

Recommendations for Restoration of Monarch Butterfly Winter Habitat at Norma B. Gibbs Park, Huntington Beach, CA

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1.0 Introduction

1.1 Scope: During 2007, the City of Huntington Beach, in cooperation with concerned citizens, initiated an effort to remove diseased trees and restore monarch butterfly winter roosting habitat at Norma B. Gibbs Park. The Creekside Center for Earth Observation (CCEO) was contracted by private citizen Leslie Gilson to visit the site and provide recommendations for the habitat restoration effort based on the best available science concerning monarch habitat needs. Herein we provide eight recommendations, with the primary goal of reestablishing tree stand structure that attracts and protects a local monarch population. This report does not constitute a comprehensive site stewardship plan, but rather it provides practical recommendations for initiating the site restoration. Reestablishment of suitable stand structure calls for many years of ongoing management, and will require solid scientific foundations together with ongoing commitment by the City of Huntington Beach and the public.

1.2 Background: Each winter monarchs from throughout western North America migrate to winter habitat along the California coast, where forest stands provide protection from extreme weather. Scientific research on suitable stand structure (Leong 1990, Leong *et al.* 1991, Weiss, *et al.* 1991) and conservation management (Weiss 1998, Weiss and Luth 2002, Weiss *et al.* 2005) provide the foundations for site specific stewardship planning (Appendix A, Stewardship of Monarch Butterfly Winter Habitat in California). Historically, stands of eucalyptus trees, primarily Blue Gum (*Eucalyptus globulus* Labill.), supported overwintering populations of monarch butterflies (*Danaus plexippus* L.) at Norma B. Gibbs Park in Huntington Beach, CA. During 1993, in response to concern about diminished monarch winter habitat, conceptual and tree remediation plans were developed for the City (Heimsberger Hirsch & Associates 1993, David Marriott personal communication) and an effort was initiated to restore monarch winter habitat at Gibbs Park. Ongoing monitoring shows that monarch populations have remained extremely low in recent years (Table 1). During the summer of 2007, a large number of diseased Bluegum trees at Gibbs Park were removed by the City (Randy Menzel personal communication). City officials and concerned citizens (Appendix B, Contact Information), in consultation with butterfly and tree experts, initiated a new restoration effort designed to reestablish a healthy overwintering population of monarch butterflies at Gibbs Park (Appendix C, Orange County Register News Article from September 23, 2007).

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Table 1. Monarch butterfly Thanksgiving population estimates for 1997-2006 at Norma B. Gibbs Park. Each year counts are obtained to provide an index of the status of monarch populations throughout California (courtesy of David Marriott, Monarch Foundation).

1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
350	8	7	0	8	---	1	20	60	---

2.0 Recommendations

2.1 Recommendation One: Plant a mixed stand of trees to reestablish suitable stand structure for monarch butterfly winter habitat.

Design: We recommend a planting design at Gibbs Park with three zones (Figure 1):

- 1) Core zone:** a relatively open mixed stand (4-5 species), with 20-30 ft (6-9 m) irregular spacing between tree centers, resulting in variable canopy density that will provide a diversity of wind shelter and solar exposure microsites for the monarchs.
- 2) Gap zone:** two irregular-shaped gap areas, approximately 20-50 ft diameter, in which canopy openings surrounded by multiple rings of trees provide protected open and forest edge microsites within the core zone.
- 3) Windbreak zone:** a denser mixed stand (4-5 species), with ~20 ft (6 m) spacing between tree centers, resulting in protection of the core zone from wind and solar exposure.

