

BIODIVERSITY MANAGEMENT PLAN
for
MARIN MUNICIPAL WATER DISTRICT
LANDS

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EXECUTIVE SUMMARY

This Biodiversity Management Plan (BMP) has been prepared to provide background information for the Marin Municipal Water District's 2009 update of its Vegetation Management Plan (VMP). The Biodiversity Management Plan addresses management goals and actions for all of the lands managed by the Marin Municipal Water District (MMWD), including lands within the Mt. Tamalpais watershed, the Nicasio Reservoir watershed, and the Soulagule Reservoir watershed, which total approximately 20,000 acres.

High levels of biological diversity characterize the lands managed by the Marin Municipal Water District, and the District is committed to protecting this biological diversity at all levels. District lands contain a large array of plant and animal species that occupy many different habitats, vegetation types and ecosystems. The total number of species found within District lands is unknown, but it includes more than 900 species of vascular plants and at least 400 species of vertebrate animals. Many more species of fungi (mushrooms) and invertebrates such as insects and other arthropods undoubtedly occur within District lands. Of the species that are known or likely to occur, there are 43 plant species of special significance, including seven that are federally or state listed as rare, threatened or endangered; and 34 vertebrate animal species of special significance, including two fish, two amphibians, one reptile, 21 birds and eight mammals with designated conservation status. Within the vegetation of the Mt. Tamalpais watershed, at least 59 alliances and habitats, and 88 associations have been identified. This diversity, found within a large-scale landscape that has protected status, resulted in the inclusion of MMWD lands within the Golden Gate Biosphere Reserve created by UNESCO in 1988 (UNESCO 2008).

Threats to biological diversity on MMWD lands include the effects of: non-native invasive plants and animals, wildfire, Sudden Oak Death and other forest pathogens, and global climate change. These threats can result in the loss and degradation of habitats, vegetation types, and ecosystems; and the reduction in size, range, and reproductive capacity of special-status plants and animals.

To address these threats and fulfill the goals and objectives of the 2009 update of the Vegetation Management Plan, the District will use a strategy that includes planning, direct actions, monitoring, adaptive management, and support for research. This multi-faceted approach requires the District to: 1) maintain an up-to-date inventory of its biological resources, and current maps that display the distribution patterns of native and non-native species, vegetation, and wildlife habitats; 2) monitor the outcome of projects and actions conducted for management of biological resources; 3) monitor the condition of these resources over time in order to detect changes and take appropriate management actions; 4) take actions to preserve and protect resources that are currently

in good condition; 5) take actions to restore resources that exist in degraded condition or suboptimal numbers; and 6) manage resources over the long term through a process that incorporates monitoring results into the decision-making process, which means to use *adaptive management*.

In Section 6, this Plan describes a variety of projects and actions that the District will implement to protect and enhance biological diversity within its lands. These include: six projects to address mapping and inventory needs, four monitoring projects and programs, four projects to protect existing resources, three projects to restore degraded habitats, including weed control projects at 25 or more specific sites, and 11 projects and actions that will implement adaptive management, develop long-term solutions, and foster research.

In Section 7, this Plan includes a variety of recommended methods to address weed control needs. Recommended control methods are organized by weed species, and by the type of control activity to be undertaken (e.g., control seedlings, remove adult plants, etc.). Methods using no herbicides are listed separately from those using herbicides. The feasibility and effectiveness is given for each control method, including specific information for different infestation sizes.

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1 INTRODUCTION

This Biodiversity Management Plan (BMP) has been prepared to provide background information for the Marin Municipal Water District's 2009 update of its Vegetation Management Plan (VMP). The Biodiversity Management Plan addresses management goals and actions for all of the lands managed by the Marin Municipal Water District (MMWD), including lands within the Mt. Tamalpais watershed, the Nicasio Reservoir watershed, and the Souklajule Reservoir watershed (see Figure 1-1). Section 2 describes the biological resources found within District lands. Sections 3 and 4 explain current and anticipated future threats to these resources. Section 5 outlines the District's strategy for protecting these resources, including a summary of the VMP goals and objectives. Section 6 describes all of the projects and actions that the District will implement in order to protect and enhance the biological resources on its lands. Section 7 provides a summary of recommended weed control methods to combat the spread of its highest priority weeds. A glossary is included in Section 8. A list of references is included in Section 9.

