



**Pacific Grove Monarch Grove Sanctuary
Management Plan**

June 2011

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- A Detailed Methods and Results: Dr. Stuart Weiss Report 2011
- B. Assessment of Mature Trees in the Monarch Grove Sanctuary:
Rick Katen, Certified Arborist C.
- C. Chronicle of Potted Eucalyptus Tree Experiment, Over-
wintering Season 2010/2011: Dr. Monte Sanford Blog
Posting, January 7, 2011

*Written with assistance from Esther Trosow of the Pacific Grove Monarch Conservancy, based in large part on John Lane's *Monarch Report* at the end of the *Draft Report for the Dively Property*

I. Introduction

The City of Pacific Grove is fortunate to host Monarch Butterflies each winter as part of a complex North American migration phenomenon. The City of Pacific Grove has been entrusted with stewardship responsibilities for the Monarch Sanctuary Grove. In recent years, the dynamic tension between the dual responsibilities of habitat management and maintenance for visitor safety has come in conflict, resulting in departures from a habitat management plan adopted in 1998. During the summer of 2010, the City commissioned Dr. Stuart Weiss of the Creekside Center for Earth Observation to update his scientific analysis of habitat conditions in the Grove. This analysis was completed in February, 2011. City Manager Tom Frutche appointed a subcommittee of the Natural Resources Commission and Museum Advisory Board to solicit community input on Dr. Weiss's analysis and develop a Sanctuary Management Plan for recommendation to the City Council.

The subcommittee held a community meeting on February 24, 2011 to solicit community input. Based on this meeting, this plan promotes the subcommittee's vision:

- To improve the Sanctuary in order to entice the Monarchs to return.
- To enhance the Sanctuary for the education and enjoyment of those who visit while ensuring fundamental security.
- To plan for the future so that the Sanctuary will be available for the Monarchs as well as the people to enjoy for years to come.
- To form partnerships with neighbors, the City, the Pacific Grove Unified School District and advocates.

This Sanctuary management plan contains Dr. Weiss's habitat management recommendations. It also outlines accountability mechanisms to optimize volunteer resources and ensure ongoing feedback to the City Council for improved stewardship in the future.

II. Purposes of plan

- 1) Implement forest and tree management to create a mosaic of microclimates that allow monarchs to locally adjust their distribution in response to variable weather, including extreme wind storms.
- 2) Maintain public safety by managing potential structural and natural hazards without compromising monarch habitat.
- 3) Establish and maintain diverse and abundant nectar resources in and near the Sanctuary to provide early and season-long nectar for the butterflies.
- 4) Establish and institutionalize the annual adaptive management cycle to include systematic advocate evaluation of efforts, recommendations for improvement and feedback to the City Council.
- 5) Reduce conflict and increase cooperation among the City and advocates.
- 6) Maintain the site for decades to come as the forest inevitably changes.

III. Description of habitat

Monarch Grove Sanctuary. The Pacific Grove Monarch Grove Sanctuary, located between Ridge Road on the east and Grove Acre Avenue on the west, is a 2.696 acre flag-shaped parcel that slopes to the west from a maximum elevation of 56 feet along Ridge Road to a minimum of about 27 feet at Grove Acre Avenue. The property supports a variety of trees, mainly Eucalyptus, Monterey Pine, and Monterey Cypress.

The Sanctuary itself is surrounded by single-family homes, a multi-unit motel, a two-story historic inn (Warner house, 1914), and the Pacific Grove USD Adult School. Unimproved dirt paths extend throughout the property, winding from the kiosk/interpretive area at the terminus of the Ridge Road easement path, past the viewing area (across from the primary roosting site consisting of two rows of Eucalyptus trees along the southern fence), and downhill around a one-story historical structure (Brokaw Hall, built c. 1914). There is an area of open grass downhill near Grove Acre Avenue.

It was purchased for “acquisition, preservation, rehabilitation, maintenance, improvement, and completion of an overwintering site for monarch butterflies” through the issuance of \$1.23 million in general obligation bonds following 2/3 voter approval of Measure G in 1990. It is designated as open space and butterfly habitat in the city’s general plan, and is protected by municipal code 12.16.250. An additional \$200,000 was granted in 1992 by the state’s Wildlife Conservation Board towards the purchase of what they named the “Pacific Grove Monarch Butterfly Ecological Reserve,” and the CC&Rs of this conservation easement further govern use of the property. In 1992, a 5-foot easement along the adjacent motel property’s southernmost border was granted to the city by the inn’s owner to provide for a public walkway from Ridge Road.