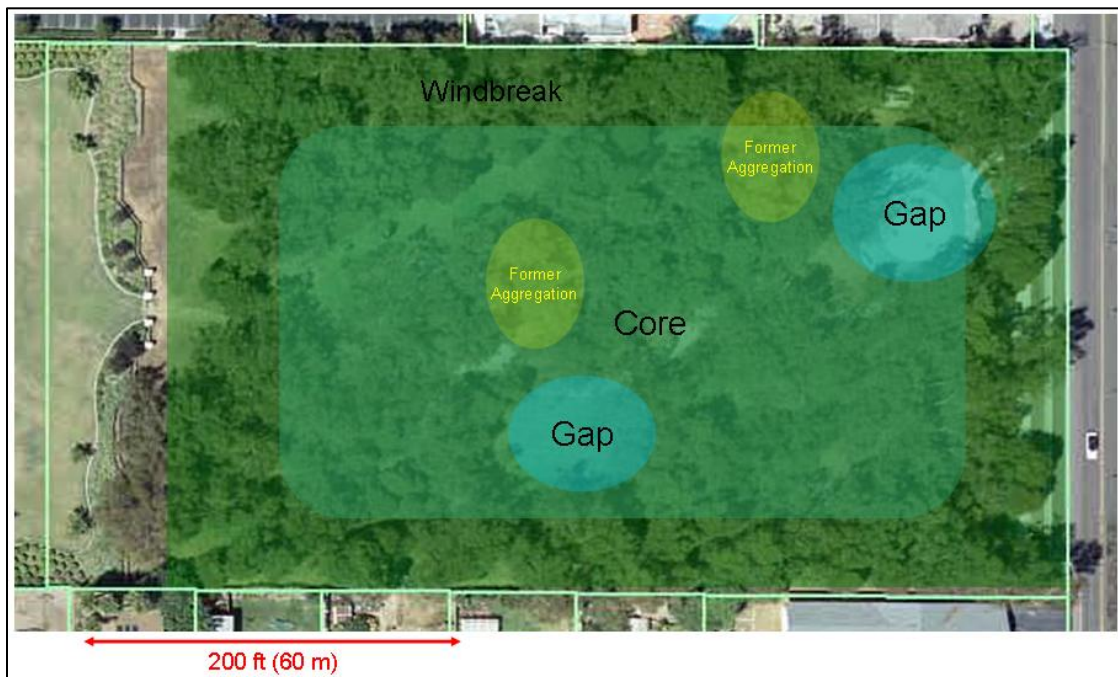


Figure 1. Planting design for Norma B. Gibbs Park restoration.

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Both the more open core zone (Figure 2A) and the denser windbreak zone (Figure 2B), should be planted with sufficient space between trees to ensure healthy, well-formed crowns, and incorporating established trees where possible. Planting of mixed species will help protect against pests and provide the heterogeneity of canopy microsites needed by the monarchs. Some adjacency of the same species should not cause problems. In a planting of four or more species, the loss of one species will not unduly modify habitat characteristics or greatly impair the effectiveness of the windbreak. Plantings can be offset by +/- 3 ft (1 m) to avoid row-like appearance. The multi-species planting will also help to minimize visual regularity. Canopy gaps will provide additional heterogeneity of protected open areas and forest edge within the core zone. The windbreak zone should be planted in a two to three row zig-zag pattern, creating approximately 60 ft (~18 m) of solar and wind break.

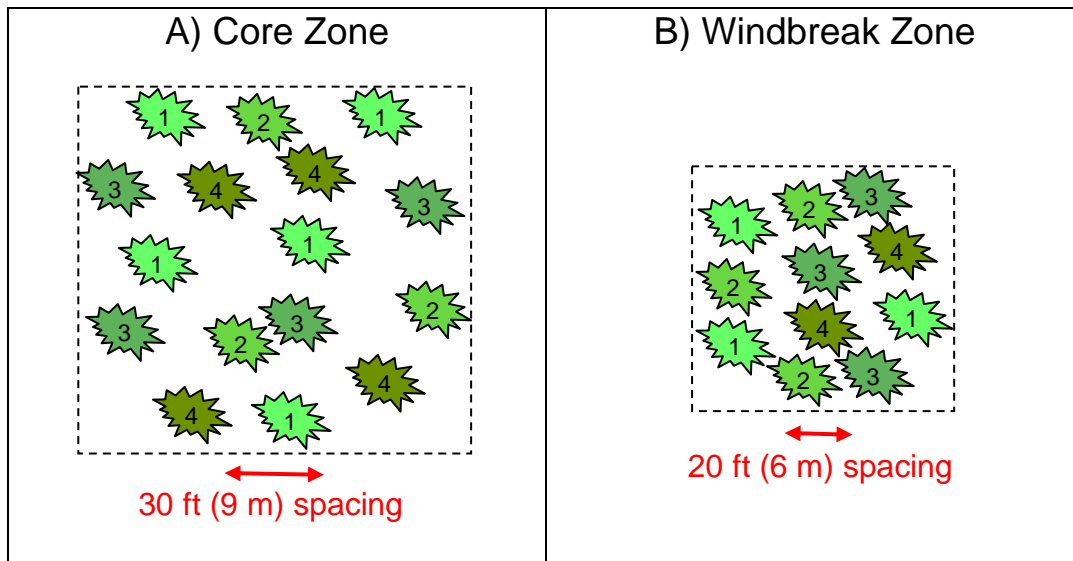


Figure 2. Planting considerations: A) The core zone should have irregular spacing of 4-5 species with 20-30 ft (6-9 m) spacing between tree centers. B) The windbreak zone should have a zig-zag spacing of 4-5 species, with approximately 20 ft (6 m) spacing between tree centers, and with two to three rows of windbreak trees ~ 60 ft (18 m) surrounding the core zone.