High levels of biological diversity characterize the lands managed by the Marin Municipal Water District, especially those within the Mt. Tamalpais watershed. MMWD manages approximately 20,000 acres of land, including a significant portion of the Mt. Tamalpais watershed. At the District-sponsored Mt. Tamalpais Watershed Symposium in February 2008, more than 20 scientists described the watershed's biodiversity and its management to the 350 attendees. Presentations from this symposium are an important source of information for this BMP.

Within District lands is found a large array of plant and animal species that occupy many different habitats, vegetation types and ecosystems. The total number of species found within District lands is unknown, but it includes more than 900 species of vascular plants and at least 400 species of vertebrate animals. Many more species of fungi (mushrooms) and invertebrates such as insects and other arthropods undoubtedly occur within District lands. Of the species that are known or likely to occur, there are 43 plant species of special significance, including seven that are federally or state listed as rare, threatened or endangered; and 34 vertebrate animal species of special significance, including two fish, one amphibian, one reptile, 21 birds and eight mammals with designated conservation status. Within the vegetation of the Mt. Tamalpais watershed, at least 59 alliances and habitats, and 88 associations have been identified. This diversity, found within a large-scale landscape that has protected status, resulted in the inclusion of MMWD lands within the Golden Gate Biosphere Reserve created by UNESCO in 1988 (UNESCO 2008).

The values of biodiversity on a global scale are limitless. Core biodiversity values of the lands managed by MMWD include: providing a high quality water supply for homes,