Microclimate and over-wintering phenomenon. Monarch butterflies (*Danaus plexippus*) follow a complex migratory pattern that brings the western North American population to climactically protected areas along the California coast to overwinter. The Sanctuary offers the knife-edge microclimate monarchs need to survive, created by the correct combination of conditions, including: a frost-free maritime environment close to the shoreline, low elevations, topographical features, and vegetation (including tree cover and understory plants & shrubs). This delicate balance of conditions provides protection from storms and wind, offering adequate sunlight to keep the insects warm enough to fly to nectar and water sources, yet cool enough to maintain the fat supplies that sustain them through the overwintering season.

The Sanctuary currently supports the largest “permanent” overwintering colony in Monterey County. There is dynamic movement between numerous other “temporary” coastal sites during the early fall months of the overwintering season. As the days grow shorter and the winter solstice approaches, the monarchs tend to disperse, eventually aggregating at a permanent overwintering site with the correct conditions to sustain them throughout the harshest months. Since the degradation of Washington Park, the Sanctuary has served as the main permanent overwintering site in the county (except in 2009-10, when the Eucalyptus trees were trimmed). When daylight hours and temperatures increase in late winter/early spring, mating occurs at these “permanent” sites. It is important to remember that no egg-laying occurs in the Pacific Grove

area: the rest of the butterfly's life cycle occurs well inland where the egg-laden females encounter milkweed.

George Washington Park. In addition to the Monarch Sanctuary Grove, the City's overwintering habitat includes a section of George Washington Park. The park is comprised of approximately 29 acres, bordered by Short Street to the north, Sinex Avenue to the south, Alder Street to the east, and Melrose Avenue to the west. Picnic facilities, a baseball field, and playground facilities occupy the southern portion of the park, with a densely-stocked pine-oak forest

Current conditions of the Monarch Grove Sanctuary. In the fall of 2010, Dr. Weiss documented the conditions in the Sanctuary to provide a baseline for future improvements:

- 1) The Sanctuary and surrounding forest still contains the necessary components to support monarch butterflies, as evidenced by their persistence for many months at the site in 2009-2010 and 2010-2011 (Villablanca 2010, Pacelli and others, 2011). But, it is on the edge, and butterflies have largely abandoned the site after large storms in previous years – during record winds in Dec 1995 (Weiss 1998) and in late January 2010, intense winds (50+ mph at Monterey Airport) greatly reduced the population numbers (Villablanca 2010). The L-shaped grove of blue gum Eucalyptus trees provides the key structure for microclimate suitability. The tall wall of foliage provided by these trees is variable from point to point, and some light and wind can penetrate. But the single row is vulnerable to incremental and catastrophic events.
- 2) The butterflies cluster for much of the season in the SE corner of the Sanctuary along the south edge, and on a pine tree several meters south of the Sanctuary. These areas have high to medium insolation, high exposure to SE, S, and SW winds, and medium to low exposure to NW winds. There is considerable fine-scale variability in all these factors, as the influence of individual trees, branches, and gaps is felt with changing weather conditions.
- 3) Large parts of the Sanctuary are still highly exposed to NW winds, which diminish the quality of the site and often drive the monarchs to cluster on trees on the southern neighbors' property. These neighbors' trees have serious short-term, mid-term, and long-term issues, and their senescence is likely within a decade or two. Trees further south of the Sanctuary, ranging across Ridge Road and Short Lane provide some southerly wind shelter in areas south of the Sanctuary boundary. The long-term health of these trees needs to be assessed, but some will eventually be removed in the next years and decades+ as crowns senesce and become hazards.
- 4) Conditions have changed since the last assessment in 1998. In particular, there has been a loss of high canopy Monterey pines to senescence and disease.
- 5) New plantings from the late 1990s are reaching 50+ ft high, and include blue gums, pines, and cypress, planted to provide better wind shelter from the NW. But, 5-15 more years will be required before a full windscreen develops to adequate height. This wind screen will consist of a mix of blue gum, cypress, and pine.
- 6) The southern blue gum row is still relatively intact, but gaps in the canopy allow some wind and light penetration from the NW and from the SE, S and SW. There are many gaps at low levels, and in the mid-canopy (10 m).
- 7) These trees are approaching 90 years old, and will continue to develop hazard branches. Blue gum trees are very plastic and will respond to new patterns of light availability by growing foliage.

