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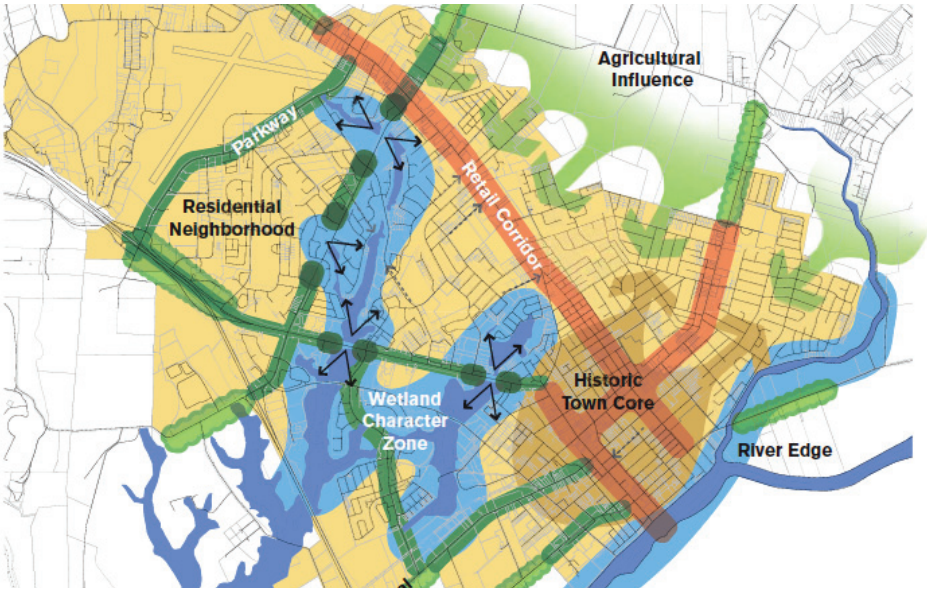
CALIFORNIA



CITY OF WATSONVILLE

URBAN GREENING PLAN

September 2012

Acknowledgements

The Urban Greening Plan was funded in part through the Urban Greening Grant Program, which is under the authority of the State of California Natural Resources Agency and pursuant to The Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coastal Protection Bond Act of 2006 –Proposition 84.

The City of Watsonville is pleased to have received the Urban Greening Grant to support these planning efforts.

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1. Program Overview

In this Section:

What is Urban Greening Planning?

Natural Resources and Urban Areas

Population density has increased significantly in California cities in recent decades, creating many new challenges for local jurisdictions unaccustomed to dealing with population swells and the resulting constraints on natural resources, open space, and infrastructure. In coming years, urban areas will face new challenges related to impacts of climate change. Effective planning of land use and public infrastructure is critical to meet the needs of growing urban communities.

Many cities address these needs by preserving natural resources and leveraging the "ecosystem services" that natural systems provide. Instead of relying completely on large, expensive public infrastructure investments, urban

areas can use smaller, localized investments in natural resources to meet community needs. Unlike traditional public infrastructure, these natural systems that provide green infrastructure tend to increase in value over time and provide additional benefits to community members, such as improved air quality, water quality, and access to nature. The implementation of Urban Greening projects may require more labor and less investment in materials. This stimulates the local economy and provides job opportunities in an emerging field.

A multi-disciplinary and cross-departmental planning method is required to effectively implement this approach. Coordination between different departments within City government and outreach to stakeholders throughout the community are necessary for successful urban greening. Much like a natural system, the individual components of the urban greening plan work together to function as a whole. Ultimately, the urban greening planning process is intended to result in the identification of a long-term strategy for adapting to a new urban landscape.

Strategic Growth Council Urban Greening Program

The Strategic Growth Council (SGC) developed the Urban Greening Grant Program to incentivize development of urban greening plans. The plans will ultimately result in projects that help the state meet environmental goals and create healthy communities. SGC is a committee comprised of members from a variety of state agencies including: Business Transportation and Housing, California Health and Human Services, California Environmental Protection Agency, and the California Natural Resources Agency; the director of the Governor's Office of Planning and Research; and a member from the general public.

Much like a natural system, the individual components of the urban greening plan works together to function as a whole.

An urban greening plan outlines projects that provide multiple benefits including: reducing greenhouse gas emissions, decreasing air and water pollution, reducing consumption of natural resources and energy, increasing reliability of local water supplies, and increasing adaptability to climate change.

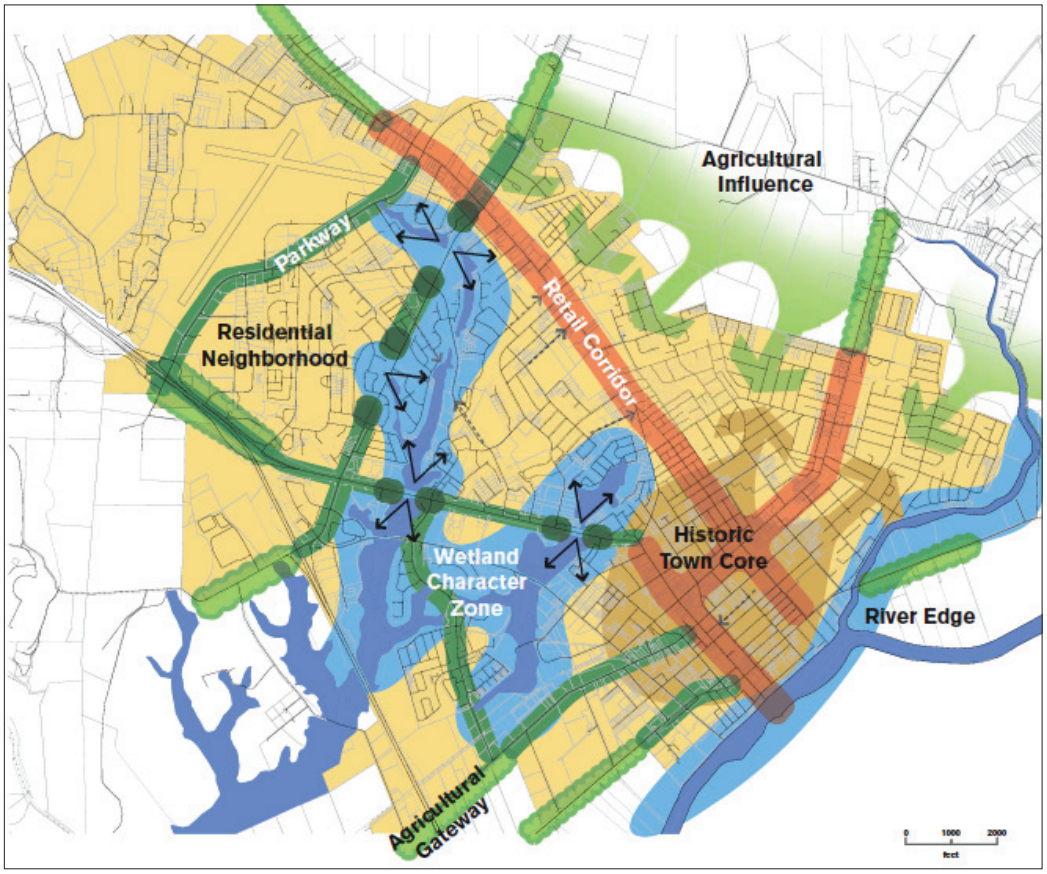
Urban Greening in Watsonville

The City of Watsonville is in an excellent location for urban greening projects for many reasons, including demographics and community needs, existing natural resources, and potential impacts of climate change. These factors create unique challenges and opportunities to shape the future of the community. City staff are very effective at coordinating across departments and collaborating with community stakeholders. This, along with Watsonville's willingness to test solutions that are "outside of the box," makes Watsonville an ideal place to pilot urban greening projects that can be replicated in other agricultural communities throughout California.

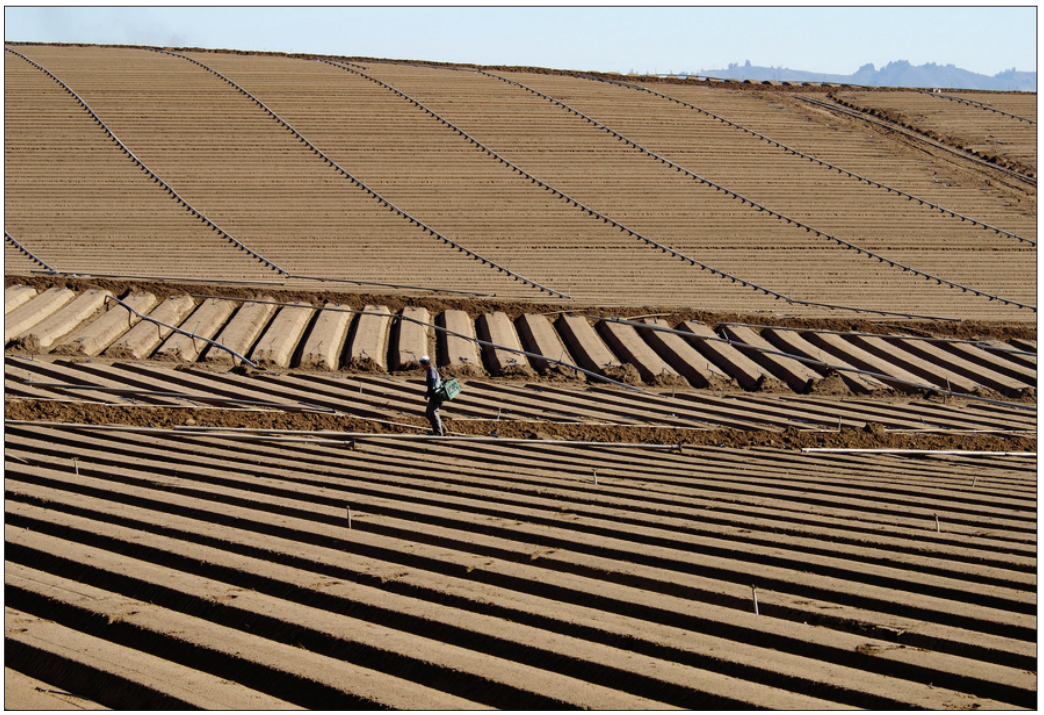
Demographics and Community Needs

Watsonville has a current population of 77,150 and is expected to grow by 37% by 2030. In the 2010 Census, about 19% of all employed persons in Watsonville reported farm work as their prime occupation, a high concentration when compared to the national average of 5%. Watsonville has experienced relatively fast population growth over the last decade—especially among those under 18 years of age.

Watsonville families, and youth in particular, are faced with a range of challenging social conditions that include poverty, high unemployment, poor educational attainment, overcrowded homes, and gang violence. Fifteen percent of all Watsonville families live below the poverty level, and 21% of families with children under 18 years of age live below the poverty level. Between 77% and 83% of students attending middle schools in the City qualify for a free or reduced-price lunch, according to the California Department of Education. Watsonville has an annual unemployment average of



This diagram shows the framework for the Watsonville Street Trees Plan.



About 19% of people in Watsonville report working in agriculture.

22% (unadjusted for seasonal employment), which takes into account the seasonal fluctuations of agricultural-based jobs. Watsonville's annual unemployment rate is more than twice that of the rest of the state (11.0%), according to the Department of Labor Statistics.

While the City of Watsonville has made great progress in creating a more livable town that supports the health of its residents, economy and environment, huge challenges still exist. Through the adoption of this Urban Greening Plan, Watsonville now has a clear road map to incorporate greening principles as we move forward.

Affordable Housing

The National Association of Home Builders consistently ranks the Santa Cruz-Watsonville area as the second least affordable housing market in the United States. Between 2000 and 2007, median City housing prices increased from $224,700 to $586,000. Consistent with national economic conditions, current median housing prices have dropped to $516,300 with high foreclosure rates significantly reducing values. To address these issues, the City passed an Affordable Housing Ordinance that requires most new housing developments to include units that are affordable to families who live and work in the community. Depending on the number of homes in the development, either 15% or 20% must be affordable. The affordable housing units are distributed among different income levels and advertised on the City's website. In addition, the City offers several rehabilitation loan programs and first time homeowner programs to encourage repair of existing housing and help low income first time homebuyers. Several elements of the Urban Greening Plan are likely to have a positive effect on property values. A recently completed study by the University of Washington found that the presence of larger, mature trees in yards and as street trees can add from 3% to 15% to home values throughout neighborhoods. In addition, the study found 7% higher rental rates for commercial offices that have high-quality landscaping.

Safe Routes to School

In 2010, Watsonville ranked 5th highest among 103 cities (with similar population size) for total pedestrians killed/injured, according to the California Office of Traffic Safety. Between 2007 and 2008 there were 31.2 pedestrian injuries and only one fatality. Close to half of the pedestrians injured in Watsonville were under age 18. Recognizing the need to create safer routes for multi-modes of transportation, Watsonville has invested in the creation of several miles of off-street trails, roadway improvements to support biking, and other initiatives to support pedestrian safety. Several elements of the Urban Greening Plan will improve opportunities for residents to safely walk or bike to school, work and other places.

Public Health

Obesity is an issue facing many residents of Watsonville. This is attributed to many factors including lack of safe walking routes, lack of opportunities for safe and enjoyable physical activity, and not enough access to healthy food. About 26% of respondents in a 2011 Pajaro Community Health Trust survey (www.pvhealthtrust.org) reported that their overall health is only fair to poor compared to 13.8% of Santa Cruz County as a whole. According to the same survey, 64% of respondents reported that they are either overweight or obese (determined by body mass index). Increased physical activity is linked to higher academic achievement, better health habits, and greater resilience to negative social behaviors such as substance abuse and gang involvement. With only 2.8 acres of City-owned parkland per 1,000 residents, the City realizes it must plan for more open space and provide opportunities for residents to walk or bicycle to school, work, stores and home, thereby increasing physical activity in a community with an obesity challenge. The City has supported development of several community centers, maintains 184 acres of parks, and supports numerous sports and activities programs. Several elements of the Urban Greening Plan will increase or improve opportunities for residents to become physically active.

The Watsonville Sloughs Trail provides open space and recreational opportunities.

Existing Environmental Conditions

Watsonville has diverse environmental resources, including an extensive wetland system near the Pajaro River, highly productive agricultural lands, and proximity to the Pacific coastline. Many of these natural resources are threatened by quickly expanding residential development and pollution from urban areas. Recently, the community has begun to embrace these unique environmental resources, such as the prominent Watsonville Sloughs, and has invested in substantial restoration programs. Projects include an 80-acre restoration project around Pajaro Valley High School, six wetland restoration projects in the Watsonville Sloughs and restoration of a section of the Pajaro River. Yet despite a significant investment in restoration projects, many threatened resources, including the Pajaro River, remain in need of restoration plans.

The City of Watsonville is poised to use urban greening

The Pajaro River Watershed provides valuable ecosystem services.

Future challenges related to Climate Change

While the coastal climate and rich soils in and around Watsonville create one of the most productive agricultural regions along the West Coast, agricultural productivity comes with challenges, including harmful runoff from pesticides and a high demand for water. Watsonville's proximity to the coast also makes it susceptible to sea level rise. This could lead to flooding, erosion, loss of agricultural land, changes in economic conditions, and threats to infrastructure. Another potential impact to the agricultural sector includes changes in agricultural patterns that could result in increased pumping of the already over-drafted aquifer and threats of sea water intrusion in coastal wells. This would escalate the significant threat to the City's water supply.

Other possible impacts of climate change include increased intensity and duration of extremely hot days, and an increase in air pollution levels, and increase in heat-related illness. With a large percentage of impervious surfaces and relatively little canopy cover from trees, Watsonville is also susceptible to heat island effects, which will worsen with climate change. Climate change will have an even bigger impact on the poor and elderly, two growing segments of the population in Watsonville. These residents are medically underserved, making them less able to cope with rising temperatures, rising

costs of food, and other impacts of climate change. The Urban Greening Plan directly addresses the root cause of climate change by identifying projects and policies that are known to curb greenhouse gas emissions. For example, by planning for a network of pedestrian paths and bikeways to connect the entire city, people will be encouraged to walk or bicycle to work, school and other places, thereby reducing the burning of fossil fuels.

In addition to taking action to reduce greenhouse gas emissions, the Urban Greening Plan identifies ways for the community to better adapt to a changing climate, such as mitigating heat island effects by identifying areas for street tree plantings, creating trail corridors, and implementing other greening activities in the most densely developed areas. Watsonville is poised to implement many of the solutions outlined in its Urban Greening Plan.

The Watsonville Sloughs Trail traverses urban areas.

Goals

The City is in the process of adopting the Watsonville VISTA 2030 General Plan, which establishes guiding principles and policy goals for sustainable community development.