Figure 1-1. Lands Managed by the Marin Municipal Water District

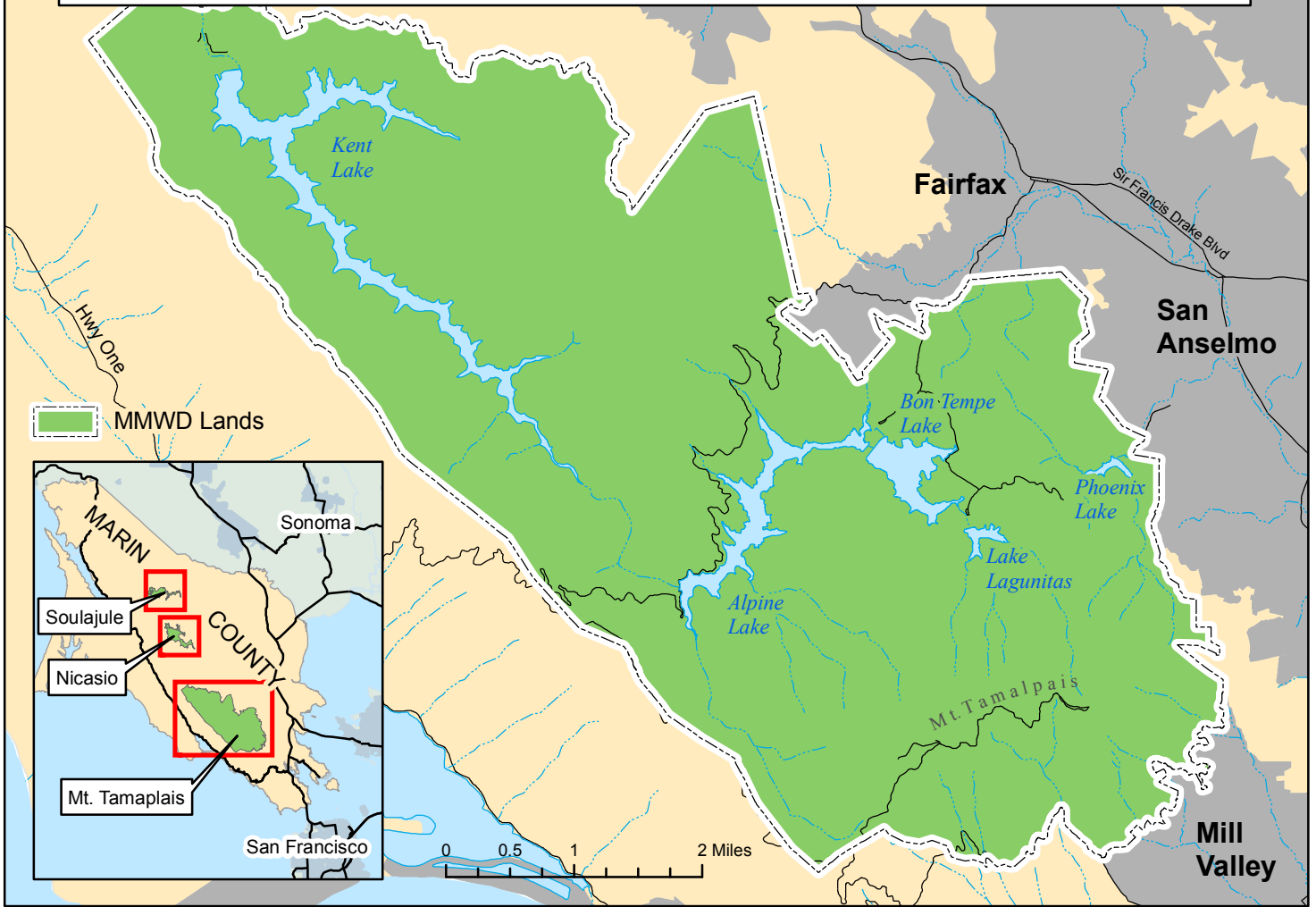


Figure 1-1a. Mt. Tamalpais Watershed Administrative Unit (approximately 18,900 acres)

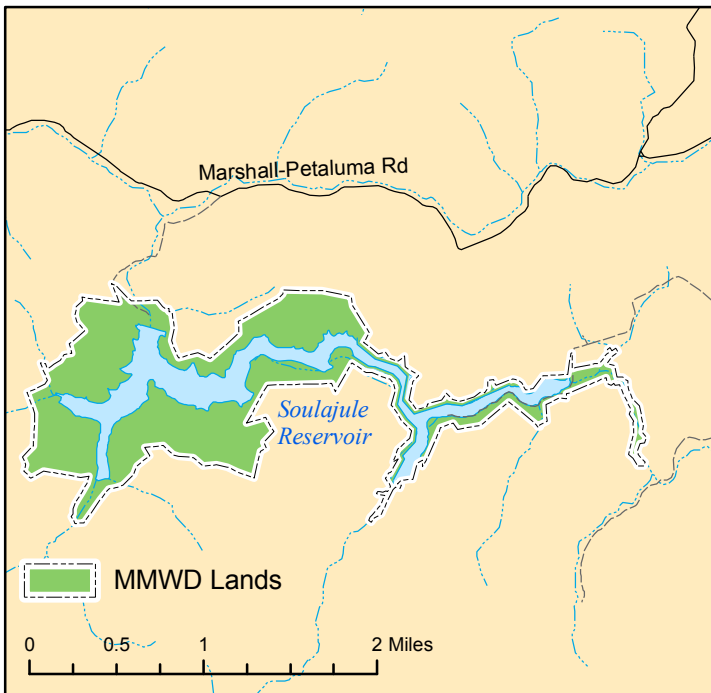


Figure 1-1b. Soulagule Reservoir Lands (approx. 1,100 acres)