What makes good monarch winter habitat? Monarchs literally track suitable microsites that provide protection from extreme weather, and move between microsites depending upon changing meteorological conditions. As such, we cannot predict exact locations of aggregations, but rather we can provide a variety of microsites that fall within the known range required by monarchs, and observe what the monarchs choose. Monarchs prefer sites that are well protected from wind and excessive solar exposure, though some solar exposure is required for the butterflies to warm up. Typically the largest monarch aggregations are observed in well-protected tree stands near modest-sized canopy gaps where limited solar exposure prevents them from becoming overly active and depleting fat reserves. As solar angles shift more toward the zenith during the spring, the monarchs receive increased solar exposure, with increased temperatures triggering the spring migration. Suitable winter habitat for monarchs is primarily dependent upon suitable stand structure, rather than on the exact mix of tree species present, though some tree species produce better stand structure than others.

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Role of Arborist: Success of the Gibbs Park restoration depends upon the expertise of a skilled arborist for planning, planting, and ongoing maintenance of the grove. The arborist, in consultation with butterfly experts and city planners, should be assigned the role of making the final selection of tree species to be planted and deciding the exact locations of planting based on the monarch butterfly needs described herein and in keeping with sound principles of urban forestry. The role of the arborist should continue during subsequent planting and ongoing management, and should include oversight of the planting, periodic evaluation of tree health and risks to public safety by branch or treefall, and recommendation of management in terms of irrigation, fertilization, pruning, tree removal, additional planting, and pest control.

Species Choice: For the core zone we recommend planting a mix of 4-5 tree species, with a focus on tall to medium height eucalyptus species from Australia (Table 2). Eucalyptus species, while not native to California, have various advantages: they produce excellent wind and solar protection and their bark, branches, and leaves provide excellent physical substrate for roosting; they are relatively fast growing and attractive; they are resistant to disease (with notable exceptions); and various species grow well in the California Coastal climate of Huntington Beach. The main disadvantage of eucalyptus trees is that they can displace native California species; however this should not be a problem in the urban environment of Gibbs Park, where precautions can be made to prevent unintentional spreading. For the windbreak zone, we recommend planting a mix of eucalyptus, pines, and low growing evergreens (Table 2) with the latter toward the outer perimeter, especially on the outer west edge. Although Coast Live Oaks (*Quercus agrifolia* Née) grow slowly and would add a native species to the eventual mix, other low to mid height 20ft (6 m) evergreen/flowering trees can be considered as well. The lower growing species can be planted in a matrix between taller canopy trees to provide wind and solar protection across a full range of height.

Table 2. Candidate tree species for planting at Norma B. Gibbs Park.

Scientific Name	Common Name	Description	Zone
<i>Corymbia ficifolia</i> (F. Muell.) K.D.Hill & L.A.S.Johnson (formerly <i>Eucalyptus ficifolia</i> F.Muell.)	Red-Flowering Gum	to 25 ft (8 m); dark glossy leaves and dramatic sprays of red flowers (begins flowering at 7 years); Australian.	core, windbreak
<i>Eucalyptus citriodora</i> Hook.	Lemon-Scented Gum	to 100 ft (30 m); light green leaves and citrus-like scent; Australian.	core
<i>Eucalyptus globulus</i> Labill.	Tasmanian Blue Gum	to 180 ft (55 m); heavily peeling bark and draping leaves; no additional planting in Gibbs Park recommended, however existing trees should be maintained; Australian.	core, windbreak
<i>Eucalyptus leucoxyton</i> F.Muell.	Yellow Gum, White Ironbark	to 100 ft (30 m); light gray or cream-colored bark and draping branches; small white, pink, or red flowers; Australian.	core
<i>Eucalyptus nicholii</i> Maiden & Blakely	Narrow-Leaved Black Peppermint	to 50 ft (15 m); Australian.	core, windbreak
<i>Eucalyptus rudis</i> Endl.	Desert Gum, Flooded Gum	to 60 ft (18 m); coarse dark bark and broad leaves; tends to shed leaves, bark, and flowers; Australian.	core, windbreak
<i>Eucalyptus sideroxyton</i> A.Cunn. ex Woolls	Red Ironbark	to 100 ft (30 m); dark, deeply furrowed bark, long slim leaves, and draping branches;	core