Many General Plan objectives address aspects of urban greening, including the following:

- Encourage pedestrian-friendly neighborhoods and a vibrant downtown, including great streets, parks and plazas, by leveraging public investments and guiding private actions.
- Provide a high proportion of streets with sidewalks, low-speed design, tree canopy, street furnishings and themed elements.
- Provide a high proportion of homes within one-quarter mile of parks, schools, retail conveniences, and transit by retrofitting urbanized areas and setting aside land in new growth areas. Reduce vehicle miles traveled per household.
- Reduce the proportion of street frontages lined by parking lots or blank walls. Increase street connectivity.
- Develop and maintain a trail system that encourages appreciation and respect for natural habitats and provides safe, secure passageways in and around the community.

Objectives

While the General Plan and state planning policies promote green initiatives, there is no road map to prioritize and integrate these elements, and site-specific actions are not defined. This Urban Greening Plan has eight key objectives to implement and integrate multiple sustainability goals identified in the City's planning documents. The following objectives will be accomplished through the actions contained in the specific plan components identified in Section 3.

Objective 1: Provide increased opportunities for bicycling and walking in our community.

Objective 2: Improve habitat, preserve natural resources and create open space along selected trail corridors and adjacent areas.

Objective 3: Improve air and water quality, livability and energy efficiency.

Objective 4: Conserve water and other natural resources through sustainable landscaping and plant selection.

Objective 5: Reduce stormwater runoff, improve air and water quality, and conserve resources.

Objective 6: Improve access to healthy local food while preserving natural resources.

Objective 7: Engage local stakeholders in the Urban Greening planning process. This includes public outreach to community members through bi-lingual announcements, posting information on the City website, communicating with other local agencies and offering public workshops to discuss the six plan components.

While the General Plan and state planning policies promote green initiatives, there is no road map to prioritize and integrate these elements.

Objective 8: Encourage and support inter-departmental and cross-agency collaboration in the planning process to find solutions and implement action items for all of the six components of the Urban Greening Plan.

Integration with Existing Plans

Due to the cross-departmental nature of urban greening, the Urban Greening Plan is integrated with other planning efforts in the City of Watsonville and the region. The Urban Greening Plan complements other plans, provides more detail in some areas, and will be referenced in updates to other plans. Several elements of the Watsonville 2030 VISTA General Plan are especially relevant:

- The **Recreation, Parks and Open Space element** of the General Plan addresses trails as part of Goal 9.3, and states "Provide a network of trails along natural areas to promote safe travel ways and appreciation of sloughs, creeks, and the Pajaro River."
- Establishing community gardens is consistent with Chapter 8 of the General Plan (Parks & Recreation), which states "Consider Implementation of a Community Garden Program." Undeveloped land that is being held for future use by the City is one example of land that could be used for community gardens.
- The Parks, Recreation and Public Facilities chapter of the General Plan addresses trails as part of Objective 7.6, and is described in the next section.

Other planning efforts that are integrated with the Urban Greening Plan:

- Storm Water Pollution Prevention Plan, 2010
- Bicycle Transportation Plan, 2010
- Envisioning the Monterrey Bay Area: A Blueprint for Sustainable Growth and Smart Infrastructure
- Go for Health! Collaborative Strategic Plan and Committees
- 1994 General Plan and Local Coastal Program for the County of Santa Cruz
- The Watsonville Sloughs Watershed Conservation and Enhancement Plan (WSCEP)
- Watsonville Wetlands Trail Vegetation Management and Maintenance Manual
- Climate action planning and AB32 compliance activities in multiple city departments

Street trees provide multiple benefits for the community, including shade.

2. Urban Greening Process

In this Section:

Overview of the Planning Process

Project Team

Resources & Consultants

Public Involvement Methods

OVERVIEW OF PLANNING PROCESS

After receiving the Urban Greening Planning Grant from the Strategic Growth Council, the City of Watsonville Public Works and Utilities Department formed a project team and advisory committee to direct the planning process. This team:

- was a combination of expert consultants from private firms and local non-profits, City staff and local stakeholders.
- refined work items for each project component and identified resources to complete this work.
- engaged the public through workshops and disseminated information to community networks.
- reviewed findings and action items for each component to ensure consistency with existing plans and identify a policy framework for implementation through which to implement the Plan.

PROJECT TEAM

An inter-departmental project team was convened to guide development of the Urban Greening Plan. Each team member was selected based on their unique understanding of different City functions or connection to the community. This team met several times to select consultants, review work items and keep the planning process on schedule. In addition, a steering committee consisting of staff from key public and non-profit agencies in Watsonville and the surrounding region reviewed draft documents to identify areas for potential collaboration and coordination.

Some components required a bid/award process and expert consultants were selected from a highly qualified pool to work on each component. City staff completed other components in coordination with key stakeholders. This team will also present the final Urban Greening Plan to the City Council for adoption.

The table on Page 17 provides a summary for each component.

Downtown Watsonville includes a vibrant business district.

PROJECT TEAM

Name	Title	Role
Bob Geyer	Assistant Director Public Works and Utilities	Overall project coordination. Trails, stormwater, water, wastewater and recycling, solid waste, watershed management, environmental education, street maintenance
Maria Esther Rodriguez	Principal Engineer	Coordination on transportation, including vehicle, mass transit, bicycle and pedestrian travel on public roadway system
Robert Ketley	Sr. Utilities Engineer, AB 32 Implementation Coordinator, Stormwater Manager	Green infrastructure, stormwater, coordination with AB 32 Scoping Plan implementation
Suzi Aratin	Senior Planner	Coordination with the General Plan objectives, community planning, CEQA
Nancy Lockwood	Public Works and Utilities - Community Gardens Program Manger	Coordination of the Community Gardens component and stakeholder outreach
Michelle Templeton	Public Works and Utilities - Environmental Projects Manager	Link to environmental education and outreach programs, coordination with water conservation, water quality and solid waste reduction efforts
Jonathan Pilch	Restoration Director, Watsonville Wetlands Watch	Restoration and stewardship of natural areas, trail linkages
Clara Cawaling	Administrative Analyst	Financial tracking and reporting
Monica Reid	Consultant	Grant management, Urban Greening Plan synthesis and document preparation
Nick Kraemer	Consultant	Grant management, Urban Greening Plan synthesis and Document Preparation
Cleo Martinez	Traffic Systems Coordinator	Street signs, maintenance and traffic signals, coordination with the Bicycle Plan
Kurt Overmeyer	Economic Development Manager	Business community liaison
Ana Espinosa	Parks and Community Services Manager	Coordination with park planning, identifying problems in key neighborhoods, coordination with Go for Health

RESOURCES & CONSULTANTS

Component	Team	Lead
City-Wide Bicycle & Pedestrian Trails Plan	RBF Consulting, Waterways Consulting, Inc. and Kittleson Environmental Consulting, Inc.	Bill Wiseman, Vice President - Planning
Habitat Restoration and Enhancement for Trail Corridors & Adjacent Areas	Watsonville Wetlands Watch	Jonathan Pilch, Restoration Director
Street Trees Plan	Wallace, Roberts, and Todd, LLC	James Stickley, Principal Consultant, ASLA, LEED, AP
Plant Palette & Landscaping Guidelines	Wallace, Roberts, and Todd, LLC	James Stickley, Principal Consultant, ASLA, LEED, AP
Green Roof Design Criteria	Design Ecology	Josiah Cain, Principal and Founder
Community Gardens	City of Watsonville, Public Works and Utilities Department	Nancy Lockwood, Environmental Projects Manager
Synthesis of Full Plan	Kestrel Consulting, Inc.	Monica Reid, Principal Consultant

PUBLIC INVOLVEMENT METHODS

Public involvement was a key objective in completing the Urban Greening Plan. There were several public meetings and workshops held for each of the six plan components. Approximately 125 people attended those meetings. In addition, all draft planning documents were uploaded to the City's website. The project team and consultants contacted local agencies and stakeholders, such as gardening groups and youth bicycling groups, to encourage participation in the planning process. The full Urban Greening Plan was presented to City Council for adoptions.

Component	Public Involvement Methods
C1 - Citywide Bicycle & Pedestrian Trails Plan	Advisory Group, Public Meetings/Workshops, informational displays in the library, City Hall and at the nature center, Public Hearing Process. Tabling was conducted at two community events.
C2 - Habitat Restoration and Enhancement for Trail Corridors & Adjacent Areas	C2 was presented, along with C1, at two public meetings and a display was set up at the FITZ Wetlands Educational Center.
C3 - Street Trees Plan	Advisory Group, Public Meetings/Workshops
C4 - Plant Palette & Landscaping Guidelines	Advisory Group, Public Meeting/Workshop
C5 - Green Roof Design Criteria	Brochure and meeting with building officials and local developers, as well as at a meeting with the Landscape Architects Association
C6 - Community Gardens	Advisory Group, Public Meeting/Workshop, and Public Hearing Process

3. Urban Greening Plan Components - Overview & Action Steps

In this Section: An Overview of Each Component & Action Steps

C1 - Citywide Bicycle & Pedestrian Trails

C2 - Habitat Restoration and Enhancement for Trail Corridors

C3 - Street Trees Plan

C4 - Plant Palette & Landscape Guidelines

C5 - Green Roof Design

C6 - Community Gardens

OVERVIEW & ACTION ITEMS

Each component of the Urban Greening Plan has its own unique goals and objectives related to the overall Urban Greening Plan. This section provides an overview of each component. Section 4 contains each component's full plan, which were prepared by consultants who were experts in the subject area.

Photo courtesy SFBike

Component #1 – Citywide Bicycle and Pedestrian Trails Plan

PURPOSE: Develop a framework for building an integrated system of paths and bikeways that link residents to jobs, schools, shopping and outdoor recreation.

BENEFITS: Provide alternative transportation, improve health, protect the environment, and build upon existing assets such as the Watsonville Wetland Trail network.

APPROACH: Assess existing conditions and organize into sub-areas; propose new trails, lanes and facilities; develop guidelines by facility type; make recommendations for implementation.

KEY STATISTICS: In Santa Cruz County, 3.1% of commuters travel by bike. In Watsonville, 0.9% of commuters travel by bike.

KEY FINDINGS: Sloughs, levees, on-street trails, and regional trails have similar opportunities for leveraging investments in existing and future infrastructure. They also face similar constraints, inluding access to funding, obtaining easements, and meeting legal constraints. Connectivity between high priority destinations must improve. A variety of acquisition strategies can be used to build high priority segments based on number of connections, acquisition effort, cost and required permits.

ACTION ITEMS

The following Action Items for C1 - Citywide Bicycle and Pedestrian Trails will be carried out by the Department of Public Works and Utilities.

Action Items
(C1-1) Santa Cruz County Regional Transportation Commission approves Citywide Bicycle and Pedestrian Trails Plan.
(C1-2) City Council adopts Urban Greening Plan.
(C1-3) City incorporates new trail construction priorities into the Capital Improvement Program (CIP).
(C1-4) City completes construction drawings, trail specifications, and environmental assessments for priority segments.
(C1-5) City coordinates with Army Corps of Engineers on design and construction of trail segments along the flood control levees.
(C1-6) Develop a trail promotion program, which includes developing trail brochures and providing information on the city's website and at activity centers about the location of citywide trails and connections to regional trails.
(C1-7) Acquire public ownership or easement of trail corridors and access points to develop an effective trail network. Identify potential tax-related incentives and seek funding for other inducements for private property owners to allow and support public trails.
(C1-8) Maintain the City's GIS-based trail map with parcel information so that the city can track existing and required easements.
(C1-9) Apply for grants and alternative funding sources from various state and federal sources, particularly via local transit organizations such as the SCCRTC.
(C1-10) Establish an "Adopt a Trail" program for maintenance and patrol activities.
(C1-11) Coordinate the city's trail system planning, implementation and management efforts with those of regional jurisdictions and public agencies.
(C1-12) Identify partnership opportunities with neighborhood groups, private individuals and local businesses as a means to acquire various trail amenities.
(C1-13) Ensure that trails and bike lanes are included in plans for new transportation projects such as bridges and overpasses.

Component #2 – Habitat Restoration & Enhancement for Trail Corridors

PURPOSE: Guide vegetation management and natural resource enhancement along the future trail corridors.

BENEFITS: Improve the diversity of native plant and animal species in the wetlands, creeks, rivers, grasslands, and woodlands in the City of Watsonville and the lower Pajaro watershed while increasing scenic values, improving water quality, and creating green jobs.

APPROACH: Assess and map existing conditions, and create a summary of opportunities for restoration and enhancement by waterway or natural area.

KEY STATISTIC: Several endangered plant and animal species, including Santa Cruz tar plant, steelhead, red-legged frog, and long-toed and tiger salamanders, can be found in trail corridors.

KEY FINDINGS: Riparian habitats of Corralitos Creek and the lower Pajaro River provide critical habitat linkages between the coast and the Santa Cruz Mountains. Better connection of the trail system with restoration of its adjacent natural areas will provide habitat corridors for a diversity of species, and paths for residents. Invasive species are a significant problem within trail corridors, inhibiting diversity and creating maintenance issues. Planted buffers between agricultural areas, residential areas, and the proposed trail corridors would provide many benefits.

ACTION ITEMS

The following Action Items for C2 - Citywide Habitat Restoration & Enhancement for Trail Corridors will be carried out by the Department of Public Works and Utilities.

Action Items
(C2-1) Create a program to remove invasive species along trail corridors.
(C2-2) Develop maintenance regimes to protect critical native habitat and prevent spreading of invasive species in trail corridors.
(C2-3) Work with private landowners to improve maintenance regimes, remove invasives and provide buffers.
(C2-4) Incorporate GPS data tracking of invasives and inventory of native habitats in city GIS systems.
(C2-5) Apply for grants and alternative funding sources for trail corridor restoration from various state and federal sources.
(C2-6) Develop and install signage for trail users to identify invasives and provide information about native species.
(C2-7) Coordinate with volunteer groups and other local partners, such as Watsonville Wetlands Watch, for trail corridor restoration projects.

The Struve Slough is one of many wetlands in Watsonville that provides multiple benefits to citizens.

Component #3 – Street Trees Plan

PURPOSE: Develop specific guidelines and plans for high-priority areas to increase the number of street trees in Watsonville.

BENEFITS: Street trees capture stormwater, improve air quality, provide energy savings with shade, calm traffic, create habitat, improve public health and sense of place, and add community value.

APPROACH: Assess existing conditions, develop street tree program framework, identify priority implementation areas, and specify a Plant Palette.

KEY STATISTIC: The City's tree canopy coverage, including trees on private property as well as street trees and parks, is approximately 7.8%. A city with Watsonville's climate can reasonably set a goal of 40% canopy cover.

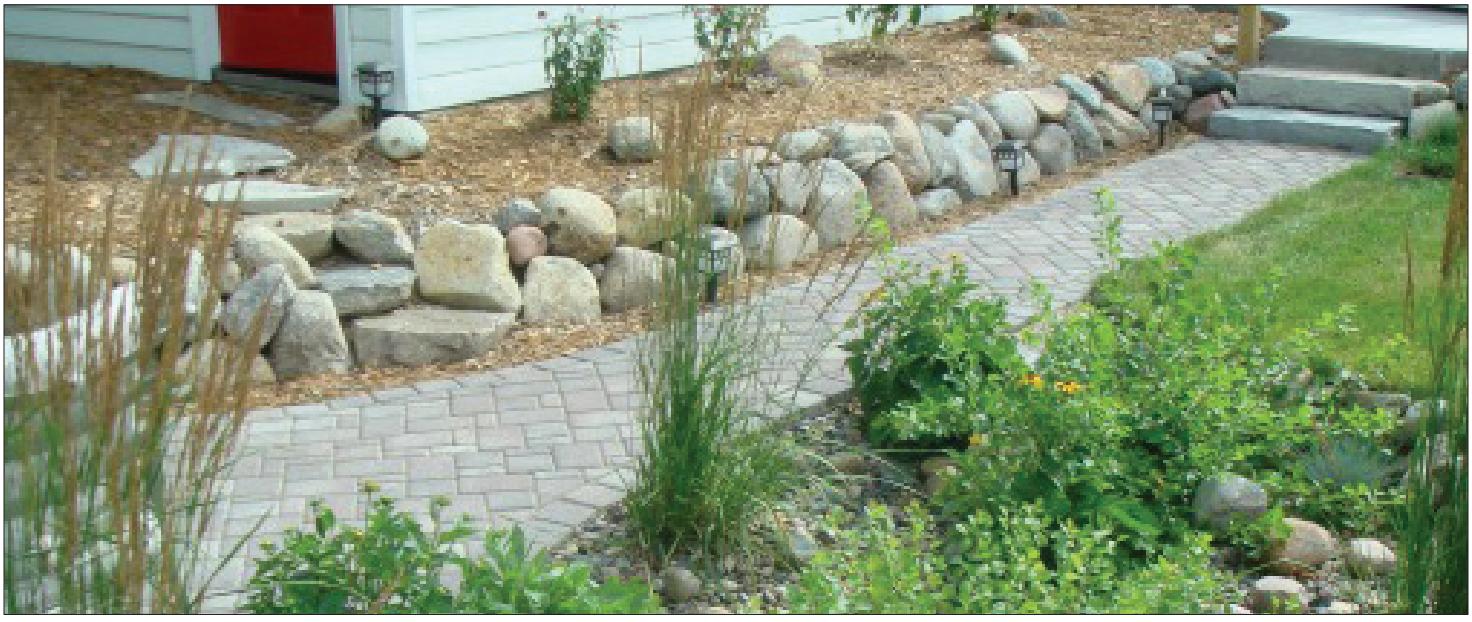
KEY FINDINGS: Watsonville trees are in relatively good condition and possess a diversity of age and species. However, there is a significant lack of canopy coverage throughout the City. Many potential opportunities exist to incorporate trees into the streetscape. The City can offer front-yard planting incentives, plant in retail corridors where possible and plant within roadways (medians, tree islands, planting strips).