- 8) The boxed trees placed in the interstices of the blue gum row in 2010-2011 filled in low gaps to heights of 3-9 m. They supported monarch clusters on many days, and decreased wind and light exposure at low heights along the southern edge (Pacelli and others 2011). These trees essentially provided the equivalent of low branches, and were used by monarchs on many occasions. The use of these trees indicates that reproducing these effects with live trees over the long-term should be effective in providing favored monarch habitat.
- 9) Regrowth of trimmed trees was noted qualitatively.

IV. Visitor experience improvements.

Management of the Sanctuary requires balanced attention to the habitat needs of the butterflies and the safety and educational experience of visitors. Optimizing these purposes simultaneously creates dilemmas for the City. Taken to logical extremes, optimizing access and protection for visitors could mean clearing all potentially hazardous vegetation, allowing visitors unlimited access to the butterflies and trees in which they roost and leveling and paving all pedestrian surfaces. Obviously, such actions would be detrimental to the butterfly habitat and therefore ultimately unsustainable for the Sanctuary. Conversely, a singular focus on optimizing the habitat could mean closing off the Sanctuary to humans and prohibiting all interference with natural forces in the Sanctuary. Obviously, either extreme approach would not be feasible or desirable, given the sensitivity of the habitat and the educational value of the Sanctuary to the community.

The layout of the Sanctuary allows visitors to view the butterflies and enjoy the Sanctuary from a reception area at the east end of the Sanctuary and from any point on a wide path that runs the length of the Sanctuary. While it has served the Sanctuary well, the existing entryway and signage could be much more attractive and educational. Its proximity to the primary butterfly roosting area provides the opportunity for enhanced interpretation and telescope-aided viewing.

The ad-hoc Sanctuary Committee recommends several improvements to the sanctuary that are intended to enhance the visitor's experience and emphasize the natural setting of the sanctuary. Major components of this vision include:

- Develop a plan proposing to construct a wooden platform area extending northward next to the relatively flat motel driveway. The wooden platform would have ample benches for groups and be attractively fenced.
- Add telescopes and utilize the new technology of web cams.
- Narrow the existing 12' sloping eroded road to 8' and improve the existing rope line demarcating the trail with higher quality posts and lines.
- Improve the entrance path with better signage and width if possible.
- In partnership with the Pacific Grove Unified School District, establish a visitor center and parking on the adjacent Adult School property. The Visitor Center could be an existing building or of modular style that could be relocated to George Washington Park, should Monarch roosting patterns change or warrant visitor accommodations there. The building would be used for education and interpretation. Web-cam feeds from the Sanctuary could be downloaded there.

V. Habitat management strategies

The ad-hoc subcommittee has used relative timeframes (short-term, medium-term, and long-term) to implement the vision articulated in the previous section of the plan.

A. Short-term strategies (immediate – 2 years)

1) Plant a second row of Blue Gum Eucalyptus in approximately the spots chosen on site, about 10' north of the existing row with 10-15' spacing, emphasis on filling low gaps. These trees should be the maximum feasible size, and should receive supplemental drip irrigation for at least the first two years. This is part of the long-term solution. Monarchs used potted trees that were initially placed in this zone, indicating that trees in this zone may immediately provide roosting sites where light and wind are favorable for monarchs. Establishment and operation of the drip system is the critical infrastructure issue. Local adjustments to preliminary placements will be necessary due to the presence of existing roots and an unmapped concrete slab.

(SUBSTANTIALLY COMPLETED 3/11)

2) Plant a subset of the potted blue gums in the ground where they are currently. Minimum spacing should be 3'. Immediately along the fence, this means every other potted tree, for an initial total of 5 trees – the healthiest and most vigorous of the trees should be chosen.

(SUBSTANTIALLY COMPLETED 3/11)

3) Off the fence to the north, plant 1-2 potted trees planted in each key gap between the large existing trees. Again, a minimum of 3' spacing. It is important to realize that these trees will grow, and fill out their crowns in coming years. But, the site is very crowded at 3' spacing and the new trees will be competing with the existing trees and may not grow vigorously.

(SUBSTANTIALLY COMPLETED 3/11)

4) Supplement newly planted trees with additional potted trees to fill gaps in fall 2011 and as needed before the planted trees fill out. As the new planted trees grow over several years, supplemental potted trees will become increasingly unnecessary. Some management of the planted trees in the crowded areas may become necessary.

5) Plant one oak between the shed and fence just south of the property boundary.

6) Plant oaks in sites selected by Dr. Weiss in other areas of the Sanctuary.

7) Coordinate with the southern neighbors on tree planting and maintenance to provide some healthy well-spaced trees – pines and cypress most likely – that will replace existing trees.