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		Australian.	
<i>Pinus pinea</i> L.	Italian Stone Pine	to 65 ft (20 m); umbrella-shaped crown; Mediterranean.	windbreak
<i>Pinus torreyana</i> Parry ex Carr	Torrey Pine	to 50 ft (15 m), with a broad, open crown; California Native; Endangered.	windbreak
<i>Quercus agrifolia</i> Née.	Coast Live Oak	80 ft (25 m); relatively slow growing evergreen with highly branched trunk; California Native.	windbreak
<i>Quercus berberidifolia</i> Liebm.	California Scrub Oak	to 12 ft (4 m); evergreen; California Native.	windbreak
<i>Quercus dumosa</i> Nutt.	Coastal Scrub Oak	to 10 ft (3 m); rounded, densely branched crown; endangered.	windbreak
<i>Quercus ilex</i> L.	Holly Oak	to 65 ft (20 m); round-crown with glossy, bristle-tipped foliage; slow growing; probably originally from eastern Mediterranean.	windbreak

Avoiding Problems of the Past: Past problems of degraded stand structure and disease can be avoided by judicious management. During extended drought, as has been present throughout California in recent years, irrigation can prevent trees from becoming stressed and succumbing to disease. Mixed planting can further protect against disease. Ongoing monitoring and adaptive management can help ensure that suitable stand structure is attained and maintained via pruning and tree removal. Coppicing, in which multiple low-growing shoots sprout from tree stumps, is to be avoided because it prevents development of the upper canopy. In addition to planting of trees for the current restoration, multiple waves of planting will be required to fill in areas where there is not sufficient canopy development, as well as to replace senescent trees and trees that become diseased or damaged.

2.2 Recommendation Two: Plant a butterfly garden to attract monarchs and other butterflies. We recommend a focus on native herbaceous plants that provide nectar (Table 3). Such planting of butterfly plants will serve to engage the public, provide aesthetic interest, and in the long term attract monarchs to the developing grove. Past planting of milkweed as a food source for larvae at Gibbs Park proved difficult to maintain in an attractive state (David Marriott, personal communication). Therefore we recommend that any planting of milkweed, while beneficial for attracting monarchs, be approached with caution.

Table 3. Some candidate butterfly garden species. Websites for additional guidance: <http://www.monarchwatch.org>, <http://www.monarchprogram.org>, <http://www.learner.org>.

Species	Common Name	Description
<i>Buddleja</i> spp. L.	Butterfly Bush	Perennial; Scrophulariaceae; 6-12 ft (2-4 m); shrub with dense clusters of white, pink, purple or yellow flowers; native to Western Hemisphere
<i>Chrysanthemum</i> spp.	Chryanthemum	Perennial; Asteraceae; 1.5-5 ft (0.5-1.5 m); hardy and easy to grow, with large yellow, pink, or red flowers; pollution reducer; native to Asia and Northeastern Europe
<i>Coreopsis</i> spp. L.	Calliopsis, Tickseed	Perennial or Annual; Asteraceae; 1-2 ft (0.3-0.6 m); drought tolerant, with large yellow flowers; native to Western Hemisphere
<i>Cosmos</i> spp. Cav.		Perennial; Asteraceae; 1-6 ft (0.3-2 m); large yellow, white, pink, or red flowers; native to Western Hemisphere