ACTION ITEMS

The following Action Items for C3 - Street Trees will be carried out by the Department of Public Works and Utilities.

Action Items
(C3-1) Develop a community tree-planting program, which includes a public outreach campaign, incentives for tree plantings (treebates), and a local "Tree Corps" that coordinates plantings.
(C3-2) Conduct necessary studies to assess feasibility of implementing sidewalk widening and overall streetscape improvements on Freedom Blvd.
(C3-3) Improve stormwater management and evaluate roadway narrowing on Martinelli Street and Clifford Avenue using tree plantings.
(C3-4) Implement large-scale gateway plantings on Upper Main Street and Riverside Drive.
(C3-5) Apply for grants and alternative funding sources for a community tree-planting program.
(C3-6) Integrate GIS data from street tree inventory into city database.
(C3-7) Implement tree maintenance and preservation policy recommendations for trees planted under the street tree planting program.

Citywide street trees guidelines are included in Component 3.



Component #4 – Plant Palette and Landscape Guidelines

PURPOSE: Develop a Plant Palette and guidelines for appropriate plant species and planting techniques.

BENEFITS: Develop stormwater management through strategic planting, prevent water and material waste through drought tolerant planting, create habitat through locally appropriate planting, improve plant diversity, eliminate invasive species, and reduce landscape irrigation water use and related impacts.

APPROACH: Identify benefits of different approaches to landscaping, and develop specific design considerations for plant palettes by neighborhood type.

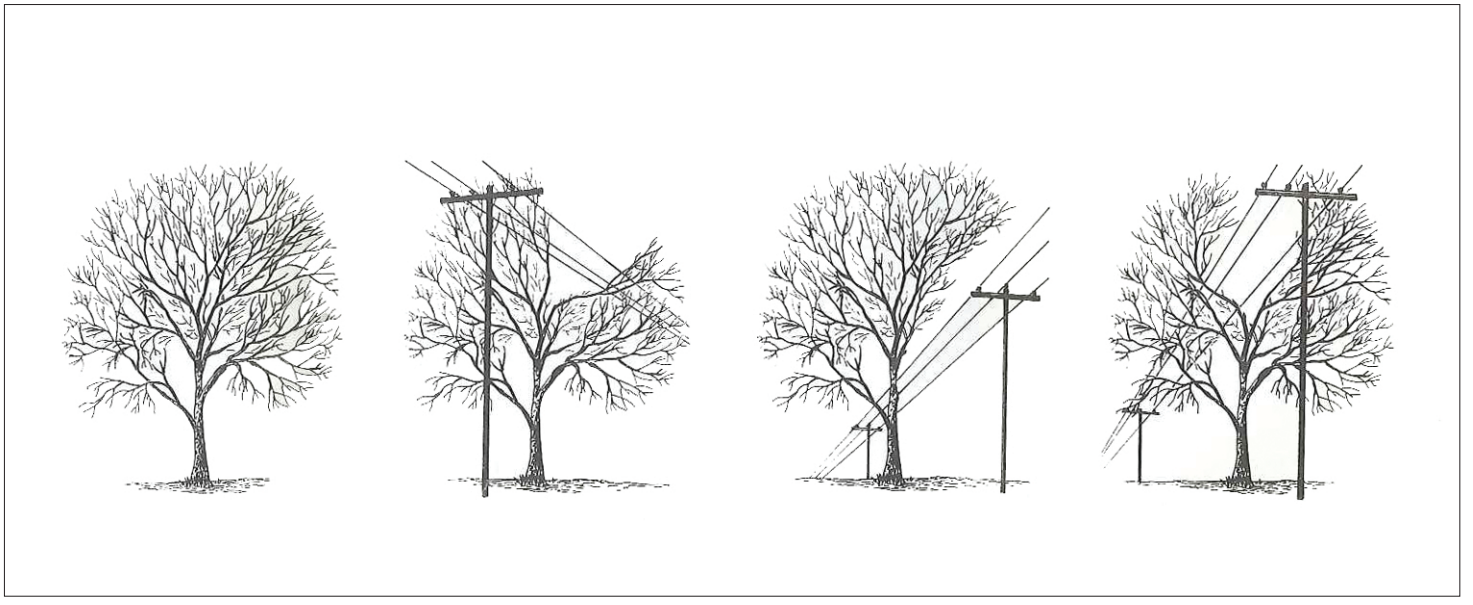
KEY STATISTIC: Bioswales can replace pavement or traditional grassy areas to reduce stormwater runoff, reduce fertilizer and pesticide use and conserve water.

KEY FINDINGS: Design guidelines and plant palettes that address five main objectives: reinforce a sense of place, make Watsonville more beautiful and livable, improve safety, protect buildings and infrastructure, and reduce water use.

ACTION ITEMS

The following Action Items for C4 - Plant Palette and Landscaping Guidelines will be carried out by the Department of Public Works and Utilities.

Action Items
(C4-1) Consider including the planting guidelines and plant palette in future City ordinances.
(C4-2) Ensure compliance with planting guidelines during plan review and maintenance audits, including any City projects.
(C4-3) Encourage appropriate plantings in areas with conflicting adjacent uses. Examples include screening parking lots and public utilities with appropriate landscaping.
(C4-4) Maintain plantings around roadways to ensure safety and good visibility.
(C4-5) Identify opportunities to convert existing landscaping areas to reduce water use, maintenance costs, and provide multi-benefits (habitat, stormwater management).



Schematics for pruning street trees is part of the Landscape Guidelines.

Component #5 – Green Roof Design

PURPOSE: Identify types of green roof systems (intensive, extensive, built-in-place modular) appropriate for use in Watsonville.

BENEFITS: Reduce stormwater roof runoff, which reduces flooding and erosion, improves air quality, reduces heat island effect, reduces energy use, improves aesthetics, and improves habitat.

APPROACH: Identify design considerations that include preferred systems, types of vegetation, and maintenance plans. Recommend opportunities for implementation.

KEY STATISTIC: Green roofs can capture 50% to 70% of stormwater runoff from a roof.

KEY FINDINGS: Green roofs could be incorporated with the low-impact development stormwater management approach used in Watsonville. Green roofs could be incentivized with grants or density bonuses.

ACTION PLAN

The following Action Items for C5 - Green Roof Design will be carried out by the Department of Public Works and Utilities.

Action Steps
(C5-1) Distribute a green roofs brochure to local developers and community members.
(C5-2) Incorporate green roofs into stormwater management planning policies as an LID BMP.
(C5-3) Develop a way to incentivize green roofs by providing per-square-foot rebates and/or grants where appropriate.
(C5-4) Provide density bonuses to developments that incorporate green roofs.
(C5-5) Require that new municipal projects or private projects of a certain size incorporate green roofs where technically and financially feasible.
(C5-6) Consider establishing a stormwater impact or utility fee to fund these actions and other urban greening objectives.

Green roofs like this one provide multiple benefits for building residents, including reduced energy use.

Component #6 – Community Gardens

PURPOSE: Explore the context of community gardening and recommend how the City of Watsonville could work with community partners to promote the establishment and operation of community gardens on City-owned properties.

BENEFITS: Provides space to grow food in dense urban areas, provides healthy foods, promotes community connections, utilizes vacant public lands, and protects resources through consumption of locally grown food.

APPROACH: Conduct a literature review, study program models for operating community garden programs, visit existing and potential garden sites in the City, refine lists and maps of potential garden sites on City-owned properties and other privately-owned sites, consult with stakeholders, draft the Community Garden Program Guide. *Note: All of these steps are complete.*

KEY STATISTIC: The group identified two suitable locations for community gardens in addition to three existing gardens in Watsonville.

KEY FINDINGS: The City could launch a community garden program in a way that enables gardens to be created without substantial City investments. Successful implementation requires highly specific guidelines for operations, which have been completed.

ACTION PLAN

The following Action Items for C6 - Community Gardens will be carried out by the Department of Public Works and Utilities.

Action Steps
(C6-1) Coordinate Community Garden permitting process with interested neighborhood groups on City-owned property.
(C6-2) Allow use of vacant and under-utilized City-owned land for volunteer run community gardens.
(C6-1) Provide water service connections to City-owned community garden sites. Users pay for usage.
(C6-1) Apply for grants and alternative funding sources for a community garden program.

Community gardens increase access to healthy, local food.

4. Full Plans

In this Section: Complete Plans for Each Component

C1 - Citywide Bicycle & Pedestrian Trails

C2 - Habitat Restoration & Enhancement for Trail Corridors

C3 - Street Trees Plan

C4 - Plant Palette & Landscape Guidelines

C5 - Green Roof Design

C6 - Community Gardens

C1.

Citywide Bicycle & Pedestrian Trails

City of Watsonville

Trails & Bicycle Master Plan

for the Watsonville Scenic Trails Network

RBF CONSULTING
A Baker Company

WATERWAYS CONSULTING, INC.

Kittleson
Environmental
Consulting

City of Watsonville

TRAILS & BICYCLE MASTER PLAN

for the Watsonville Scenic Trails Network

November 2012

Acknowledgements

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EXECUTIVE SUMMARY

Document Organization

The Watsonville Trails & Bicycle Master Plan is organized into the following chapters:

- Introduction
- Existing Environment
- Proposed Trail Network
- Design Guidelines
- Implementation
- References
- Appendices

Executive Summary

The purpose of the *Watsonville Trails & Bicycle Master Plan for the Watsonville Scenic Trails Network* is to develop a framework for building an integrated system of pathways and bikeways that will link residents to the outdoors. The future network will provide residents of Watsonville and the greater region with close-to-home and close-to-work access to pedestrian and bicycle trails that connect to the city's most popular destinations and surrounding natural areas, including the vast network of sloughs that are unique to south Santa Cruz County. These trails will serve the non-vehicular transportation and recreation needs and help to encourage quality, sustainable economic growth.

These trails will provide a variety of benefits that will ultimately affect the sustainability of the city's economic, environmental, and social health. These benefits include:

- Improving bicycle and pedestrian transportation;
- Improving health through active living;
- Clean air, productive sloughs, creeks and rivers, and protected wildlife and native plants;
- Enhancing cultural awareness and education about the Pajaro Valley's rich heritage and natural amenities; and
- Creating value and generating economic activity.

Based on stakeholder and public input, extensive fieldwork, research into related planning efforts, and a thorough analysis of aerial photographs, elevation contours and parcel data, the proposed trails and bicycle network is design to achieve the following objectives:

- Build upon the existing Watsonville Wetland trail network which constitutes the central core of the future region-wide trail system;
- Connect major destinations and serve as an opportunity for alternative transportation as well as recreation;
- Offer area residents a viable choice to walk or bike for their local trips;
- Provide opportunities for improving the personal health and fitness of individuals;
- Serve as a regional asset to residents and visitors of the greater Pajaro Valley and Monterey Bay region;
- Stimulate economic growth through increases in real property value and tourism;
- Enhance and protect the environmental quality of open spaces, sloughs, creeks and river corridors; and
- Conserve and tell the story of local culture, history, and environmental resources through interpretive signage.

The components of the plan are explained in further detail in the following chapters. An Aerial of the study area is shown in Figure ES-1: Aerial Photo of the City of Watsonville.

Figure ES-1: Aerial Photo of the City of Watsonville

Source: RBF Consulting, 2012.

1 INTRODUCTION

In this Chapter:

- Purpose of the Plan
- The Planning Process
- The Benefits of Trails & Bikeways
- Visions and Goals

Purpose of the Plan

In August of 2011, the City of Watsonville commissioned RBF Consulting, Waterways Consulting, and Kittleson Environmental Consulting to prepare a citywide *Trails & Bicycle Master Plan for the Watsonville Scenic Trails Network* (the Master Plan), which is a component of the Watsonville Urban Greening Plan (UGP). The UGP will serve as the master set of documents that will guide and coordinate greening projects in the city. The UGP will be consistent with the state's planning policies as they pertain to the following priorities:

- Promote infill development and equity;
- Protect environmental and agricultural resources; and
- Encourage efficient development patterns.

The UGP is funded by Proposition 84 Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coastal Protection Bond Act of 2006.

The purpose of this Master Plan is to develop a framework for building an integrated system of trails and bikeways that will link residents to the outdoors. The future network will provide residents pedestrian and bicycle trails that connect to the city's parks, schools, transit facilities, commercial centers, and various public facilities. The future network will also serve transportation and recreation needs and help to encourage personal fitness and an improved quality of life. Building upon past planning efforts and existing facilities, this Master Plan contains detailed trail and bikeway recommendations and guidelines, which together form a comprehensive non-vehicular circulation network.

The design and construction for specific trail segments will be prepared at a future date and funding sources are identified and property acquisition and/or easements are completed. Because this is a conceptual planning study, environmental review for this Master Plan is exempt under Section 15262 of the California Environmental Quality Act (CEQA). However, CEQA will be required for each specific trail segment as part of the design and permit review process, prior to construction.

Bicycle Transportation Account Compliance

The Bicycle Transportation Account (BTA) was created to implement the California Bicycle Transportation Act, Streets and Highway Code Sections 890-894 (1994). BTA money may be used for infrastructure projects aimed at improving bicycle commuting and safety. Only projects which are listed and described in the local Bicycle Transportation Plan are eligible to receive BTA funding. This Master Plan, with specific reference to the Bicycle Plan component, is consistent with the criteria stated in the California Streets and Highways Code section 891.2 listed in Bicycle Transportation Plan Checklist in Appendix B: Bicycle Plan Criteria to Meet State Requirements. The checklist also indicates the guidelines used in the preparation of the Plan and their location within the Plan. This Master Plan, with specific reference to the Bicycle Plan component, is in conformance with the criteria to meet State funding requirements and, therefore, the projects listed within the Bicycle Plan are eligible for BTA funding.

The Planning Process

The planning process started with the collection and analysis of existing plans and Geographic Information Systems (GIS) data. A kick-off meeting between city staff and the project consultants refined the initial work plan, which consisted of identifying an initial network of future trails and bikeways throughout the city. Field studies were conducted with staff and stakeholders to validate initial segment alignments. An opportunities and constraints assessment was then prepared to determine alignment feasibility and potential environmental impacts.

A Trails & Bicycle Master Plan Advisory Committee (see Acknowledgements), made up of various stakeholder interest groups, met throughout the development of the Master Plan to provide advice and recommendations and helped determine how the Master Plan could best serve the interests of the city as a whole as well as the broader Pajaro Valley and Monterey Bay region.

Draft recommendations were presented to the public for review, including opportunities for residents to speak with city staff and project consultants about any concerns, comments, or ideas for the Master Plan. In addition, comments were received during the public hearing process and were considered.

The Santa Cruz County Regional Transportation Commissions (RTC) Bicycle Advisory Committee also reviewed the Master Plan's recommendations. Final presentations concluded the effort with recommendations to officially adopt the Master Plan and to request RTC certification of the Plan as being compliant with the Streets and Highways Code.

The Benefits of Trails & Bikeways

Trails and bikeways provide a variety of benefits that will ultimately affect the sustainability of the City of Watsonville's economic, environmental, and social health. These benefits include:

- Improving health through active living;
- Creating value and generating economic activity;
- Non-vehicular transportation options;
- Improved air quality;
- Enhancing cultural awareness and community identity; and
- Support/compliment flood protection efforts.