8) There will be a reduction of sunny open areas in coming decades because many trees have been planted where they will eventually shade currently open areas. Based on advise from Arborist and Dr. Weiss, identify areas to remain open, and remove selected trees planted in recent years to optimize dew, water, and nectar for monarchs. The most likely areas are west of Brokaw Hall. Thinning small and medium saplings within recent tree plantings should be considered to allow for faster growth of selected individuals trees.

9) Complete a detailed assessment of the Monterey Pines to understand pitch canker risks, and designate “back-up trees” should individual pines succumb. Summer 2011 (ARBORIST ASSESSMENT ATTACHED AS APPENDIX B)

10) Establish a nectar plan and place plants by October 2011. Nectar sources should be placed in and around the Grove, especially high concentration, non-native species. While monarchs do overwinter in areas with little or no nectar, they readily use available nectar on sunny days. Fall and early winter nectar may be especially important for keeping monarchs at the site. Also, a nectar garden could be established in a sunny part of the schoolyard and become a test bed for evaluating nectar sources with the students as observers. Existing

bottlebrush trees should remain for late season nectar. If suitable natives are identified, plantings in the ground can be considered. Observations of nectar availability (including blue gum) and use would help guide nectar provisions. A discussion of some nectar plants from Jan Southworth at Ardenwood/Coyote Hills is included at the end of the Weiss Report, Appendix A. This list should foster be widened and updated through time with input from Pacific Grove resident gardeners.

11) Foster habitat that includes both native and non-native plant species that provides for both nectar sources for butterflies and native plant cover. Native perennial flowers shrubs are the most likely to thrive in these areas, as aggressive annual grasses minimize success of native annual wildflowers. Deer fencing may be necessary for establishment of many species.

12) Establish ornamental plant zones where appropriate planter boxes and non-invasive ground plantings can be considered. Ongoing, begin planning in summer 2011.

13) Of the 336 trees evaluated by the City Arborist, only one shall be reduced to a snag and three shall be pruned in the interest of safety. The snag shall be left as tall as possible to both preserve habitat and reduce the immediate hazard to visitors.(ARBORIST ASSESSMENT ATTACHED AS APPENDIX B)

14) Monitor and record Monarch distribution among trees during the overwintering season. This work shall only be performed by personnel authorized by the City of Pacific Grove

15) Improve the quality of the public walkway to optimize safety and improve aesthetics in the Sanctuary while simultaneously narrowing the path to begin transition to a more natural Sanctuary experience.

16) Upon approval by the City Council, implement a plan for the Brokaw Hall site.

17) Develop a specific plan for monarch habitat at George Washington Park.

18) Improve physical details (fencing, pathway, etc.) to improve the look and feel of the Sanctuary.

19) Establish a fund with the Monterey Peninsula Community Foundation to receive tax-deductible donations for the benefit of the Sanctuary and promote the benefits of contributing to the fund.

B. Medium-term strategies (2 -5 years)

20) The trees in the surrounding neighborhood provide cluster sites and wind shelter, hence should be considered part of the monarch habitat. The trees on the southern neighbors' properties need a full evaluation by arborists to determine health and potential longevity. The more distant tall trees to the south, along Ridge Road, and Short Lane, also need to be assessed.

21) Contingent on arrangements with the neighbors, plant a row of inoculated pines, spacing 10' minimum and south of the fence on the adjacent fenced in property, west of the gazebo. The pines should be as large as feasible, and will likely grow vigorously in the high light environment. This is an important long-term solution that will provide roosting sites and wind protection along the south edge and replace senescent and ailing trees south of the Sanctuary.

22) Develop and implement plans for an improved visitor area that includes relocated and permanent public restrooms.

23) Design and implement a new pathway through the forest along the northern edge of the Grove to provide an alternative pathway for visitors.

24) Design and implement a new visitor center, pursuant to #6 in Section IV.

C. Long-term strategies (beyond five years)

The Sanctuary is only artificially limited by neighboring properties. Vigorous Monarch habitat activity has been observed on the southern side of the existing fence. For long-term habitat viability, the City should work with adjacent property owners to expand protection and public stewardship of the Sanctuary.

VI. Principles of adaptive management

The key principles for the adaptive management plan include *resiliency*, *redundancy*, *dynamic ecosystems*, *proactive adaptive management*, and *decision making in the field*.

Resiliency provides a range of conditions that buffer environmental variability. In the case of the Sanctuary, the key variables are wind, sunlight, and temperature. Ambient conditions outside the grove are filtered by the forest canopy, creating a complex fine-grained environment where microclimates change meter by meter through the site, and hour by hour through the season. As the varied combinations of wind shelter and light exposure change through the day and season, and monarch butterflies move about on fine-scales within grove, and broader scales among groves, as they attempt track their preferred environmental envelope, and avoid extremes. In particular, extreme windstorms can drive monarchs from sites.