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<i>Dianthus</i> spp. L.	Carnation, Pink, Sweet William	Mostly perennial; Caryophyllaceae; 0.5-3 ft (up to 1 m); hardy, with frilled pink flowers; native mainly to Europe and Asia.
<i>Echinacea</i> spp. L.	Echinacea, Purple Coneflower	Perennial; Asteraceae; 3-6 ft (1-2 m); purple flowers and dark green foliage; North American native.
<i>Eupatorium purpureum</i> (Linnaeus) E.E. Lamont	Joe Pye Weed	Perennial; Asteraceae; 5-7 ft (1.5-2 m); small pink flowers in large dome-shaped structures; North American native.
<i>Heliotropium</i> spp. L.	Heliotrope	Annual; Boraginaceae; 1-3 ft (0.3-1 m); fragrant clusters of purple flowers; needs full morning sun; North American native.
<i>Lantana</i> spp. L.	Lantanas, Shrub Verbenas	Perennial; Verbenaceae; 1.5-6 ft (0.5-2 m); aromatic multicolored flower clusters; mildly toxic leaves and fruit; native to tropical regions of the Americas and Africa.
<i>Liatris ligulistylis</i> (A. Nelson) K.Schum.	Meadow Blazingstar	Perennial; Asteraceae; 3-5 ft (1-1.5 m); red buds and purple-pink flowers; North American native.
<i>Liatris pycnostachya</i> Michx.	Prairie Blazingstar	Perennial; Asteraceae; 2-4 ft; red-purple spiked flowers on tall stems; North American native.
<i>Pentus lanceolata</i> Schum.	Star Flower, Star Cluster	Perennial or Annual; Rubiaceae 1-3 ft (0.3-1 m); dark green foliage, with clusters of red, white, purple, or pink flowers; fast-growing; native to Africa.
<i>Rhododendron</i> spp. L.	Azaleas, Rhododendron	Perennial; Ericaceae; 6-10 ft (2-3 m); large bunches of red, pink, or white flowers; natives throughout Northern temperate zone.
<i>Scabiosa</i> spp. L.	Pincushion Flowers	Perennial or Annual; Dipsacaceae; 2-3 ft (0.6-1 m); clusters of pink, purple, blue, or white flowers on stalks; hardy and long-flowering; native to Europe and Asia.
<i>Verbena bonariensis</i> L.	Verbena	Perennial; Verbenaceae; 3-6 ft (1-2 m); clusters of small, fragrant purple flowers; native to South America.
<i>Zinnia</i> spp. L.	Zinnia	Perennial or Annual; Asteraceae; 1-4 ft (0.3-1.3 m); large pink, red, yellow, or orange flowers on long stems; require full sun; native to the American Southwest and Mexico.

2.3 Recommendation Three: Apply adaptive management techniques. Adaptive management employs a flexible approach of management practices that change depending upon changing circumstances and newly available knowledge (Table 4). As such, adaptive management is both responsive and proactive, using the best available science and becoming informed by experience. For example, while it may not be necessary to irrigate during typical weather conditions, it may become necessary to irrigate regularly during drought conditions, which have prevailed in recent years.

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Table 4. Adaptive management needs.

Management Practice	Considerations
Stand Establishment	Extra irrigation, fertilization, and other tending as needed until established; ongoing assessment of progress and response to facilitate growth of healthy trees.
Maintenance of Tree Health	Annual assessment of growth and health status of individual trees; integrated pest management (focus on biological control, with minimal use of potentially dangerous and ecologically damaging chemicals); pruning, tree removal and replanting as required.
Attainment and Maintenance of Monarch Habitat Suitability	Annual assessment of stand structure and monarch habitat suitability by experts (visual assessment, hemispherical photography, stand mapping, sensor measurements, prediction of future stand changes, etc.); planning and implementation of ongoing stand restoration (removal of senescent or damaged trees, additional planting, etc.).
Monitoring of Monarch Population Status	Annual Thanksgiving count; other population monitoring.

2.4 Recommendation Four: Develop a site stewardship plan. The stewardship plan for Norma B. Gibbs Park should include elements detailed in Appendix B.

2.5 Recommendation Five: Foster cooperation between stakeholders. Success of the current restoration depends upon ongoing commitment by the City and concerned citizens in consultation with butterfly and tree experts.

2.6 Recommendation Six: Seek ongoing expert input. In particular, ongoing input from the City arborist and monarch butterfly experts is essential.

2.7 Recommendation Seven: Initiate education and outreach. This should include deployment of interpretive signage, sponsorship of events to increase awareness by public and city officials, organization of citizen volunteers, fundraising of private resources to assist with the restoration, encouragement of press to write articles relevant to the restoration, development of curriculum (including field trips) for local schools, and eventual development of a docent program.

2.8 Recommendation Eight: Document progress. This should include maps of tree locations, measurements of tree stem diameters and heights, butterfly population census records, associated weather records, photographic documentation of the restoration effort, hemispherical photographs of the stand structure, etc.