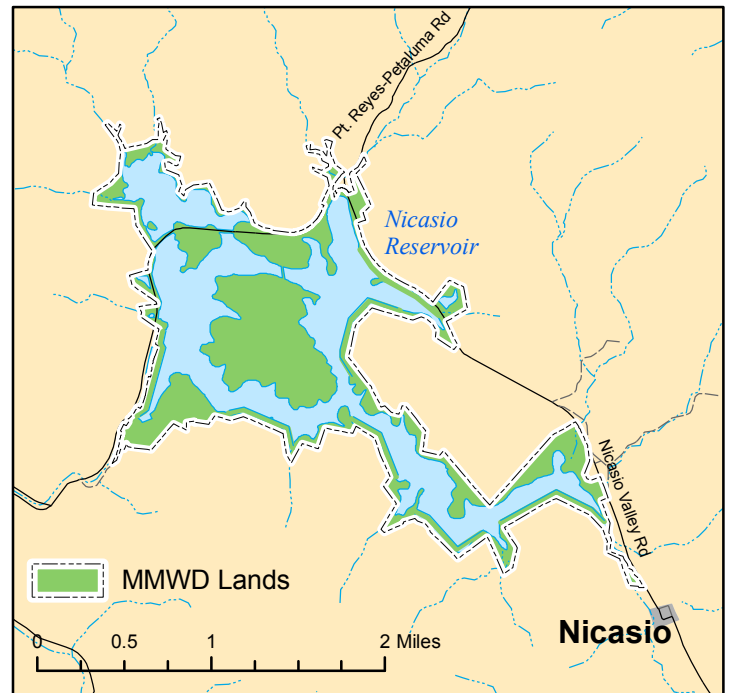


Figure 1-1c. Nicasio Reservoir Lands (approx. 1,600 acres)

businesses and nature; protecting downslope towns and cities from storm-based erosion; providing a natural landscape for recreation; protecting economic resources associated with tourism and agriculture; providing an aesthetically pleasing visual backdrop for towns at the base of Mt. Tamalpais; and contributing to the biodiversity of the Bay Area region and California as a whole, which has garnered worldwide recognition.

The District is committed to protecting this biodiversity at all levels. The protection of intact habitats and ecosystems, and healthy populations of common and rare species, is of special importance now that we have entered the era of global climate change. District lands, if maintained in top condition, have the capacity to serve as *refugia* for at-risk species and ecosystems, giving land managers and other conservationists time to evaluate environmental changes as they develop, and select the management practices that will best preserve biodiversity in a warming world. To achieve this, the District will implement actions designed to increase *ecosystem resilience, resistance and stability*. These qualities increase the likelihood of species and ecosystem survival over the long term, and enhance flexibility in management options (Chapin et al. 2006).

While lands managed by the District are largely undeveloped, the biological diversity within these lands is subject to a variety of threats. Besides global climate change, the impacts of invasive species, especially weeds and forest pathogens, is a significant source of biodiversity loss on MMWD lands. Fire-related threats to biodiversity also are important. The District's construction and maintenance activities can threaten some habitats and species. Threat interactions compound the difficulty of determining the most effective response.

Management goals and objectives included in the District's 2009 update of its Vegetation Management Plan address issues of biodiversity protection. These goals and objectives will be fulfilled through implementation of a biodiversity protection strategy. Key components of the District's strategy to fulfill its goal of protecting biodiversity can be summarized as: inventory and mapping projects, monitoring programs, preservation and protection actions, restoration projects, and the use of adaptive management. This multi-faceted approach requires the District to: 1) maintain an up-to-date inventory of its biological resources, and current maps that display the distribution patterns of native and non-native species, vegetation, and wildlife habitats; 2) monitor the outcome of projects and actions conducted for management of biological resources; 3) monitor the condition of these resources over time in order to detect changes and take appropriate management actions; 4) take actions to preserve and protect resources that are currently in good condition; 5) take actions to restore resources that exist in degraded condition or suboptimal numbers; and 6) manage resources over the long term through a process that incorporates monitoring results into the decision-making process, which means to use *adaptive management*.

This Biodiversity Management Plan outlines a wide range of specific projects and actions that are recommended for the District to implement within the timeframe of the 2009 Vegetation Management Plan, which is 10 to 15 years. Specific weed control measures are recommended for the District's highest priority weeds because weed control is one major issue of biodiversity protection on District lands.

2 INVENTORY OF BIOLOGICAL RESOURCES

This section describes the biological resources of the lands managed by the Marin Municipal Water District, focusing on biological resources of special significance, which include legally protected species and other important elements of biodiversity, as defined below. These resources are the focus of this Plan because they face both current and future threats, and because addressing these threats is an important function of the biodiversity conservation and management goals and objectives of the updated 2009 Vegetation Management Plan.

A great diversity of biological resources has been documented within lands managed by the Marin Municipal Water District. This diversity is one reason why the MMWD lands were included within the Golden Gate Biosphere Reserve created by UNESCO in 1988 (UNESCO 2008).

Biological resources of special significance or importance are described briefly below. Additional information on the biodiversity found within MMWD lands, including information on common and typical species, can be found in the references listed below in Section 2.3.