Numerous studies have made the positive link between trails and their benefits abundantly clear. The degree to which a particular type of benefit is realized depends largely upon the nature of the trail system being implemented. Although this Master Plan is primarily focused on trails for recreation and transportation, many conservation-related benefits apply.

Visions and Goals

The vision for the City of Watsonville's future trail network is derived from input from community residents, stakeholders, city staff, and the consultant team. Input was gathered via meetings, public hearings, and written comments. A fundamental part of this vision is that the trail network will contribute to the overall quality of life throughout the City of Watsonville. Given the benefits of trails described above, specific visions and goals of the Master Plan for Watsonville include the following:

- Develop a safe and interconnected city-wide network of trail and bicycle facilities that link together destinations and people, both locally and regionally;
- Develop a trail network that provides facilities and programs designed to expand and encourage active recreation, community strength, and alternative transportation;
- Enhance, protect, and preserve the environmental quality of open space, waterways and wildlife habitats;
- Stimulate economic growth through increased tourism and real property value, by developing a city-wide trail network; and
- Conserve and tell the story of local culture, history, and heritage through interpretive signage.
- Preserve and protect agricultural land while still providing opportunities for trail construction as long as it does not disrupt farming operations and is done so with the full support of the respective land owner(s) and farm operator(s).

2 | EXISTING ENVIRONMENT

In this Chapter:

- Introduction
- Opportunities & Constraints
- Existing Trail Network
- Existing Bicycle Network
- Existing Planning Efforts

Introduction

This chapter describes the existing conditions in the City of Watsonville that will inform the planning process of trail development. Land uses and popular destinations are discussed in relation to existing and proposed future trails. Existing parks and open space features, as well as existing environmental features are also discussed. And finally, previous and ongoing planning efforts are reviewed for their influence on trail development.

Study Area

The City of Watsonville is the second largest city in Santa Cruz County. According to the 2010 Census, the City had a population of 51,199.

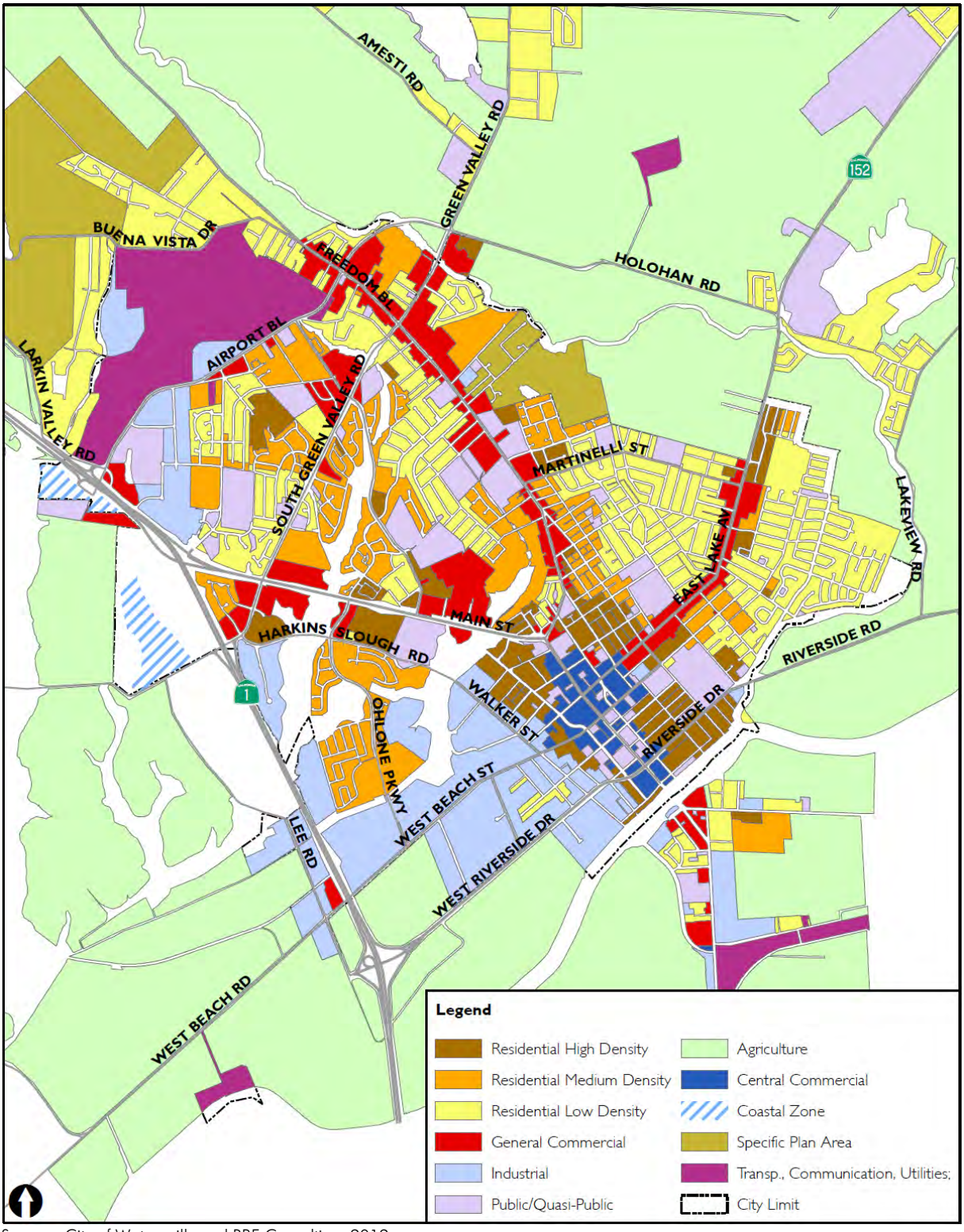
Watsonville is located in the agriculturally rich Pajaro Valley. Its economy centers predominantly around the farming industry. It is known for growing strawberries, apples, lettuce and a host of various vegetables and flowers.

The project study area includes the City of Watsonville as well as the regional areas that surround the city. This includes the Pajaro Dunes and Pajaro River to the southwest, and Pinto and College lakes to the east. It also includes the broader unincorporated areas of Santa Cruz County that surrounds the city. (See Figure ES-1: Aerial Photo of the City of Watsonville).

Land Use

Figure 2-1: Land Use shows the Watsonville 2005 General Plan land use designations throughout the city. The residential areas, shown in yellow, orange, and light brown make up the majority of the city. Commercial uses are concentrated in downtown and along the major arterial roads of East Lake Avenue, Freedom Boulevard and Main Street. The industrial and employment uses are located primarily south and west of the downtown, in the Westridge Business Park (Westridge Drive) and around the Watsonville Municipal Airport. A majority of the land surrounding the city are agricultural and rural residential.

Figure 2-1: Land Use



Source: City of Watsonville and RBF Consulting, 2012.

Opportunities & Constraints

Greater Watsonville has a variety of natural and built amenities that afford important opportunities for trail development. There are also some challenges that will require creative design solutions as part of trail construction and maintenance.

Water Bodies

Watsonville Sloughs

As described in the Watsonville Sloughs Watershed Conservation and Enhancement Plan (Swanson, 2003), the environs of the Watsonville Sloughs are a highly valued and unique wetland resource situated adjacent to Monterey Bay and west of the city limits. Six individual sloughs (Watsonville, Harkins, Struve, West Branch Struve, Gallighan, and Hanson) drain a 12,500-acre (19.5 square miles) watershed from the coastal plain and foothills of southern Santa Cruz County into Monterey Bay. These sloughs sustain large wetland marsh and riparian habitats for a variety of wildlife and native plants. The adjoining hillsides and upland areas contain important wildlife areas including grassland, oak woodland and chaparral habitats. Economically important agricultural production occurs throughout much of the Watsonville Sloughs (the Sloughs) watershed along with wildlife habitat.

The Sloughs have a rich history of natural resource utilization beginning with the original hunter/gatherer Native American societies. Substantial changes occurred after European settlement began in the early 1800s with widespread clearing of native vegetation and reclamation of wetlands for agriculture. This led to hydrologic changes detrimental to native plants and wildlife habitat, culminating in large losses of wetlands and native habitats during land reclamation efforts in the late 1800s and early 1900s.

A marked decline in open space and habitat accelerated after World War II with an expansion of urban areas around the City of Watsonville. All of these changes fragmented the Sloughs, reduced water circulation and groundwater recharge, and introduced a number of pollutants to the waterways and remaining natural wetlands. As a result, the Watsonville Sloughs system has been listed as an impaired water body under the Federal Clean Water Act (Section 303d) for elevated levels of pesticides, sediment, oils and grease, metals and pathogens.

In recent years, as the drainage system constructed during the reclamation era has decayed, large areas of agricultural land have been seasonally inundated resulting in a significant loss of agricultural production. This process has been further accelerated with the accompaniment of a trend of land subsidence over large areas and urban expansion upstream adding more runoff that has further taxed the drainage system. Although a greater area of inundation can be viewed by some as favorable to the overall wetlands value of the Sloughs, (particularly with expanded open water habitat for winter migratory waterfowl and wetland vegetation), it has been coupled with reduced water circulation, eutrophication, and a reduction in the general biotic health of the aquatic ecosystem. In their current condition, and despite the reversion to wetlands, the natural resources of the Sloughs exist well below their potential value. Simultaneously, agricultural productivity has been adversely affected by the same conditions.

Various agencies and organizations, including Santa Cruz County, the City of Watsonville, Watsonville Wetlands Watch, the Resource Conservation District for Santa Cruz County, and the Land Trust of Santa Cruz County have been actively engaged in restoration and preservation efforts to lands within the Watsonville Sloughs.

Other Water Bodies

Pinto Lake

Pinto Lake is located north of the city and east of Highway 152. Pinto Lake Park is a 78.50 acre Community park owned by the City of Watsonville and operated by the Parks and Community Services Department. It provides for a number of significant recreational activities including a camping, boating, fishing, birding, a softball field, picnic areas, playgrounds and a boat ramp to the lake itself.

Pinto Lake County Park is a 183 acre regional park that is owned and managed by the County of Santa Cruz Department of Public Works. Amenities include playgrounds, picnic areas, ball fields, a fishing pier and a disc golf course.

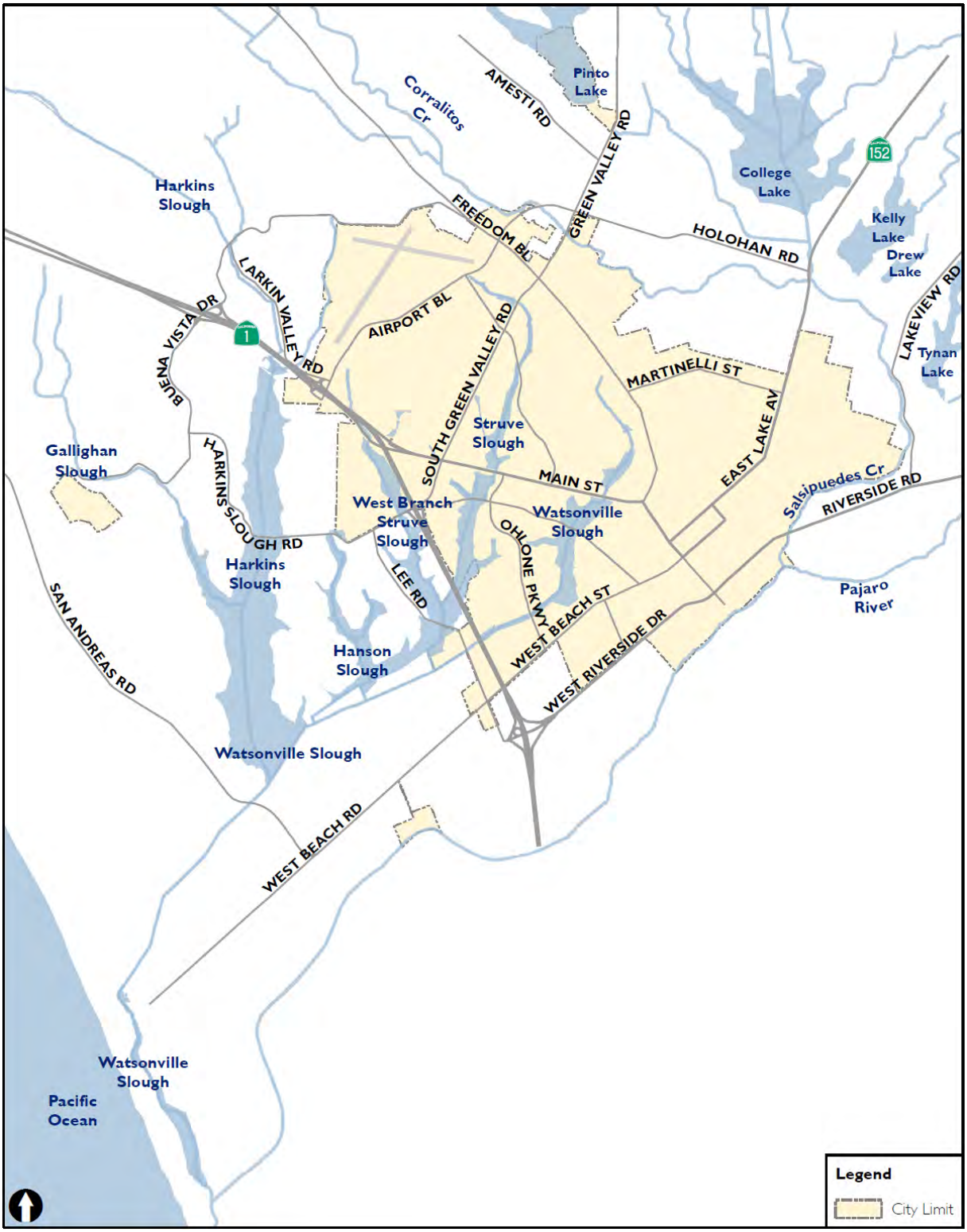
College Lake

College Lake is a seasonal lake located near the Santa Cruz County Fair grounds and is bordered by East Lake Avenue (Highway 152) and Paulsen Road. The lake is fed by a few small creeks during the rainy season, and it eventually drains into Salsipuedes Creek. College Lake is usually dried up by late spring or summer and the land area is used for farming.

Other lakes, located south east of Highway 152 include Kelly Lake, Drew Lake, and Tynan Lake.

The Watsonville Sloughs and other water bodies associated with this Master Plan are shown in Figure 2-2: Watsonville Sloughs and Other Water Bodies.

Figure 2-2: Watsonville Sloughs and Other Water Bodies



Source: City of Watsonville and RBF Consulting, 2012.