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3.0 Conclusion: The recently initiated restoration of Norma B. Gibbs Park promises to reestablish overwintering populations of monarch butterflies, with associated benefits for recreation, aesthetics, and conservation. The challenges are many. First and foremost, a stand of trees must be planted that will eventually provide suitable habitat for the butterflies. While an attractive grove can be established in relatively few years, it will be many years before the stand structure is sufficiently developed to support a substantial population of overwintering monarchs. By basing the restoration effort in the best available science and modern adaptive management techniques, eventual success is likely. Our current investment will pay off by building a desirable environment for future generations, replete with the knowledge that we are doing our best to be good stewards of our natural heritage.

4.0 References

- Heimberger Hirsch & Associate Inc. 1993. Norma B. Gibbs Conceptual Plan and Tree Remediation Plan. *Landscape Architecture and Planning for Community Services Department, City of Huntington Beach, CA.*
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- Weiss, S.B. 1998. Habitat suitability, restoration, and vegetation management at Monarch Grove Sanctuary, Pacific Grove, CA., *TRA Environmental Report.*

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Appendix A. Stewardship of Monarch Butterfly Winter Habitat in California Vision, May 15, 2007, by Paul M. Rich, Karen R. Shihadeh, and Stuart B. Weiss



Goal: Conserve the long-term integrity of winter roosting sites for monarch butterflies throughout California by developing comprehensive site stewardship plans.

Background: Each winter monarch butterflies (*Danaus plexippus*) from throughout North America migrate to winter habitat in Mexico and California, where they roost in sites protected from extreme weather. In California dozens of sites support overwintering butterflies from western North America. Responsible protection and management of these sites is critical for the long-term welfare of western monarch butterflies. We propose a collaborative effort to develop and implement site stewardship plans that ensure the long-term integrity of the major monarch butterfly winter roosting sites.

Elements of Stewardship Plans

- **Data compilation:** assemble historic and current records concerning habitat characteristics, butterfly populations, and site management; ensure that site data are properly managed, archived, and accessible
- **Habitat characterization:** characterize stand structure and microclimate (solar radiation, temperature, wind, etc.) using hemispherical photography, forest stand maps, and meteorological sensors
- **Tree health:** assess tree health and risks to human safety and property
- **Interactions with surrounding environment:** evaluate impacts of surrounding lands on site (land use, management, development, etc.) and site on surrounding environment (invasion of non-native tree species from forest stand, etc.)
- **Site modeling:** model changes over time (tree growth, senescence, and recruitment)

to identify best management strategies (pruning, tree removal, tree planting etc.)

- **Ongoing monitoring:** monitor butterfly population status, changes in stand structure and microclimate, tree health, risk to humans and property, interactions with surrounding environment, etc.
- **Ongoing management and restoration:** manage roost trees, shelter trees and understory to ensure long-term habitat suitability; restore appropriate native plants
- **Education and outreach:** develop general and site-specific resources (curriculum, web, brochures, presentations, and signage) for education and interpretation
- **Planning and review:** plan for site-specific adaptive management, with periodic review of success and reassessment of goals; facilitate communication/collaboration among stakeholders (scientists, public, managers, decision makers, etc.); form management team to oversee annual schedule of work and meetings

Benefits

- Conservation of monarch winter habitat
- Sound scientific basis for proactive, cost-effective management
- Minimization of human and property risks
- Compliance with government regulations
- Coordination and collaboration across sites