2.1 Significant Biological Resources

Significant biological resources, as defined for this Plan, include: special-status plants, lichens and bryophytes; special-status wildlife species; and special-status vegetation types. All of these have been given special conservation status, in many cases including legal protections derived from listing as rare, threatened or endangered. Their conservation status results from analyses by resource agencies and non-profit organizations such as the California Department of Fish and Game (CDFG), the U.S. Fish and Wildlife Service (USFWS), or the California Native Plant Society (CNPS). Also included in the category of significant biological resources are wetlands and aquatic resources, which are not listed but are protected under a broad array of local, state and federal regulations and policies.

Important habitats is another category of significant biological resources described in this Plan. Important habitats, such as oak woodlands and native grasslands, have a lower level of legal protection, but are also of high ecological value. Within these important habitats, *high quality habitat* areas can be recognized. These consist of sites with relatively intact (uninvaded) vegetation, and low levels of human-based disturbance.

2.1.1 Special-status Plants, Lichens and Bryophytes

Special-status plants, lichens and bryophytes are defined using information from the California Native Plant Society's *Inventory of Rare and Endangered Plants of California* (CNPS 2008), the California Natural Diversity Database (CNDDDB 2008a), and other sources listed below. A plant is considered to be of special status if it meets one or more of the following criteria:

- Listed, proposed for listing, or a candidate for listing as threatened or endangered under the federal Endangered Species Act (CDFG 2008a, USFWS 2006);
- Listed, or a candidate for listing, as rare, threatened or endangered under the California Endangered Species Act (CDFG 2008a);
- Special plant, lichen or bryophyte as defined by the California Natural Diversity Database (CNDDDB 2008a); or
- Listed by the California Native Plant Society in the current online version of its *Inventory of Rare and Endangered Plants of California* (CNPS 2008).

Table 2-1 summarizes information on the special-status plants known from or expected to occur on MMWD lands. Forty taxa of special-status plants have been documented as occurring on MMWD lands, or are very likely to occur, based on a 1990 inventory by Charles Patterson (Patterson 1990), observations from Doreen Smith, the Rare Plant Coordinator of the Marin Chapter of CNPS (Smith 2008), and other information. Included are seven taxa that are federally or state listed as rare, threatened or endangered. Table 2-1 includes an additional three species that have not been documented from District lands, are known from the vicinity, and for which suitable habitat may exist on District lands. Figure 2-1 shows the known locations of special-status plants on District lands. Lichens and bryophytes have not been inventoried on MMWD lands, so it is not known whether any special-status lichens or bryophytes occur there.

Special Status Plant Species on the Mt. Tamalpais Watershed*

Map 1 of 5 (Kent Lake)

Hesperolinon congestum
 (Federal/State Threatened)


Ceanothus masonii
 (State Rare)

All other CA Native Plant Society
 Special Status Species
(Special Status Plant Species Sources:
 CNDDDB Aug, 2007; Patterson 1993
 Klein unpublished)

Major Road - Paved
 Primary Road - Paved
 Minor Road - Paved
 Access Road - Unpaved (MMWD)
 Access Road - Unpaved (other)
 Trail - System (MMWD)
 Trail - System (other)
 Boundary - MMWD Lands