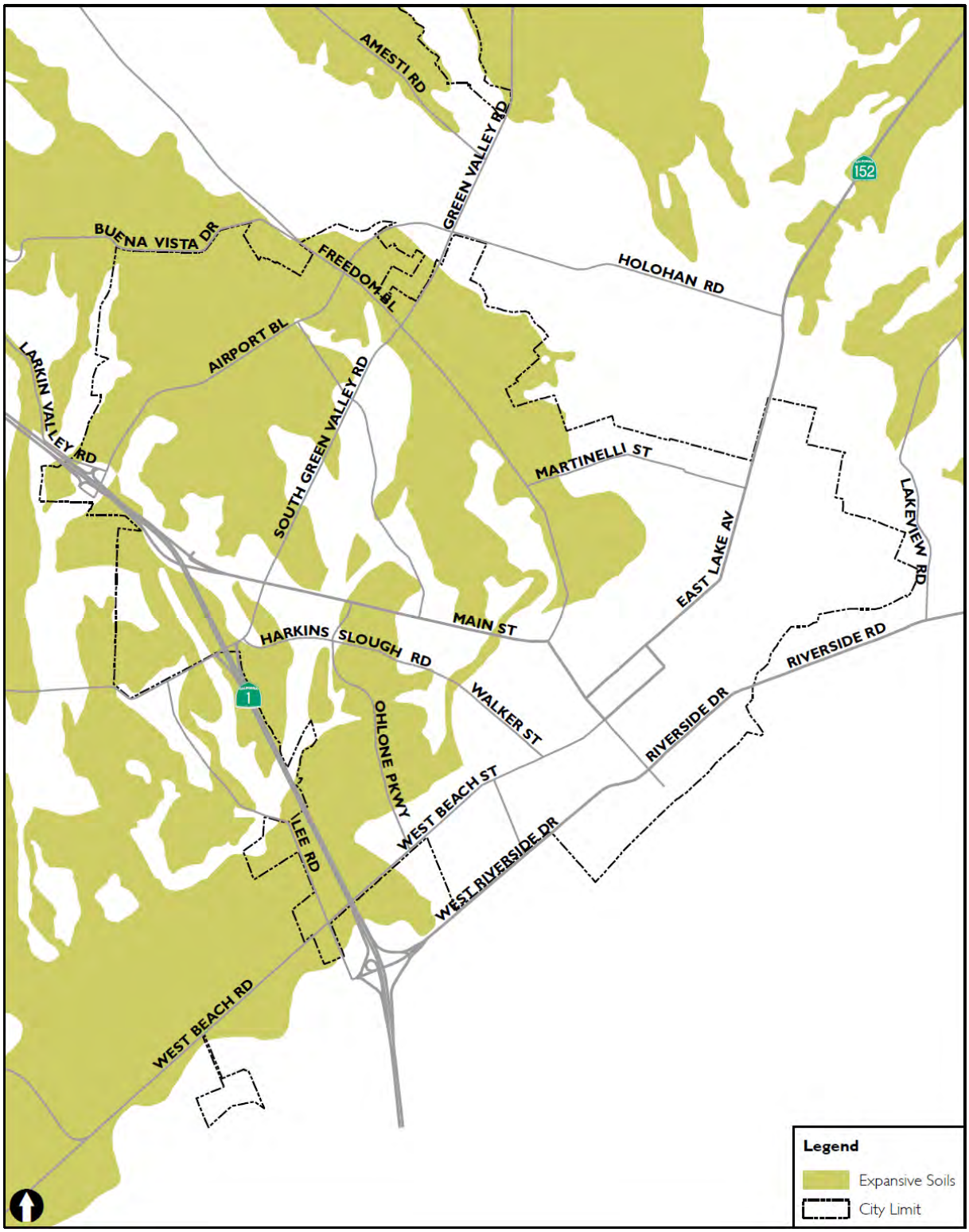
Expansive Soils

Expansive soils are common throughout the Pajaro Valley. They typically contain clay-rich natural topsoil and subsurface soil with a high shrink-swell potential. These clay-rich soils contain montmorillonite and other minerals that swell under wet conditions and shrink under dry conditions. As shown in Figure 2-3: Expansive Soils, a majority of these soils have moderate to high shrink-swell potential. Expansive soils are especially common to the areas near Sloughs. Damage to structures, such as cracked foundations, can result from differential movement and from several alternating periods of shrink and swell. Similarly, they often cause cracking and other surface modifications to trails and pathways.

As such, many parts of the existing trail system in Watsonville that are prone to expansive soils have utilized a combination of different stabilization methods to ensure that the finished trail surface remains serviceable. These have included:

- Over-excavation, moisture conditioning and re-compaction of sub-grade materials;
- Installation of geosynthetic stabilizers, such as pavement reinforcing fabric;
- Installation of subsurface drainage blankets at select locations to minimize soil saturation within the trail alignment;
- Placement of a thickened base course (typically drain rock); and
- Use of flexible pavements that can accommodate soil movement.

Figure 2-3: Expansive Soils



Source: City of Watsonville and RBF Consulting, 2012.

Sensitive Biological Resources

The City of Watsonville is located in the Pajaro Valley of southern Santa Cruz County, a productive agricultural region with a distinctly rural character. The planning area encompasses significant, though disturbed, natural areas, including wetland habitat within the Watsonville Sloughs, important remnants of riparian habitat along the Sloughs, the Pajaro River, Pinto Lake and Salsipuedes and Corralitos Creeks, and small areas of intact oak woodland and grasslands. These areas provide important habitat for wildlife, including migratory birds and several species listed under the federal and state Endangered Species Acts.

Watsonville, Struve, and Harkins Sloughs

The most significant biological resource in the planning area is the system of sloughs and marshes that drain the Pajaro Basin and flow into Monterey Bay. Seasonal and perennial freshwater marsh occurs within the channels of the Watsonville Sloughs. Within and adjacent to the low flow channels of these Sloughs, permanently moist soils support rhizomatous perennial hydrophytes (water-loving plants) including cattail (Typha spp.), bur-reed (Sparganium eurycarpum), and bulrush (Scirpus spp.). During the winter months, open aquatic habitat is available in the deepest areas of the Sloughs. In contrast, higher zones within the marsh dry out in summer and are colonized by perennial herbs such as bur marigold (Bidens laevis), dock (Rumex spp.), and rush (Juncus spp.).

In general, these Sloughs are highly degraded by agricultural runoff, urban fill for roadway crossings, and invasion by non-native species. Himalayan knotweed (Polygonum polystachyum), a noxious weed of seasonally-moist soils, and feathered mosquitofern (Azolla pinnata), introduced for mosquito control, are particularly pervasive. Upland areas surrounding the Sloughs are also highly degraded by invasive fennel (Foeniculum vulgare) and Harding grass (Phalaris aquatica), which greatly reduce habitat quality for wildlife.

Restoration and protection of the Sloughs has been an ongoing priority by the city in coordination with Watsonville Wetlands Watch and other agencies and organizations. Additional wetland enhancements are planned for the future and outlined in the Watsonville Sloughs Resource Conservation and Enhancement Plan (Santa Cruz County 2003). The entire Watsonville Slough system has been designated an Area of Special Biological Importance by the California Department of Fish and Game (CDFG), and is identified as a Significant Biological Resource in Santa Cruz County's Growth Management Plan and the County's Local Coastal Program Land Use Plan.

Riparian Forest and Scrub

The Pajaro River, Watsonville Slough system, Corralitos Creek, Salsipuedes Creek, and various drainage swales throughout the planning area provide important remnants of riparian habitat. Arroyo willow (Salix lasiolepis) and red willow (Salix laevigata) dominate these areas, often to the point of shading out understory species. Fremont cottonwood (Populus fremontii) and California sycamore (Platanus racemosa) are occasional associates. Understory vegetation, when present, is typically a dense thicket of California blackberry (Rubus ursinus) and non-native species such as Harding grass, fennel, and poison hemlock (Conium maculatum). The upper reaches of these riparian corridors, particularly within the Buena Vista area, are degraded by stands of planted blue-gum

eucalyptus (Eucalyptus globulus). Riparian areas are protected by the California Department of Fish & Game through regulations in Sections 1601-1603 of the Fish and Game Code, and are recognized as sensitive by Santa Cruz County.

Watsonville Municipal Airport

The undeveloped portions of the Watsonville Municipal Airport is dominated by annual, non-native grass species, and is defined as California annual grassland as per the California Native Diversity Data Base (CNDDB) classification. There are also scattered inclusions of native grasses and other native herbaceous species.

Annual grasslands are also present and are comprised of mostly non-native annual grass species, including native bunchgrasses which are scattered and relatively few (Watsonville Municipal Airport Master Plan Draft EIR, 2002).

Based on a survey completed in 2002, the Watsonville Municipal Airport supports the largest population of Santa Cruz Tarplant known. It also contains small pockets of artist's popcorn-flower's and San Francisco popcorn-flower's. All of these plant species are designated as Special Status Plant Species, which warrant special protection. The location of these species, as well as Tarplant Mitigation Easement areas are shown in Figure 2-4: Sensitive Biological Resources at the Watsonville Municipal Airport.

Figure 2-4: Sensitive Biological Resources at the Watsonville Municipal Airport

Source: City of Watsonville and RBF Consulting, 2012.

Existing Trail Network

The City of Watsonville currently supports 9.8 miles of slough and levee trails, comprising 14.3 acres. There are 6.9 miles of slough trails that extend along Lower and Upper Struve Sloughs and around Watsonville Slough. The remaining 2.9 miles of levee trails extend along the northerly side of the Pajaro River and Salsipuedes Creek (City of Watsonville 2009). The location of these trails are shown in Figure 2-5: Existing Trail Network.

Figure 2-5: Existing Trail Network

Source: City of Watsonville and RBF Consulting, 2012.

Existing Planning Efforts

City of Watsonville

Watsonville Urban Greening Plan

The City of Watsonville is currently working on the development of an Urban Greening Plan (UGP). The UGB will guide and coordinate the City's greening projects and improve the sustainability and livability of this community, in concert with the goals of the Strategic Growth Council. The planning process was funded by the California Department of Natural Resources from Proposition 84 grant funds.

The UGP consists of the following components:

- Citywide Bicycle & Pedestrian Trails;
- Greening/Restoration for Trail Corridors & Adjacent Areas;
- Street Trees Plan or Guidelines;
- Community Gardens;
- Plant Palette & Landscaping Guidelines & Policy; and
- Green Roof & Cool Roof Design Guidelines.

WatsonvilleVISTA 2030 General Plan

The WatsonvilleVISTA 2030 General Plan (General Plan) represents the comprehensive update of the Watsonville 2005 General Plan. A draft of the WatsonvilleVISTA 2030 General Plan was prepared in May 2006 but was not adopted by the City Council due to legal issues. These issues have now been addressed and the 2030 General Plan is scheduled for adoption by the Watsonville City Council in early 2013.

The General Plan outlines future community growth and objectives. It includes policies that promote Watsonville as a livable community with a compact urban center with access to jobs and housing. The General Plan will accommodate an additional 4,100 new households and 7,500 new jobs over the next 20-25 years. Approximately half of this new growth would be achieved by amending land-use designations and zoning within certain neighborhood areas within the City to allow higher density residential uses and/or mixed of uses than are currently allowed. The remaining new growth would be accommodated by designating three specific plan areas currently outside of the City limits for residential, neighborhood commercial, and employment-related development. These specific plan areas are Buena Vista, Atkinson Lane, and Manabe-Ow.

The General Plan promotes pedestrian and bicycle connections throughout the city and encourages citizens to use alternative modes of transportation.

The Recreation, Parks and Open Space element of the General Plan addresses trails as part of Goal 9.3, and is described below:

Goal 9.3 Provide a network of trails along natural areas to promote safe travelways and appreciation of sloughs, creeks, and the Pajaro River.

The city shall develop and maintain a trail system that encourage both appreciation and respect for natural habit and provide safe, secure passageways in and around the community.

Policy 9.3.1 Trail Systems.

Implementation

9.3.11 Protection of slough, riparian corridors and other environmentally sensitive areas.

The city shall continue to protect its sloughs and riparian corridors and other environmentally sensitive areas as provided for in the Environmental Resources Element.

9.3.12 Continuous Trail Network.

The city shall strive to make a more continuous network by requiring cooperation with adjacent jurisdictions to establish trails and linear open space between sloughs and riparian corridors, as indicated in Figure 9.6 and described below through the preparation of a Trails Master Plan (see Figure 2-6: Watsonville Vista 2030 General Plan Conceptual Trail Network Plan). Trail alignments shall be coordinated with all necessary jurisdictions and abut undevelopable land, where practical, to provide trail users with expansive views.

Within the Buena Vista area, a linear open space with trails shall be pursued in coordination with the County to link trails anticipated along Corralitos Creek and Harkins Slough. In addition, Buena Vista Park shall have a trail that extends from Buena Vista Drive to Larkin Valley Road.

The city shall seek to extend trails along Struve Slough to Airport Boulevard, and shall endeavor to install landscaped trails along Airport Boulevard and Green Valley Road, to connect trails anticipated along Struve Slough and Corralitos Creek.

The city shall endeavor to establish trail connections between Watsonville Slough and the Pajaro River through cooperation with various county, state and interested groups. Potential alignments include: a landscaped trail along Ohlone Parkway and extending south near the Urban Limit Line, and/or along Walker Street as part of an enhanced streetscape with bike lanes.

9.3.13 Regional Trail System.

The city shall encourage the development of a regional trail system which may include improvements and expansion of the levee, wetlands, and other trails.

Figure 2-6: Watsonville Vista 2030 General Plan Conceptual Trail Network Plan

Parks and Recreation Facilities Master Plan

The 2009 Parks and Recreation Facilities Master Plan provides an overarching plan for the development and implementation of future parks and recreational opportunities throughout the City of Watsonville over the next 20 years. It also describes a process and priorities for managing the Parks and Community Services Department's commitments so that new requests and initiative are considered in light of existing conditions and funding requirements.

The City of Watsonville oversees 184 acres of park land in 26 existing Pocket, Neighborhood and Community parks. The city's park system consists of a variety of recreation attractions, such as parks, playgrounds, sports fields, natural areas and open space, trails, recreation facilities, and access to the wetlands and levee trail system. In addition to parkland resources, the Parks and Community Services staff maintains various landscaped areas throughout the city including street medians in Vista Montana.

Residents of Watsonville believe that access to trails and bikeways is a very high priority, and in fact ranked them higher than any other recreation activity. As part of the development of the Parks and Recreation Facilities Master Plan, 87% of respondents to a phone survey responded that walking, hiking, or running was very/somewhat important. 80% of the respondents said that biking was very/somewhat important. In discussions at community workshops, participants were very supportive of restoring and expanding the trail system throughout the city and surrounding region using greenway and bikeway strategies.

Santa Cruz County

Santa Cruz County General Plan

The 1994 General Plan and Local Coastal Program for the County of Santa Cruz contains policies and programs to guide future growth and development in a manner consistent with the goals and quality of life desired by Santa Cruz County citizens. Policies within the General Plan become the basis for all future land use and expansion decisions.

The General Plan calls for the establishment of a system of hiking, bicycling, and equestrian trails that provide access and connect to parks, riparian corridors, and beaches within the County. Trails are envisioned to be implemented through publicly-owned lands, easements, and dedications.

The Parks, Recreation and Public Facilities chapter of the General Plan addresses trails as part of Objective 7.6, and is described below:

Objective 7.6 Trails and Recreation Corridors

To establish a countywide system of hiking, bicycling and equestrian trails which provides access to and connects the various parks, recreation areas, beaches and urban areas. To link the County trail system with the proposed state trail system between the state parks, adjoining counties, and cities within the County. To obtain trail easements by utilizing existing publicly owned land, and by acquisitions by dedication, in full compliance with Government Code Section 65909(a) for developments and Government Code Sections 66475.4(b) and 66748.1 et seq. for land divisions, provided that state and federal constitutional rights of land owners are not violated.

Policy 7.6.2 Trail Easements

Obtain trail easements by encouraging private donation of land, by public purchase, or by the dedication of trail easements, in full compliance with California Government Code Section 65909(a) for development permits and Government Code Sections 66475.4(b) and 66478.1 et seq. for land divisions, provided that state and federal constitutional rights of landowners are not violated. Within urban areas, obtain trail easement dedication within the specified buffer areas adjacent to riparian corridors and wetlands, and/or within the riparian corridor, subject to the above requirements, when consistent with the Riparian Corridor Protection ordinance and all other policies and ordinances protecting sensitive habitats. Any trail easements so obtained legally from the respective property owners, and only after adequate funds exist to implement a trail maintenance plan, providing for security measures, fire protection, erosion control, trail rules enforcement, and similar areas of concern. Notwithstanding the foregoing, it is the policy of Santa Cruz County to accept offers to dedicate coastal access, complete, open, and maintain or assist other public agencies or private non-profit groups to complete, open, and maintain coastal accessways between the first public road and the shoreline as soon as it is feasible. This policy is not intended and shall not be construed as authorizing the exercise of the County's regulatory power in a manner which will take or damage private property for public use without the payment of just compensation in violation of the Constitution of the State of California or of the United States. (See California Public Resource Code Section 30010.)

Policy 7.6.3 Utilization of Existing Easements

Seek to utilize existing publicly owned lands where possible to implement the trail system, subject to policy 7.6.2.

Policy 7.6.8 Trail Funding and Construction

When utilizing roadside betterment funds in the development of bicycle, pedestrian and equestrian trails, construct such trails off the pavement within the public right-of-way and separated from traffic by an appropriate distance. Include trail design and construction in all public road development projects on designated trail routes, subject to policy 7.6.2.

Policy 7.6.9 Trail Design

Locate, design and develop trails so as to minimize the impact on the areas through which they travel, subject to policy 7.6.2, habitat and resource protection policies and ordinances, and subject to regular monitoring to identify times and/or locations of adverse impacts and trail degradation. Trails should fit the contour of the land; brush removal and/or grading should be minimal or nonexistent, and access should be controlled where necessary. Ensure that environmental or safety risks are eliminated or mitigated to the greatest extent possible. Prohibit the use of motorized vehicles on trails, and discourage their use by installation of effective barriers at the trailhead. Develop specific criteria for appropriate setbacks for each project.

Objective 7.7c Beach Access

To maintain or provide access, including visual access, to every beach to which a granted access exists or to which the public has acquired a right of access through use, as established through judicial determination of prescriptive rights, and acquisition through appropriate legal proceedings, in order to ensure one access to every pocket beach and convenient, well distributed access to long sandy beaches, subject to policy 7.6.2.