Contacts

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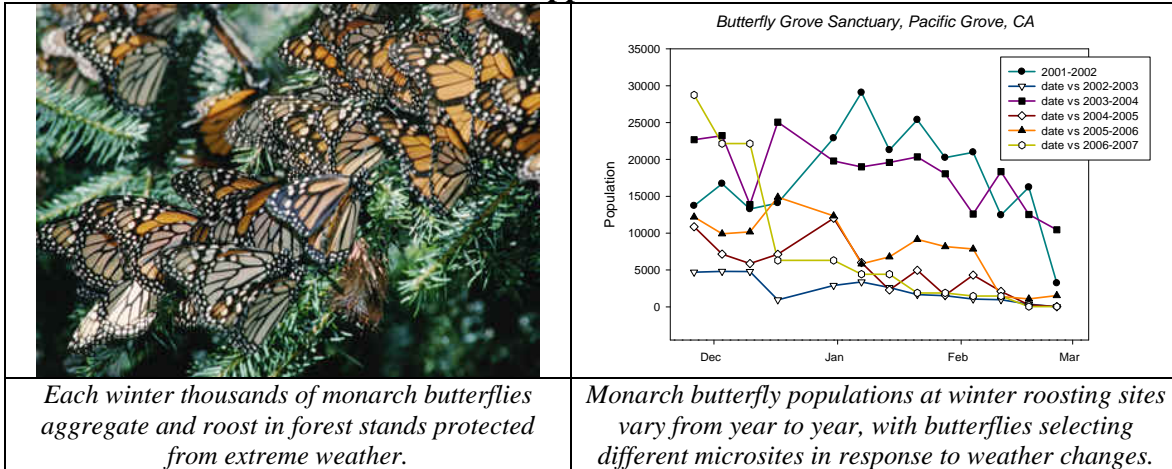
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<http://www.ventanaws.org>
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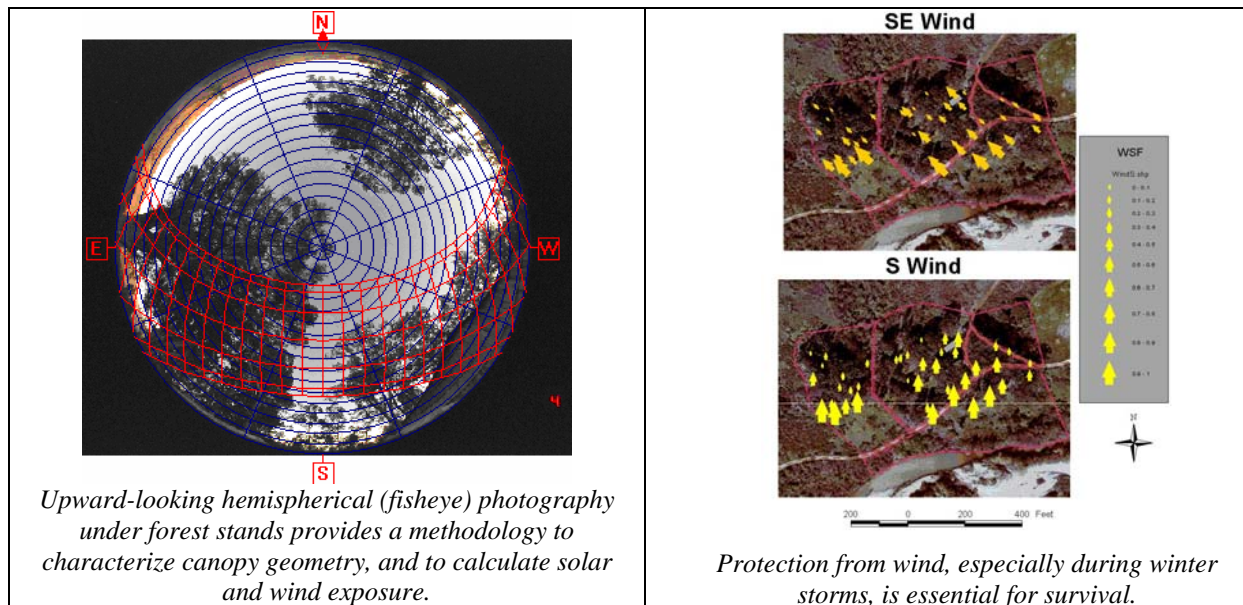
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Appendix A (contintued). Stewardship of Monarch Butterfly Winter Habitat in California Approach



Habitat Characterization and Modeling: We employ hemispherical photography, stand maps, and meteorological sensors, together with models of site changes over time, to engineer best management strategies. This

comprehensive approach enables us to identify, maintain, and restore forest canopy structure that provides suitable overwintering microsites, with respect to solar exposure, temperature, and wind protection.



Comprehensive Solutions: Our approach merges basic science, advanced technology, and adaptive management to conserve stand integrity of monarch butterfly winter habitat. We have applied this approach at sites throughout California and Mexico.

Weiss, S.B., and D.C. Luth. 2002. Assessment of overwintering monarch butterfly habitat at Cooper Grove (Andrew Molera State Park, Monterey County, CA) using hemispherical photography. *Creekside Center for Earth Observation Report*.