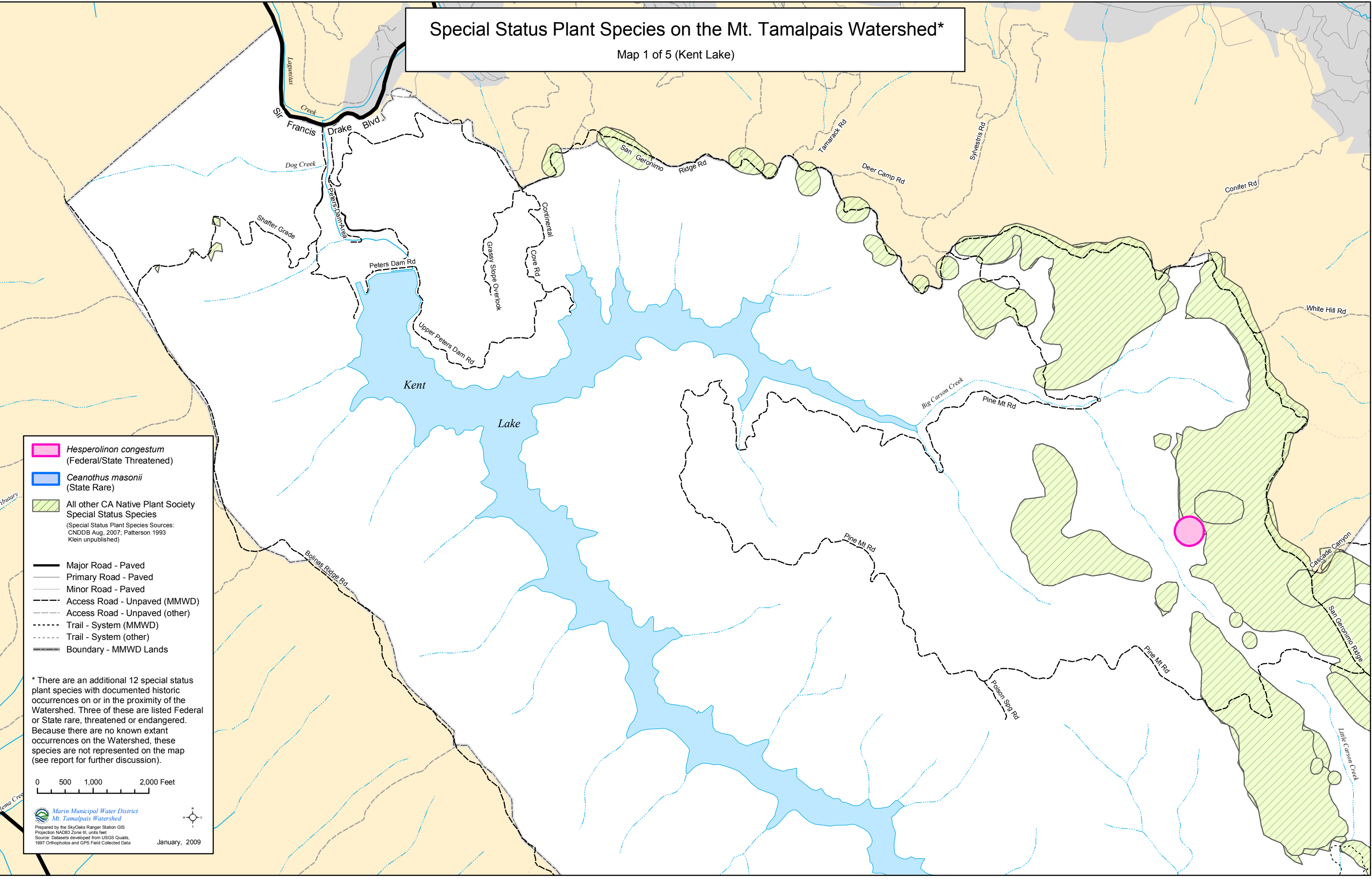
* There are an additional 12 special status plant species with documented historic occurrences on or in the proximity of the Watershed. Three of these are listed Federal or State rare, threatened or endangered. Because there are no known extant occurrences on the Watershed, these species are not represented on the map (see report for further discussion).

0 500 1,000 2,000 Feet



Prepared by the Sky Oaks Ranger Station GIS
 Projection NAD83 Zone III, units feet
 Source: Datasets developed from USGS Quads,
 1997 Orthophotos and GPS Field Collected Data

January, 2009



Hesperolinon congestum
 (Federal/State Threatened)


Ceanothus masonii
 (State Rare)

All other CA Native Plant Society
 Special Status Species
(Special Status Plant Species Sources:
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Major Road - Paved
 Primary Road - Paved
 Minor Road - Paved
 Access Road - Unpaved (MMWD)
 Access Road - Unpaved (other)
 Trail - System (MMWD)
 Trail - System (other)
 Boundary - MMWD Lands