Policy 7.7.5 Coastal Bicycle Route

Provide for safe bicycle travel along the coastal corridor by developing a coordinated, continuous bicycle route parallel to the shoreline, subject to policy 7.6.2.

Policy 7.7.6 Hiking and Biking Trail Network

Subject to policy 7.6.2, establish a system of hiking and bicycle trails and bridges which provides access to and connects the various parks, recreation areas, beaches, and urban areas. For example, develop trails to link Nisene Marks State Park with Seacliff State Beach. Link the County trail system between the state parks and provide a lateral trail route along the coast. Design trails to be accessible to persons with disabilities where resources can be protected.

Policy 7.7.7 Equestrian Access to Beaches

Allow equestrian access to the beaches where conflicts with other beach usage can be resolved, subject to policy 7.6.2.

Policy 7.7.8 Equestrian Trail Network

Establish equestrian trails which provide access to designated parks, recreation areas, and beaches where equestrian uses are permitted where use conflicts and potential impacts can be resolved, subject to policy 7.6.2.

Policy 7.7.10 Protecting Existing Beach Access

Protect existing pedestrian, and, where appropriate, equestrian and bicycle access to all beaches to which the public has a right of access, whether acquired by grant or through use, as established through judicial determination of prescriptive rights, and acquisition through appropriate legal proceedings. Protect such beach access

through permit conditions such as easement dedication or continued maintenance as an accessway by private group, subject to policy 7.6.2.

Policy 7.7.22 Access to Environmentally Sensitive Habitats

Obtain controlled public access to environmentally sensitive habitats through grants, dedication of easements or other means, including as a condition of new development approval, subject to policy 7.6.2. Open the access only for education or nature study purposes, and only when improvements and management are adequate to protect the resources.

Policy 7.7.24 Environmentally Damaging Trails

Reduce the number of trails to destinations where the present level of use is causing deterioration to sensitive habitats or serious erosion problems. Restore damaged or deteriorated areas, and monitor all trails for future resource damage and restore as needed.

Policy 7.7.27 Accessways and Agricultural Areas

Minimize the number of accessways through and adjacent to agricultural areas. Delineate the accessways adjacent to agricultural areas, so it is clear where the public is allowed. As needed, use such methods as low barriers, fences, thorny hedges, and paving.

Policy 7.7.28 Separating Agricultural Fields and Accessways

Require separation of agricultural fields and identified accessways by as much distance as practicable and further providing buffer zones, elevation separations, fencing, landscaping with natural vegetation where practicable.

Policy 7.7.29 Separating Access Users from Toxic Spraying

Require separation of access users from aerial and highly toxic spraying, and post the hazard of aerial and highly toxic spraying. Consider, where appropriate, provisions of a gate at the road and a sign on the gate for pesticide spray warnings.

Santa Cruz County Zoning Code

Portions of the proposed trail network are located in Santa Cruz County and as such may be required to comply with County regulations. These regulations apply to both private and public activities including those of the County and other such governmental agencies that are not exempted by State or Federal law. .

16.20 Grading Regulations

The purpose of the County's Grading Regulations is to safeguard health, safety, and the public welfare; to minimize erosion and the extent of grading; to protect fish and wildlife; to protect the watersheds; to ensure the natural appearance of grading projects; and to otherwise protect the natural environment of Santa Cruz County.

This chapter sets forth rules and regulations to control all grading, including excavations, earthwork, road construction, dredging, diking, fills and embankments; establishes the

administrative procedure for issuance of permits; and provides for approval of plans and inspections. This chapter

16.30 Riparian Corridor and Wetlands Protection

The purpose of this chapter is to minimize and to eliminate any development activities in the riparian corridor, preserve, protect, and restore riparian corridors for: protection of wildlife habitat; protection of water quality; protection of aquatic habitat; protection of open space, cultural, historical, archaeological and paleontological, and aesthetic values; transportation and storage of floodwaters; prevention of erosion.

16.32 Sensitive Habitat Protection

The purposes of this chapter are to minimize the disturbance of biotic communities which are rare or especially valuable because of their special nature or role in an ecosystem, and which could be easily disturbed or degraded by human activity; to protect and preserve these biotic resources for their genetic, scientific, and educational values.

16.50.095 Agricultural Land Preservation and Protection

The purpose of this chapter is to preserve and protect this land for exclusive agricultural use and to enhance and encourage agricultural operations within the County.

As described in 16.50.095, a 200-foot setback is required between agricultural lands and all development of habitable uses, which includes recreational structures. The purpose of this buffer is to "prevent or minimize potential conflicts between either existing or future commercial agricultural and habitable land uses (i.e., residential, recreational, institutional, commercial or industrial). This buffer is designed to provide a physical barrier to noise, dust, odor, and other effects which may be a result of normal commercial agricultural operations such as: plowing, discing, harvesting, spraying or the application of agricultural chemicals and animal rearing."

Where a trail is proposed through land that is zoned agriculture, it may require an agricultural designation amendment as per Section 16.50.050. This would require environmental review and a hearing and recommendation by the Agricultural Policy Advisory Commission, and pursuant to Chapter 18.10, Level VII, a public hearing and recommendation by the Planning Commission and a public hearing and final decision by the Board of Supervisors.

Permitting requirements for any trail on Santa Cruz County land will be dependent on many variables including land ownership, easement agreements, trail type and location, and environmental conditions, etc. As such, they will be addressed on a case-by-case basis in close coordination with Santa Cruz County staff and other relevant agencies, as required. In some cases, this may require working with the County of Santa Cruz to obtain an agricultural buffer and/or riparian exception where necessary and to minimize impacts to agricultural operations and land.

Watsonville Sloughs Watershed Conservation & Enhancement Plan

The Watsonville Sloughs Watershed Conservation and Enhancement Plan (WSCEP) (2003) is designed to provide a future vision and a guide for many agencies, organizations and individual landowners to further the goals of conserving and restoring the diverse natural

resources of the Watsonville Sloughs Watershed in concert with improving the existing economic, social and recreational activities for the community. The WSCEP supports and respects the rights of property owners, and projects will only occur with the support of willing landowners and other partners.

The WSCEP determined that present and historic land use has had a significant impact on natural resources in the watershed. In general, the impacts are conversion of land once habitat and open space to agricultural or urban uses; water quality degraded by constrictions to water circulation, contamination from non-point source pollutants (sediments, excessive nutrients, residual DDT and other pesticides in soil from historic use and urban runoff). Vegetation resources have been degraded through land conversion, clearing practices and invasion by exotic species. The degradation of wildlife resources is related to the effects of toxic runoff, depletion of dissolved oxygen in the water column, fragmented habitat, structural barriers to wildlife movement and the presence of aggressive non-native species.

The WSCEP recommends a diverse set of projects consisting of the following five components:

- Habitat enhancement projects, such as hydrologic improvements, replacement of exotic invasive vegetation and water quality improvements:
- Land acquisition strategies, to allow for the management of areas of open space dedicated to ecosystem process and wildlife habitat;
- Coordination and improvement of regulatory process and compliance, to provide the means for landowners to have site specific requirements of sensitive resources built into the design of reliable drainage systems;
- Support and coordination with other ongoing conservation programs within the watershed to ensure communication among stewardship organizations and resource agencies, thereby fostering implementation of enhancement projects; and
- Public access and education to foster further awareness of the important natural resources of the Watsonville Sloughs system.

The WSCEP contains extensive analysis of the environmental resources and conditions (i.e. stressors) for all of the Watsonville Slough watersheds. The WSCEP also contains an extensive set of management recommendations designed to protect and enhance these environmental resources.

It should be noted that all future proposed trails developed in areas associated physically and/or hydrologically within the Watsonville Sloughs system will be designed to be compatible with the findings and management recommendations described in the WSCEP, and will support the WSCEPs efforts to improve the environmental conditions of the Sloughs through various techniques. These include but are not limited to; the installation of urban runoff treatment measures, the removal of exotic vegetation from hill slopes, and re-vegetation with native plants.

Watsonville Wetlands Trail System Vegetation Management and Maintenance Manual

The Watsonville Wetlands Trail Vegetation Management and Maintenance Manual identifies the location and treatment methods to be used by the City's maintenance personnel, contractors, and/or volunteer groups to remove and/or control the growth of weeds and invasive, non-native plant species within the existing trail system around Struve and Watsonville Sloughs. The manual also outlines strategies to encourage native plant growth that will reduce the need for long-term weed control.

Future Pajaro River Levee Flood Control Project

The City of Watsonville and town of Pajaro, as well as the surrounding agricultural areas in the floodplain of the Pajaro River, have been subjected to flooding for many years. Despite construction of levees in 1949 by the US Army Corps of Engineers, major floods have breached the levees in 1955, 1958, 1986, 1995, 1997, and 1998. This flooding has caused extensive damage to private and public property, resulting in significant economic losses in the forms of damaged agricultural crop lands and inundated urban areas.

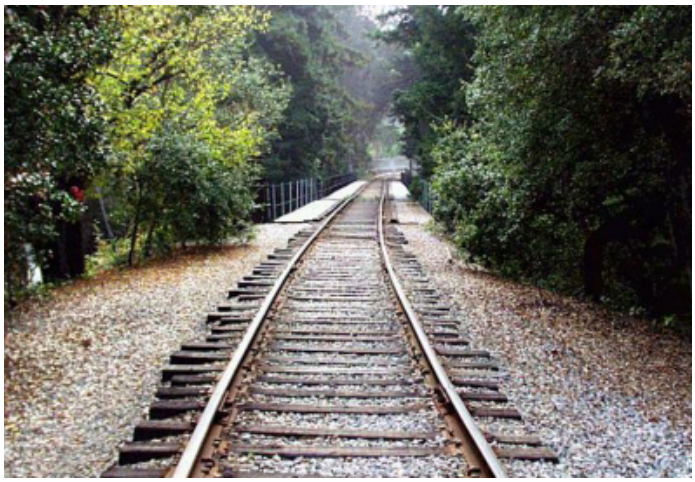
Since 1966, the US Army Corps of Engineers, in coordination with the Santa Cruz County Flood Control and Water Conservation District, the City of Watsonville, and the Monterey County Water Resources Agency, have been studying a combination of alternative solutions designed to reduce the risk of flooding along the Pajaro River and its tributaries, Salsipuedes Creek and Corralitos Creek.

Taking into consideration a series of physical, economic, and environmental objectives and constraints, a final array of levee construction design alternatives for both the Pajaro main stem and the Pajaro tributaries (Corralitos and Salsipuedes Creeks) was formulated and described in the General Re-evaluation Report, Pajaro River (US Army Corps, Working Draft 2011). These levee reconstruction alternatives evaluated the trade-offs between project costs, levels of protection, distances and locations of setback levees, and the locations of critical habitat in the project area.

. . . For any alternative, significant real estate acquisitions will be required and management of the riparian habitat areas along the Pajaro River and its tributaries will be an ongoing expense.

It should be noted that at present, none of these alternatives include the provision for trails and/or public access. However, a number of non-governmental organizations have expressed concern that the project not be solely for flood management, but also include environmental and recreation features as well.

Santa Cruz Branch Rail Right-of-Way



On October 12, 2012, the Santa Cruz County Regional Transportation Commission (RTC) completed purchase of the Santa Cruz Branch Rail Line for freight and passenger rail service, preservation and future transportation uses.

The 136-year old transportation corridor parallels Highway 1 extending almost 32 miles from the town of Pajaro in Monterey County, to Davenport in Santa Cruz County. The right-of-way is generally 50 to 60 feet wide with 37 bridges and trestles, including a crossing of the Pajaro River.

Adjacent land uses include residential, commercial, industrial, agricultural and park land/open space. The corridor links major tourism and activity centers as it traverses downtown Watsonville, Aptos Village, Capitola Village and the Santa Cruz Beach area near downtown Santa Cruz. Also adjacent to the corridor are many parks and recreational facilities. The rail line provides access to the Monterey Bay National Marine Sanctuary at several key locations.

Monterey Bay Sanctuary Scenic Trail

The Monterey Bay Sanctuary Scenic Trail (MBSST) is a broad vision for a bicycle/pedestrian Trail Network project that will span the coast of the Monterey Bay National Marine Sanctuary from the San Mateo/Santa Cruz County line to Pacific Grove, in Monterey County. The RTCRTC is leading the planning effort for project development in Santa Cruz County and the Transportation Agency for Monterey County (TAMC) is responsible for Monterey County projects. This approach will ensure that the planned bicycle/pedestrian network will provide connectivity throughout the county and into the Monterey Bay region, as well as improve a portion of the larger California Coastal Trail and Pacific Coast Bicycle Trails.

The MBSST Trail Network will be separated from motor vehicle traffic, where possible, and utilize the on-street network to provide greater community connectivity and cohesion. The Trail Network will serve transportation, recreation, health, eco-tourism, coastal access, economic vitality, and educational and interpretive purposes.

In Santa Cruz County, the "spine" or primary alignment of the MBSST Trail Network will be built parallel to (not in place of) the operational Santa Cruz Branch Rail Line wherever feasible, within the rail right-of-way, so that freight service can continue and future passenger rail service may be provided. Spur trails will connect the primary alignment to a multitude of desirable destinations throughout Santa Cruz County. The rail line southern terminus at the Watsonville Junction (in the town of Pajaro) in Monterey County provides an opportunity for new bicycle and pedestrian facilities, where right-of-way and other considerations allow.

The RTC is preparing a comprehensive master plan that includes an assessment of potential trail alignments, solicitation of stakeholder and community input; a prioritized list of short and long range trail segment projects; trail design options; identification of appropriate implementation agencies and construction cost estimates; and preparation of an Environmental Impact Report (EIR) for environmental clearance of the master plan. A draft was released in October 2012, with final adoption anticipated in Fall of 2013.

TAMC completed a master plan for the MBSST Trail Network within Monterey County in January 2008. The plan identifies various trail segments as a recommended future trail alignment. Segment 17 is the final northerly segment that ends at the Pajaro River. The plan identifies two optional segments for Segment 17. 17A utilizes Trafton Road and McGowan Road while 17B follows the Pajaro River levee north. Both options would cross the Pajaro River via the McGowan-Thurwachter Bridge and extend north on Thurwachter Road. The Santa Cruz County MBSST Network Master Plan addresses connectivity between the two counties at that location.

Pacific Coast Bike Route

The Pacific Coast Bike Route was formerly known as the Pacific Coast Bicentennial Bike Route commemorating the 200th anniversary of the signing of the Declaration of Independence in 1776. The bike route was developed in 1975 by the joint efforts of the California Department of Transportation (Caltrans) and the American Revolution Bicentennial Commission of California.

The northern end of the bike route begins on Highway 101 at the California/Oregon State Line, running basically on Highway 1 along the entire California Coast, with exceptions where it is detoured around the freeway sections of Highway 1 where bicycles are not allowed or where better alternatives exist.

Within the project area, the route extends south on San Andreas Road to West Beach Street. At Thurwachter Road, the route splits either right over the McGowan-Thurwachter Bridge or straight on West Beach Street and into the City of Watsonville.

California Coastal Trail

In 1972, Californians passed Proposition 20 that recommended a trail system be established along or near the coast. Subsequently, the Coastal Act of 1976 required local jurisdictions to identify an alignment for the California Coastal Trail (CCT) in their Local Coastal Programs. In 1999, the CCT was designated California's Millennium Legacy Trail by the Governor and the White House Millennium Trail Council. This was followed in 2000 by an official assembly declaration (AACR20) of the CCT as an official State trail. In early 2001, the California State Legislature passed SB 908, which directed the State Coastal Conservancy (SCC) to determine what was needed to complete the CCT and resulted in the 2003 report, Completing the California Coastal Trail.

Since the culminating report in 2003, the SCC and partners have been working with the State's 15 coastal counties to develop plans for completing the vision of the contiguous trail along the 1,200 miles of California coast.

The CCT extends from the Oregon to Mexico borders of California and spans 15 counties. Within the vicinity of Watsonville, the CCT extends from Palm Beach State Park along Beach Road and crosses the Pajaro River into Monterey County along Thurwachter/McGowan Roads.

Portions of the Watsonville trail system and significant portions of the MBSST Trail Network may also be identified as the California Coastal Trail through Santa Cruz County.

3 | PROPOSED TRAIL & BICYCLE NETWORK

In this Chapter:

- Introduction
- Trail Types
- Proposed Trail Network
- Individual Trail Segments
- Bikeways Plan

Introduction

This chapter provides written and visual descriptions of the existing and proposed trail network. The network was developed through extensive field work, research into related planning efforts, an analysis of aerial imagery and GIS maps, and input from city staff and the Trail & Bicycle Master Plan Advisory Committee.

