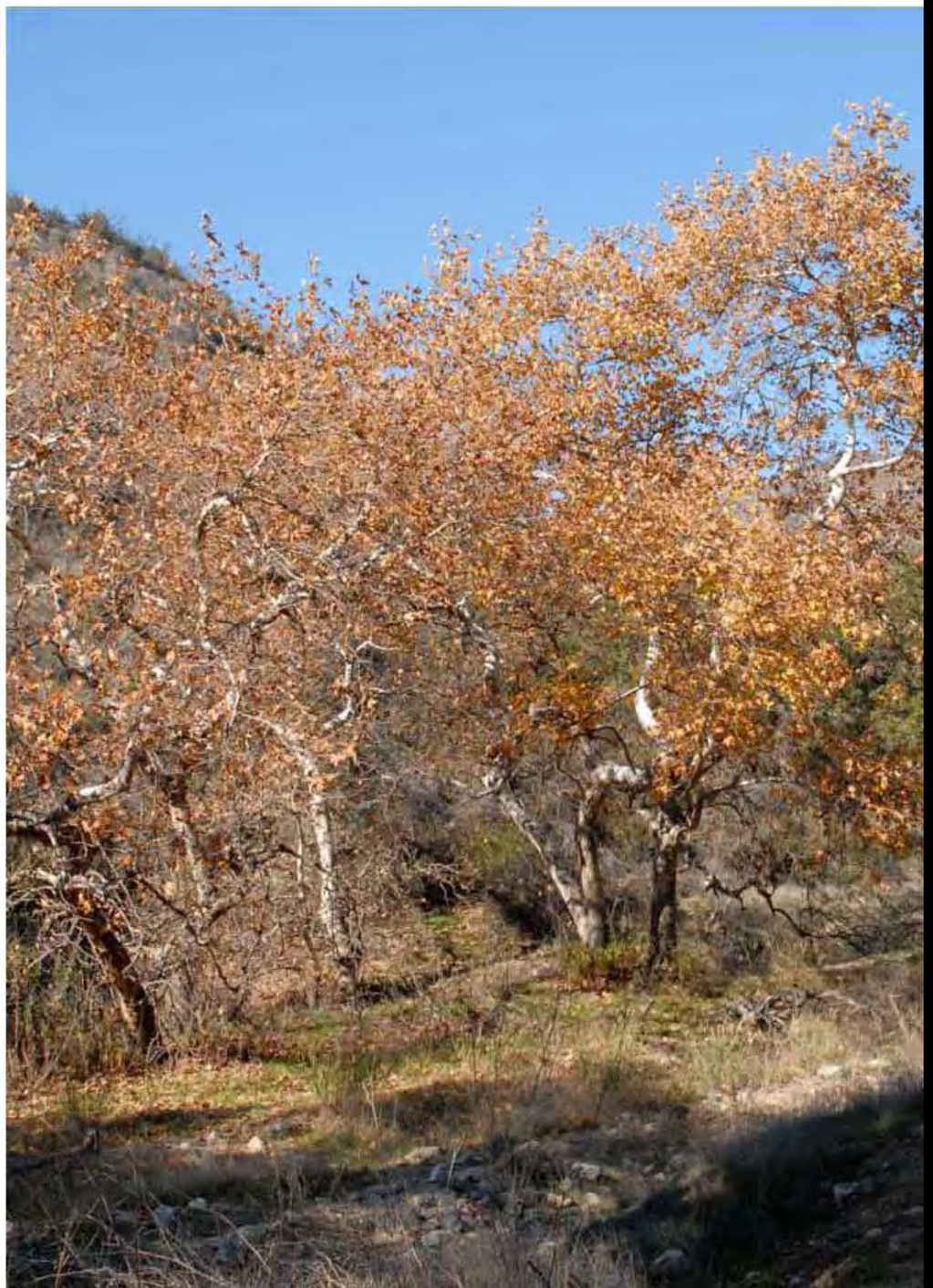
Coastal Sage
Salvia apiana - White Sage

Coastal Sage
Salvia mellifera - Black Sage

Coastal Sage
Salvia leucophylla - Purple Sage

Chaparral
Heteromeles arbutifolia - Toyon

Riparian Community
Platanus racemosa - Western Sycamore



Oak Woodland
Quercus agrifolia - Coast live oak

Sycamore Mix

Oak Mix

Pine Mix

Existing Trees