Weiss, S.B., P.M. Rich, et al. 1991. Forest canopy structure at overwintering monarch butterfly sites: measurements with hemispherical photography. *Conservation Biology* 5: 165-175.

Weiss, S.B. 1998. Habitat suitability, restoration, and vegetation management at Monarch Grove Sanctuary, Pacific Grove, CA, *TRA Environmental Report*. available online at <http://www.creeksidescience.com>

Key Literature:

Weiss, S.B., et al. 2005. Topoclimate and microclimate in the Monarch Butterfly Biosphere Reserve (Mexico). *World Wildlife Fund Report*.

Recommendations for Gibbs Park Restoration

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Recommendations for Gibbs Park Restoration

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Recommendations for Gibbs Park Restoration

Appendix C. Orange County Register News Article from September 23, 2007

Pests killing trees in Huntington Beach parks

Hundreds of dead and dying trees in Gibbs and Central parks will be uprooted by city crews over the next two years.

*By Annie Burris
The Orange County Register
Sunday, September 23, 2007*

HUNTINGTON BEACH – Branches overflowed into Graham Street on a recent weekday as city crews gutted dead and dying eucalyptus trees at Gibbs Park.

Bugs, plus the continuing drought and overcrowding, have killed or are killing about 60 percent of Gibbs Park's trees and about 3 percent of trees in Central Park, city officials said.

About 700 trees in both parks are marked for removal.

"Gibbs Park was hit more substantially because it is a smaller park and almost all eucalyptus," said Dave Webb, the city's public works director.

Since 1985, Surf City's eucalyptus trees have been attacked by at least two beetles and a lerp from Australia. Now, the tortoise beetle – which researchers have yet to find a deterrent for – is preying on the leaves of trees in Gibbs and Central parks.

Jim Jones, the city's operations manager, said he has not heard of similar problems with residential trees.

The city will spend about \$300,000 over two years to remove, replant and maintain the trees, he said. The total budget for this year's tree maintenance is \$445,000, so the project

will take funding from other tree maintenance programs, he said.



Men at Work: A work crew clears debris from trees that are being removed from Gibbs Park in Huntington Beach. (Mark Martinez, The Orange County Register)

Local tree activists have attended recent City Council meetings to talk about the extent of the damage.

"Gibbs Park has gone to wreck and ruin," said Jean Nagy of the Huntington Beach Tree Society, who plans to write grants to help fund the tree replacements.

While the two parks have similar problems, the solutions are drastically different, Jones said.

Gibbs Park, a known stopping point for migrating monarch butterflies, will have its trees removed by next week. But work on Central Park – which also has dying elder, pine and sycamore trees – will not begin until October. Those trees will be taken out in groups of 30 to 40 over a two-year span.

"The work in Gibbs Park is significant," Jones said. "Over half of the trees are being removed. We are looking at a whole new reforestation of that site."

Recommendations for Gibbs Park Restoration

On Oct. 22, monarch butterfly specialists from Pacific Grove will travel to Gibbs Park to determine the best species of trees to continue to attract monarchs. The goal is to replant in time for the migratory season, which begins in November, said resident and butterfly enthusiast Leslie Gilson, who is paying for the experts to come.

"They will figure out how to plant the trees so this doesn't happen again," Gilson said.

The longer removal process in Central Park is designed so it won't disturb the different types of birds that inhabit the park, officials said.

"The work ... would probably not be noticed because it is such a small percentage of trees being replanted," Jones said. "The public will only notice when there are machines taking out the trees."

For information about eucalyptus trees in your area, visit the U.S. Department of Agriculture's Web site, www.usda.gov.

To volunteer help restore Gibbs Park,
e-mail lesliegilson@hotmail.com.

Contact the writer:
aburris@ocregister.com or 714-445-6696

Trees under attack

The following is a list of Australian beetles and lerp that have attacked Huntington's eucalyptus trees.

Eucalyptus longhorn beetle: The beetles arrived in 1985 and began to eat the eucalyptus. A few years later, researchers found a deterrent for the pest and the beetle population subsided in the late 1980s.

Lerp psyllid: In the mid-1990s, the lerp attacked the eucalyptus by defoliating the tree. In the late 1990s, researchers found a biological control for the pest and the population subsided gradually, but they are still present.

Tortoise beetle: In 2006, this beetle arrived, attacking the leafy edges of eucalyptus trees, rendering the leaves useless. Researchers have not yet found a deterrent.