Trail Types

The proposed trail network is made up of several different types of trails as defined in Table 3-1: Trail Types. Chapter 4 includes a description and cross-sections of each of these trail types.

Table 3-1: Trail Types

Type	User Groups	Width	Composition
Trails			
Greenway Trail	Multi-use (non-vehicular); ADA Accessible	8-12 ft.	Decomposed granite or similar pervious material
Nature Path	Pedestrian only	1.5-5 ft.	Natural surface (e.g. earth) or similar pervious material
Street-based Trail [1]	Pedestrian sidewalk(s) / bike lanes	Variable (per city & state standards)	Concrete and asphalt (per city standard)
Shared Road	Pedestrian / bike / motor vehicle	Variable (typ. 20-25 ft.)	Asphalt
Levee Trail	Multi-use	8-12 ft.	Asphalt
Rail Trail	Multi-use	8 ft. minimum with 2 ft. buffers on each side	Paved: asphalt / concrete
Bikeways			
Bike Path (Class I)	Bicycle	8 ft. minimum with 2 ft. buffers on each side	Asphalt/concrete
Bike Lane (Class II)	Bicycle	4-8 ft. depending on parking	Asphalt/concrete
Bike Route (Class III)	Bicycle	n/a	Asphalt/concrete
Sharrows (Class III)	Bicycle	Variable	Asphalt/concrete

(1) Street-based trails are existing/proposed sidewalks and bikeways that serve as designated trail linkages between other trail segments.

Proposed Trail Network

The proposed trail network is based on a circular loop on the outer edge with inner trails providing access to the sloughs and wetlands as well as connections to "hub" destinations such as parks, schools, commercial centers, etc. The network will also provide important access to regional trails in both Santa Cruz and Monterey counties.

The overall trail network is shown in Figure 3-1: Greater Watsonville Trail Master Plan. Given the large size of the project area, 11 sub-areas have been identified. Proposed trail segments in each of these sub-areas are discussed in detail throughout this chapter.

The trail numbering system corresponds to the sub-area as shown on the respective sub-area maps. For example, trail segment 3.1 is shown on the Sub-area #3 map.

While there are numerous existing/proposed trail access points throughout the network, the location of only major entrances are shown.

Figure 3-1: Greater Watsonville Trail Master Plan

Source: City of Watsonville and RBF Consulting, 2012.

Trail Subareas

The Trails & Bicycle Master Plan has been divided into 11 subareas to better visualize and describe the types of trails, their features, issues and opportunities, and the identification of supporting facilities. The segments for each subarea are mapped and described on the subsequent pages.

Sub-area 1 – Pajaro River

Figure 3-2: Sub-area 1 – Pajaro River North Trail Network

Source: City of Watsonville and RBF Consulting, 2012.

Figure 3-3: Sub-area 1A – Pajaro River North Trail Network

Source: City of Watsonville and RBF Consulting, 2012.

Name	North Pajaro River Levee Trail	Segment #	1.1
Start	Pajaro Dunes / Pacific Ocean	Distance	4.2 miles
Finish	Riverside Drive	Trail Type	Levee

Route Description

From near the Pajaro Dunes residential community adjacent to the Pacific Ocean, this levee trail is located in Santa Cruz County and the City of Watsonville. It extends northeast along the north side of the Pajaro River to the Riverside Drive Bridge at the confluence of Salsipuedes Creek. Portions of this levee trail are officially designated as publically accessible trails, namely, from Thurwachter Road north past the Watsonville Water Resources Center and within the city limits (near downtown). The remaining portions of this levee trail exist as an access road for maintenance of the levee by Santa Cruz County and are not officially designated as accessible by the public.

A portion of the proposed North Pajaro River Levee Trail is located adjacent to the Santa Cruz RC Bees Model Airplane Club, a private recreation facility that is used for flying model airplanes. This facility is a good example of private recreational use co-existing on a parcel with agricultural use outside the levee, and recreational use inside the levee. Both uses successfully operation simultaneously on the same parcel, with the land owner's willing assent and cooperation.

A new parking lot is recommended on a portion of a city-owned parcel south and adjacent to River Park. Improvements will need to include an ADA accessible pathway to the North Pajaro River Levee Trail.

Several streets north of River Park end at the levee. Formal entrances (stairways and/or paths) are proposed at the southerly street ends of Marchant Street, Lincoln Street, Coolidge Avenue and Loughhead Avenue.

Any proposed improvements would be designed to be consistent with the proposed improvements associated with the ultimate design of the future Pajaro River Levee Flood Control Project, as discussed earlier.

Nearby Destinations

- Santa Cruz County RC Bees Model Airplane Club (private)
- Watsonville Water Resources Center (with parking and restroom facilities)
- A canoe & kayak launch area (just east of the Water Resources Center)
- Muzzio Park and Community Center
- River Park
- Downtown Watsonville
- Linscott Charter School and Watsonville High School
- Pacific Ocean and Palm Beach State Park

Connecting Trails

- Shell Road Trail (11.1)

- Rail Trail Spine of the Monterey Bay Sanctuary Scenic Trail Network (11.2)
- South Pajaro River Levee Trail (1.2)

Name	South Pajaro River Levee Trail	Segment #	1.2
Start	Pacific Ocean	Distance	6.0 miles
Finish	Confluence of the Pajaro River and Salsipuedes Creek	Trail Type	Levee

Route Description

This trail segment is located in Monterey County and parallels the south side of the Pajaro River. It extends from the Pacific Ocean north and east to the convergence of the Pajaro River and Salsipuedes Creek. Access to the North Pajaro River Levee Trail is provided via the McGowan-Thurwachter Bridge and the Main Street-Porter Drive Bridge.

A future Pajaro Neighborhood Park is proposed at the south end of San Joan Road and adjacent to the levee. Planned facilities include a combined soccer and baseball sports field, basketball court, two small playgrounds, picnic area, small restroom, parking and other accessory facilities. This park would provide ideal access to the South Pajaro River Levee Trail for residents of the community of Pajaro.

Currently, a maintenance road exists along the top of the south levee. There is no official public access allowed on this proposed trail segment and so any potential trail access would require a prescriptive easement (or other type of easement) from Monterey County to allow public access.

Any proposed improvements would be designed to be consistent with the proposed improvements associated with the ultimate design of the future Pajaro River Levee Flood Control Project, as discussed earlier.

Nearby Destinations

- Downtown Watsonville
- Pajaro Community / Pajaro Neighborhood Park
- Pacific Ocean
- Palm Beach State Park
- Pajaro Train Station

Connecting Trails

- North Pajaro River Levee Trail (1.1)
- Monterey Bay Sanctuary Scenic Trail
- Shell Road Trail (11.1)

Sub-area 2 – Salsipuedes Creek

Figure 3-4: Sub-area 2 – Salsipuedes Creek Trail Network

Source: City of Watsonville and RBF Consulting, 2012.

Name	West Salsipuedes Creek Trail	Segment #	2.1
Start	Riverside Road	Distance	1.4 miles
Finish	East Lake Avenue	Trail Type	Levee

Route Description

The West Salsipuedes Creek Trail extends from Riverside Road in a northerly direction along the west side of Salsipuedes Creek. The first mile is located within the City of Watsonville and is designated as an existing trail. The remaining portion is located along an existing maintenance road in Santa Cruz County and is not officially designated as a publicly accessible trail. Therefore, any future public trail access would require an easement (or other type of acquisition) from Santa Cruz County and/or the respective land owners.

The trail segment, including the undesignated portion, is the most heavily used trail in the project area. It is popular with nearby residents as it provides a relatively long trail without traffic or other conflicts and provides scenic views of the entire Pajaro Valley.

Existing trail entrances are located at Riverside Drive and the intersection of Hushbeck Avenue and Atri Court. One entrance is proposed at the south end of Bronte Avenue along an existing city sewer easement that provides access to a pump station located adjacent to the levee.

To provide access to the north end of the future segment, a parking facility with other possible amenities is proposed at the southeast parcel adjacent to East Lake Avenue and the bridge at Salsipuedes Creek. This property is currently privately owned.

Any proposed improvements would be designed to be consistent with the proposed improvements associated with the ultimate design of the future Pajaro River Levee Flood Control Project, as discussed earlier.

Nearby Destinations

- Residential neighborhoods east of East Lake Avenue
- Atri Park
- Watsonville High School
- Lake Avenue Middle School
- St. Francis High School

Connecting Trails

- East Salsipuedes Creek Trail (2.2)
- Corralitos Creek Trail (3.1)
- East Lake Avenue Street-based Trail (10.3)

Name	East Salsipuedes Creek Trail	Segment #	2.2
Start	Riverside Road	Distance	1.5 miles
Finish	South of Crestwood Drive	Trail Type	Levee

Route Description

This levee trail would extend on the east side of Salsipuedes Creek along an existing levee maintenance road. About two-thirds of the existing maintenance road / future trail parallels Lakeview Road. The entire trail is located in Santa Cruz County. There is no official public access on this proposed trail segment and potential trail access would require an easement (or other type of acquisition) from Santa Cruz County and/or the respective land owners.

Any proposed improvements would be designed to be consistent with the proposed improvements associated with the ultimate design of the future Pajaro River Levee Flood Control Project, as discussed earlier.

Nearby Destinations

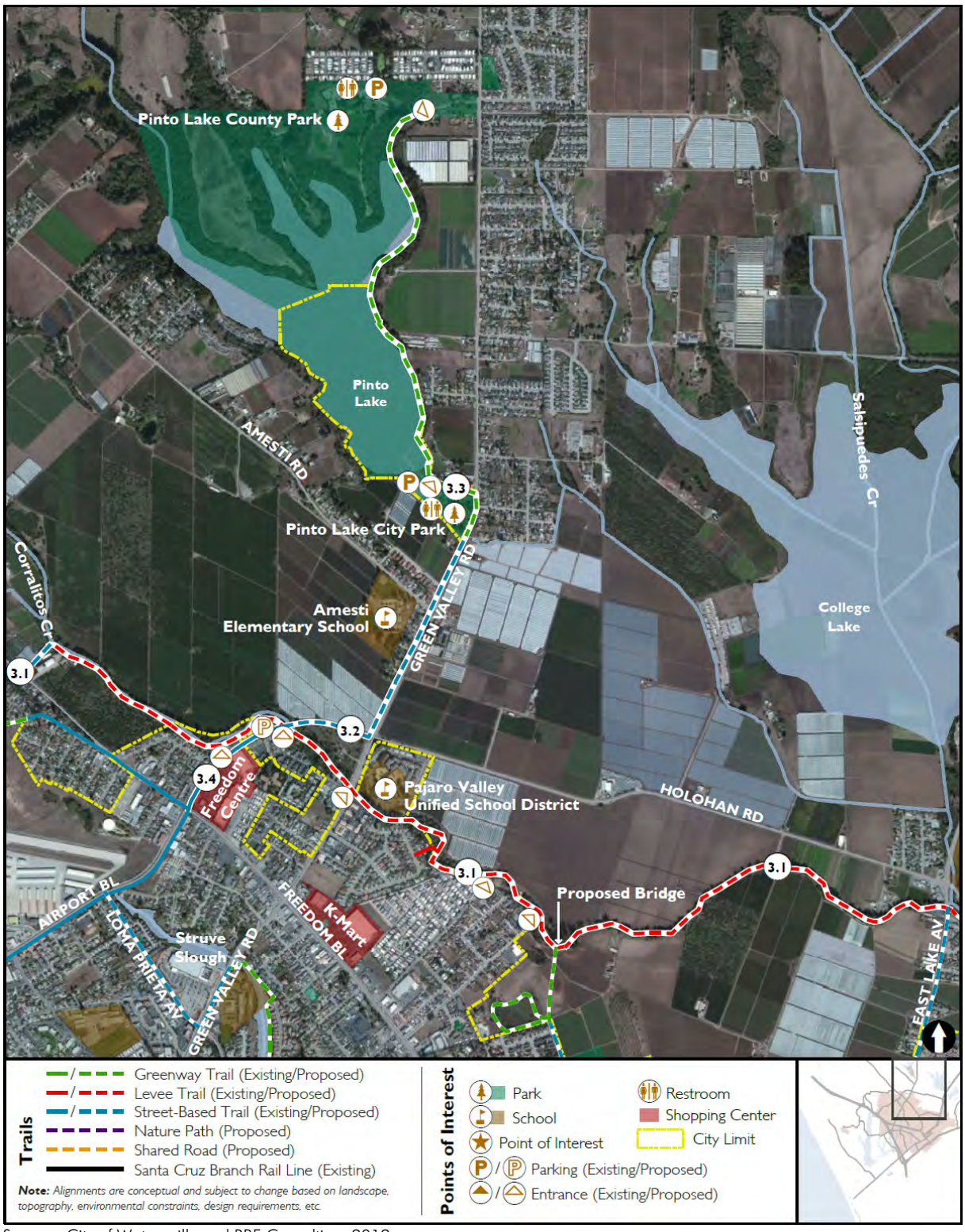
- Residential neighborhoods east of East Lake Avenue
- Tynan Lake

Connecting Trails

- West Salsipuedes Creek Trail (2.1)

Sub-area 3 – Corralitos Creek

Figure 3-5: Sub-area 3 – Corralitos Creek Trail Network



Source: City of Watsonville and RBF Consulting, 2012.

Name	Corralitos Creek Trail	Segment #	3.1
Start	East Lake Avenue	Distance	2.8 miles
Finish	Freedom Boulevard via Pista Lane	Trail Type	Levee

Route Description

This trail segment starts at the confluence of Salsipuedes and Corralitos Creeks (at East Lake Avenue) and extends west past Airport Boulevard to the terminus of the future Pajaro River Levee Flood Control Project. The trail could be located on either side of Corralitos Creek, however, given the fact that users from existing neighborhoods are on the south side, it is likely that the trail would be located on the south side, thereby minimizing the need to construct bridges.

There are no existing levee maintenance roads or other formal trails along this segment and all of the property is privately owned. Some property would need to be acquired by the US Army Corps of Engineers/Santa Cruz County as part of the future Pajaro River Levee Flood Control Project, should it be constructed.

Near Airport Boulevard, a parking facility is proposed. A number of entrances along the south side are proposed as well.

Any proposed improvements would be designed to be consistent with the proposed improvements associated with the ultimate design of the future Pajaro River Levee Flood Control Project, as discussed earlier.

Nearby Destinations

- Existing residential neighborhoods north of Freedom Boulevard;
- Various commercial shopping centers along Freedom Boulevard; and
- Pajaro Valley School District (headquarter offices).
- Watsonville Airport

Connecting Trails

- Green Valley Road Street-based Trail (3.2)
- North Airport Boulevard Street-based Trail (3.4)
- Martinelli Street / East Lake Avenue Street-based Trail (10.1)
- Brewington Avenue / Atkinson Trail (10.2)

Name	Green Valley Road Street-based Trail	Segment #	3.2
Start	Airport Boulevard at Corralitos Creek	Distance	0.8 mile
Finish	Pinto Lake (City) Park	Trail Type	Street-based

Route Description

This trail segment is a proposed street-based trail that would extend from Corralitos Creek southwest on Airport Boulevard and then north on Green Valley Road, ending at Pinto Lake (City) Park. Development of this segment would require construction of a sidewalk on one or both sides of the street for pedestrian access. Green Valley Road north to Amesti Road is an existing Class II Bike Lane.

Acquisition of land and/or an easement on private property adjacent to Airport Boulevard and Green Valley Road may be required for portions of this trail segment.

Nearby Destinations

- Pinto Lake Park
- Amesti Elementary School

Connecting Trails

- Pinto Lake Trail (3.3)
- Corralitos Creek Trail (3.1)
- North Airport Boulevard Street-based Trail (3.4)

Name	Pinto Lake Trail	Segment #	3.3
Start	Pinto Lake Park / Green Valley Road	Distance	1.3 miles
Finish	Pinto Lake County Park	Trail Type	Greenway

Route Description

This proposed greenway trail would extend up the east side of Pinto Lake on land that is owned partly by the City of Watsonville (about two-thirds of the length) and partly by Santa Cruz County.

This trail could be located along the shoreline and provide excellent views of Pinto Lake. Improvements could include viewing platforms and interpretive signage.

With the exception of one private parcel, it may be possible to locate this trail entirely on city and county property without the need to acquire any additional property.

Nearby Destinations

- Pinto Lake County Park
- Pinto Lake City Park

Connecting Trails

- Green Valley Road Street-based Trail (3.2)

Name	North Airport Boulevard Street-based Trail	Segment #	3.4
Start	Freedom Boulevard	Distance	0.3 miles
Finish	Corralitos Creek	Trail Type	Street-based

Route Description

This short trail segment extends along the north side of Airport Boulevard adjacent to the Freedom Shopping Center. A continuous sidewalk exists along the south side of the road. On the north side, a sidewalk exists from Freedom Boulevard up to the terminus of Compton Place and Corralitos Creek. The entire segment has existing Class II Bike Lanes.