Redundancy within the habitat means multiple lines of “defense” – two rows of trees, rather than one row, wind shelter from multiple directions, areas of full sunlight, dappled sunlight, and shade, multiple openings where appropriate, and other features. The loss of branches, individual trees, groups of trees, or species of tree should not fully degrade habitat. Locally complex habitat may provide more opportunities within smaller areas.

Dynamic ecosystems – trees grow and die over years and decades, and even centuries, leading to incremental and even catastrophic changes in microclimate. On a smaller scale, branches naturally fall and may be removed for public safety. Decisions made today have repercussions for decades to come.

Proactive adaptive management means that changes are anticipated well in advance, and appropriate management carried out at a deliberate and measured pace. This requires a systematic adaptive management process among institutions and stakeholders to evaluate, plan, execute, assess, and re-evaluate, on an annual cycle in synchrony with the resource. Continued and refined monitoring of the distribution and abundance of monarchs over the season at the Sanctuary is an essential component of adaptive management.

Decision making and supervision in the field – All final decisions regarding tree management should be made in conjunction with a field visit, so that exact instructions can be communicated. Management activities – planting and trimming - should be monitored by qualified and interested individuals when possible.

VII. Accountability for implementation

The City of Pacific Grove owns the Monarch Grove Sanctuary and is therefore ultimately responsible for all aspects of Sanctuary management. In recent years, lack of continuity among

successive City Councils and City staff have caused periods in which the City has not followed-through with its responsibilities for the Monarch Butterfly Habitat.

The ad-hoc committee recommends a new communication and feedback structure and process that incorporate local Sanctuary advocates, scientists and consultants, and the City Council's Natural Resources Commission (NRC). Fully embracing a more robust network of the advocates will help implement the adaptive management principles outlined previously and ensure continuity and adherence to the habitat plan in the future.

Annual evaluation and planning process.

March: NRC sponsors a public meeting of all advocates to review Monarch over-wintering season ending, evaluate progress on and compliance with the Monarch Grove Sanctuary Plan, and develop strategies for the following year.

April: NRC reports to City Council on outcomes of the March public meeting with input from scientific professionals and City staff. City Council provides direction to staff on specific initiatives for the following year.

Summer: Major maintenance and improvements

Late September: Community clean-up day to ready the Sanctuary for October 1 season opening.

October – February: Participation in scientific, qualified Monarch counting and tagging programs that provides data on annual populations and context relative to other West Coast overwintering sites. The resulting analysis is critical for understanding continually evolving Monarch migration patterns and measuring success in fostering habitat in the Sanctuary.

Volunteer coordination. The City is very fortunate to have a knowledgeable community of Monarch Butterfly enthusiasts dedicated to the stewardship and development of the Sanctuary. Since the City is ultimately responsible and legally liable for all activities occurring in the Sanctuary, it must assume a central coordinating role for volunteer activities in the Sanctuary.

No activity shall occur in the Sanctuary outside an established visitor area (e.g., a trail) without the permission of the Public Works Superintendent.

The process for volunteering and participating in maintenance, landscaping, interpretive education, or any other labor in the Sanctuary follows:

- 1) Complete a volunteer application and liability waiver at the Human Resources Office, which is located on the second floor of City Hall.
- 2) Contact Public Works Superintendent Michael Zimmer to propose a project or ongoing maintenance plan.
- 3) Upon receiving permission, proceed to perform approved activity with email or telephone communication to Mr. Zimmer upon conclusion of work (if a project) or upon each work session in the Sanctuary (if an ongoing or periodic activity)

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VIII. Financing desired improvements

The City currently has no dedicated expenditure budget or revenue source for maintaining and improving the Sanctuary. Current maintenance activities are undertaken as funds are available from the Public Works budget for building and grounds and forestry. Barring a significant positive change in the City's fortunes, the City will have to continue providing routine maintenance paid from the Public Works budget, as the Sanctuary warrants a maintenance level at least equal to that received by other parks. The recommended capital improvements outlined in this report would likely require grant-funding and donations.

Regarding donations, City staff is exploring the possibility of establishing a stewardship fund with the Community Foundation for Monterey County. The Foundation will facilitate tax-deductible donations more easily than the City can. The Foundation partnership also provides an option for donors who would rather not donate to the City, for any of a variety of reasons.