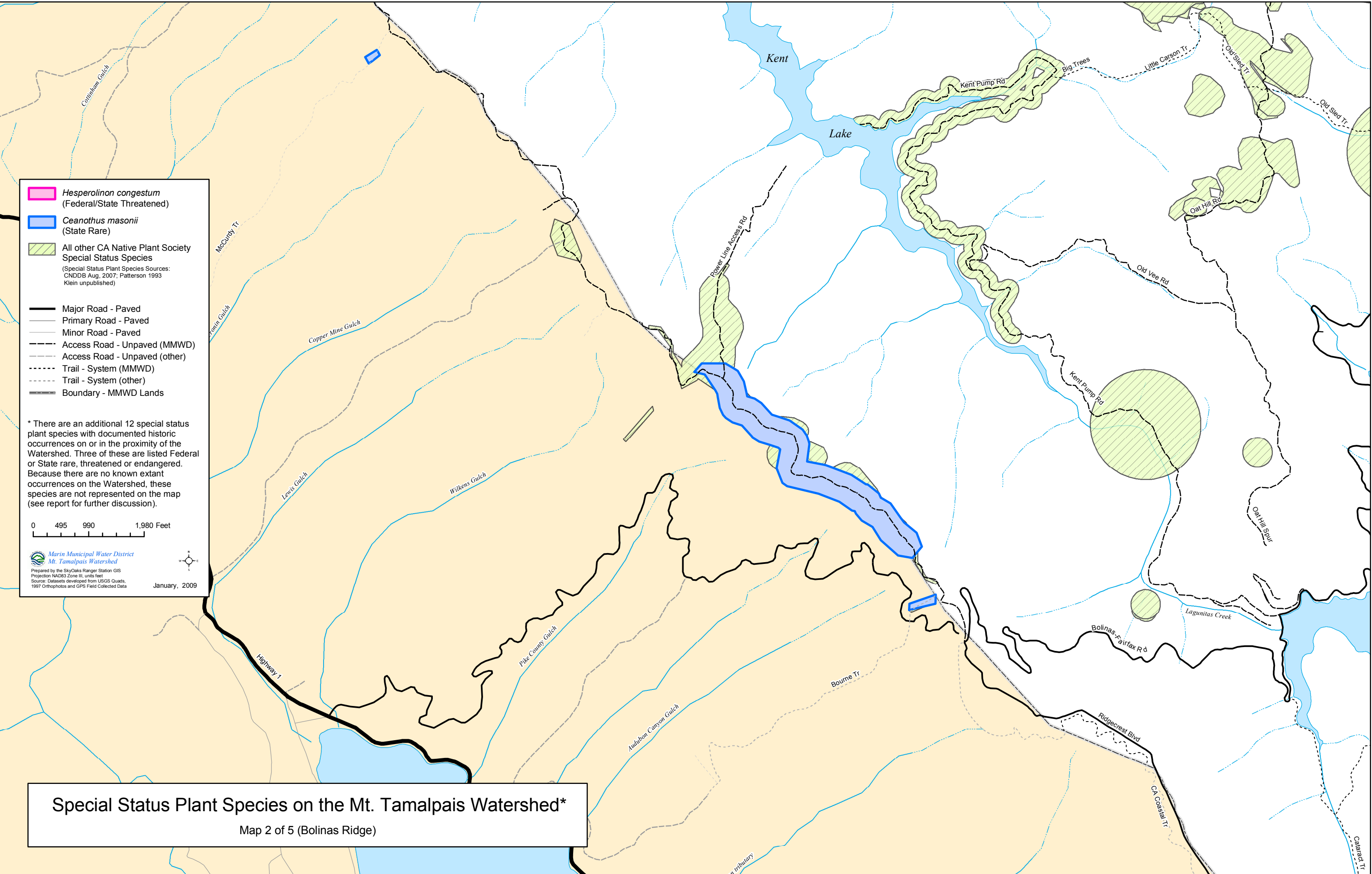
* There are an additional 12 special status
 plant species with documented historic
 occurrences on or in the proximity of the
 Watershed. Three of these are listed Federal
 or State rare, threatened or endangered.
 Because there are no known extant
 occurrences on the Watershed, these
 species are not represented on the map
 (see report for further discussion).

0 495 990 1,980 Feet



 Prepared by the Sky Oaks Ranger Station GIS
 Projection NAD83 Zone III, units feet
 Source: Datasets developed from USGS Quads,
 1997 Orthophotos and GPS Field Collected Data

January, 2009



Special Status Plant Species on the Mt. Tamalpais Watershed*
 Map 2 of 5 (Bolinás Ridge)