A parking facility is proposed on the north side of Airport Boulevard near the terminus of Compton Place.

All of the trail segments would be located within the existing right-of-way and no additional land would be required. The proposed parking facility, however, is located on parcel of land and would require the acquisition of land and/or an easement.

Nearby Destinations

- Freedom Shopping Center

Connecting Trails

- Corralitos Creek Trail (3.1)
- Green Valley Road Street-based Trail (3.2)
- Airport Boulevard Street-based Trail (4.5)

Sub-area 4 – Buena Vista/Watsonville Airport

Figure 3-6: Sub-area 4 – Buena Vista/Watsonville Airport Trail Network

Source: City of Watsonville and RBF Consulting, 2012.

Name	Freedom Blvd. / Buena Vista Dr. Trail	Segment #	4.1
Start	Airport Boulevard	Distance	0.6 miles
Finish	Buena Vista Drive (600 block)	Trail Type	Greenway / Street-based

Route Description

This trail segment would extend west from Airport Boulevard on Freedom Boulevard to Buena Vista Drive. This portion has a Class II Bike Lane and only intermittent sidewalks. The route then extends west on Buena Vista Drive paralleling the Watsonville Airport property boundary. Because the airport fence is set in on the property, a dedicated greenway path could be located on city-owned land and county right-of-way between the fence and the existing roadway as it parallels the airport property.

At the end of the airport property, the trail along Buena Vista Drive (which has a 50-foot right-of-way) would be either a street-based trail or a greenway trail.

Nearby Destinations

- Calabasas Elementary School

Connecting Trails

- North Airport Boulevard Street-based Trail (3.4)
- Airport Boulevard Street-based Trail (4.5)
- Buena Vista Park Trail (4.2)

Name	Buena Vista Park Trail	Segment #	4.2
Start	Buena Vista Drive	Distance	0.6 mile
Finish	Larkin Valley Road	Trail Type	Greenway

Route Description

This trail segment extends south from Buena Vista Drive through city-owned property that is planned as a future park and open space. The area has some steep slopes and provides drainage for upland areas on the north side of Buena Vista Drive. The final alignment and types of amenities associated with this trail may be determined as part of the preparation of the Buena Vista Specific Plan.

Nearby Destinations

- Calabasas Elementary School

Connecting Trails

- Freedom Blvd. / Buena Vista Dr. Trail (4.1)
- Larkin Valley Road Trail (4.3)

Name	Larkin Valley Road Trail	Segment #	4.3
Start	Buena Vista Park (Future)	Distance	0.7 miles
Finish	Airport Boulevard	Trail Type	Greenway / Street-based

Route Description

The segment starts as a greenway trail at Larkin Valley Road and extends south along Harkins Slough to the convergence of Harkins Slough and Larkin Valley Road. At this point, the segment would become a street-based trail along Larkin Valley Road to connect to the Airport Boulevard Street-based Trail (4.5).

Acquisition of land and/or an easement on private property would be required for portions of this trail segment.

Nearby Destinations

- Buena Vista Park (future)

Connecting Trails

- Buena Vista Park Trail (4.2)
- West Watsonville Municipal Airport Trail (4.4)
- Airport Boulevard Street-based Trail (4.5)

Name	West Watsonville Municipal Airport Trail	Segment #	4.4
Start	Buena Vista Drive	Distance	1.1 miles
Finish	Larkin Valley Road	Trail Type	Greenway

Route Description

The trail segment extends south from Buena Vista Drive along an unused road that is privately owned. It appears that this road was meant to provide secondary/emergency access from the industrial business site (Jennings Industrial Park) which is accessed from Manfre Road.

The trail would traverse the industrial site and then head south on city-owned land and within the boundary of the Watsonville Municipal Airport.

Special safety features would need to be designed for those portions of the trail that pass near the City of Watsonville Police Department's open-air pistol range. The trail alignment would also need to be located so as to avoid potential impacts to Santa Cruz Tarplant, which is known to exist on airport grounds and is listed as a special status plant species. To maintain airport security, portions of the perimeter fence would need to be relocated.

Acquisition of land and/or an easement on private property would be required for the northerly portions of this trail segment.

Nearby Destinations

- Buena Vista Park (future)
- Watsonville Municipal Airport

Connecting Trails

- Freedom Blvd. / Buena Vista Dr. Trail (4.1)
- Larkin Valley Road Trail (4.3)

Name	Airport Boulevard Street-based Trail	Segment #	4.5
Start	Freedom Boulevard	Distance	0.7 miles
Finish	Highway 1	Trail Type	Street-based

Route Description

This trail segment extends south on Airport Boulevard along a major arterial road in the City of Watsonville. The first two-thirds of this street-based trail is existing with sidewalks on both sides of the street. However, south of Aviation Way, sidewalks are intermittent on the south side of Airport Boulevard. On the north side, there are no sidewalks, however, this land is part of the Watsonville Municipal Airport, outside of the security fence, and is owned by the City of Watsonville.

A Class II bike path extends along the entire length of this trail segment on both sides of the road.

Completion of this street-based trail segment would require the acquisition of private property to complete the sidewalks on the south side of Airport Boulevard.

Nearby Destinations

- Watsonville Municipal Airport
- Watsonville Community Hospital

Connecting Trails

- North Airport Boulevard Street-based Trail (3.4)
- Freedom Blvd. / Buena Vista Dr. Trail (4.1)
- Larkin Valley Road Trail (4.3)
- Upper West Branch Spur Trail (4.6)

Name	Upper West Branch Spur Trail	Segment #	4.6
Start	Airport Boulevard	Distance	0.3 miles
Finish	Technology Drive	Trail Type	Greenway

Route Description

This is an existing trail segment that extends through the Watsonville Community Hospital over an existing storm-drainage easement. About 90% of the trail is paved access as it is used by maintenance vehicles for access. Minor improvements, including signage would be required for this trail segment.

Nearby Destinations

- Watsonville Municipal Airport
- Watsonville Community Hospital

Connecting Trails

- Airport Boulevard Street-based Trail (4.5)

Sub-area 5 – Pajaro Valley High School

Figure 3-7: Sub-area 5 – Pajaro Valley High School Trail Network

Source: City of Watsonville and RBF Consulting, 2012.

Name	Pajaro Valley High School Connector Trail	Segment #	5.1
Start	Airport Boulevard / Highway 1	Distance	1.1 miles
Finish	Harkins Slough Road	Trail Type	Greenway

Route Description

This proposed trail segment would provide important secondary, non-vehicular access, to Pajaro Valley High School from Airport Boulevard. The trail would extend south and west parallel to Highway 1 either directly adjacent to Highway 1 and within Caltrans right-of-way, or further south and away from the Highway 1 on private property.

Where the proposed trail bends and heads directly south, the land is owned by the California State Coastal Conservancy, which would require an easement for access.

Where the proposed alignment bends and heads west and then south again, the property is owned by either the Pajaro Valley High School or the City of Watsonville all the way to Harkins Slough Road.

Acquisition of land and/or an easement on private and public property would be required for portions of this trail segment.

Nearby Destinations

- Pajaro Valley High School
- Fitz Wetlands Educational Resource Center

Connecting Trails

- Airport Boulevard Street-based Trail (4.5)
- Pajaro Valley High School Loop Trail (5.2)
- Harkins Slough Road Connector Trail (5.3)

Name	Pajaro Valley High School Loop Trail	Segment #	5.2
Start	Pajaro Valley High School	Distance	0.5 miles
Finish	Pajaro Valley High School	Trail Type	Pedestrian Path

Route Description

This proposed short loop trail would be designed as a pedestrian path providing access for Pajaro Valley High School students for use as a nature/interpretive teaching associated with the Fitz Wetlands Educational Resource Center. The ultimate alignment of this trail will be determined based on site conditions.

This property is owned by the City of Watsonville and the Pajaro Valley School District so no acquisition or easement of private property would be required.

Nearby Destinations

- Pajaro Valley High School
- Fitz Wetlands Educational Resource Center

Connecting Trails

- Pajaro Valley High School Connector Trail (5.1)
- Harkins Slough Road Connector Trail (5.3)

Name	Harkins Slough Road Connector Trail	Segment #	5.3
Start	Harkins Slough Road / Pajaro Valley High School	Distance	0.3 miles
Finish	Lee Road	Trail Type	Street-based

Route Description

This short street-based trail segment would provide a connection between the Pajaro Valley High School Connector Trail (5.2) and the Lee Road Trail (7.1). Given the narrow roadway, additional right-of-way and/or easements on private property would be required for this segment.

Nearby Destinations

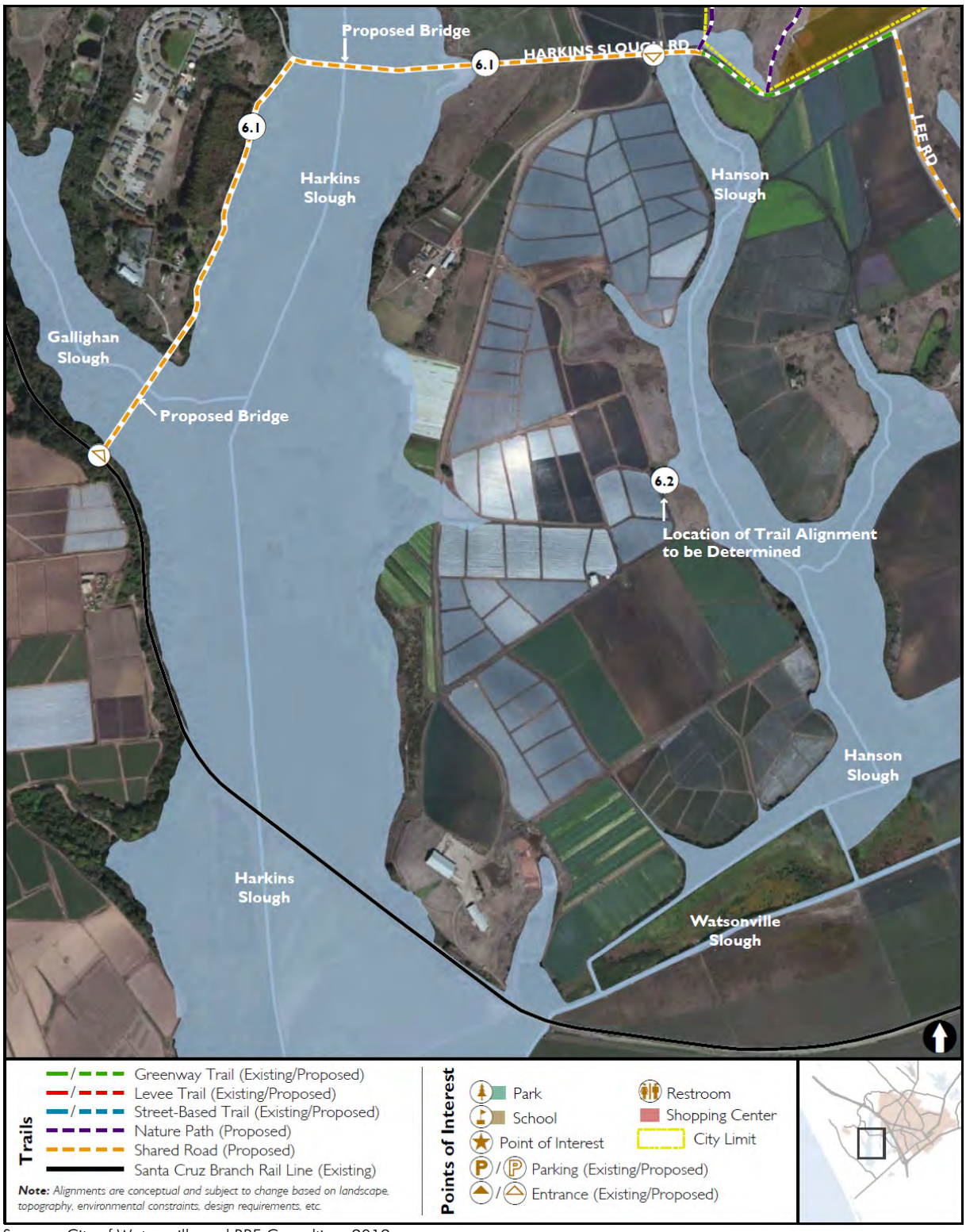
- Pajaro Valley High School

Connecting Trails

- Pajaro Valley High School Connector Trail (5.1)
- Pajaro Valley High School Loop Trail (5.2)

Sub-area 6 – Harkins Slough

Figure 3-8: Sub-area 6 – Harkins Slough Trail Network



Source: City of Watsonville and RBF Consulting, 2012.

Name	West Harkins Slough Trail	Segment #	6.1
Start	Harkins Slough Road @ Hanson Slough	Distance	0.9 miles
Finish	Santa Cruz Branch Rail Line	Trail Type	Shared Road / Greenway

Route Description

This proposed segment would provide a northwesterly connection between the greater Watsonville trail network and the regional trail network via the Santa Cruz Branch Rail Line.

The trail would extend west along Harkins Slough Road and then turn south on Rountree Road. Given the fact that there is very little traffic on these roads, users (pedestrians and bikers) would utilize the existing roadway (i.e., a shared road trail). At the end of Rountree Road, a greenway trail would be constructed across Gallighan Slough and join with the Rail Trail Spine of the Monterey Bay Sanctuary Scenic Trail Network (11.2) when constructed.

For this segment, two bridges would need to be constructed; one to cross Harkins Slough and one across Gallighan Slough. The ultimate length and type of bridge would be determined concurrent with a more detailed trail alignment and design study.

Acquisition of land and/or an easement on private property would be required for portions of this trail segment

Nearby Destinations

- Pajaro Valley High School

Connecting Trails

- East Harkins Slough Trail (6.2)
- Harkins Slough Road Connector Trail (5.3)
- Rail Trail Spine of the Monterey Bay Sanctuary Scenic Trail Network (11.2)

Name	East Harkins Slough Trail	Segment #	6.2
Start	Harkins Slough Road	Distance	~ 1.3 miles
Finish	Santa Cruz Branch Rail Line	Trail Type	Greenway

Route Description

All of the land within this proposed segment is located on the Watsonville Sloughs Farms, which is owned by the Land Trust of Santa Cruz County (LTSCC). It may be feasible to align portions of this trail through the Watsonville Slough Farms property, however, it would need to be offset from farming operations through fences and/or hedgerows to address food security and food safety issues. As agricultural blocks are retired and

buffers are established, this alignment may make more sense and provide greater opportunities for nature observation and environmental interpretation.

Therefore, given the uncertainty associated with an ultimate alignment, no specific alignment is shown on Figure 3-8.

Nearby Destinations

- Pajaro Valley High School

Connecting Trails

- West Harkins Slough Trail (6.1)
- Rail Trail Spine of the Monterey Bay Sanctuary Scenic Trail Network (11.2)

Sub-area 7 – Lee Road

Figure 3-9: Sub-area 7 – Lee Road Trail Network

Source: City of Watsonville and RBF Consulting, 2012.

Name	Lee Road Trail	Segment #	7.1
Start	Harkins Slough Road	Distance	3.0 miles
Finish	West Riverside Drive	Trail Type	Shared Road / Street-based Trail

Route Description

This proposed trail segment extends south from Harkins Slough Road along Lee Road, across Struve Slough and south along Lee Road to West Riverside Drive. From there the trail would extend down a farm road and join with the North Pajaro River Lee Trail adjacent to Highway 1.

Between Lee Road and Highway 1, the CA Department of Fish & Game manages the Watsonville Sloughs Ecological Reserve, which could provide trail access and/or be used as an interpretive observation point.

A possible trail alignment would generally follow Lee Road south from Harkins Slough Road to the confluence with Watsonville Slough. It may be feasible to align portions of this trail along the eastern edge of the Watsonville Slough Farms property. It would need to be offset from farming operations through fences and/or hedgerows to address food security and food safety issues. As agricultural blocks are retired and buffers are established, this alignment may make more sense and provide greater opportunities for nature observation and environmental interpretation. As such, the current alignment shown on Figure 3-9 of trail segment 7.1 extending along the right-of-way of Lee Road may vary as future opportunities arise.

Crossing Struve Slough will require construction of a bridge approximately 600 feet in length. Construction of the bridge will require careful coordination with Santa Cruz County, the CA Department of Fish & Game, and other relevant agencies to ensure that any potential environmental impacts are minimized, particularly as it relates to the hydrodynamics of the slough.

South of Struve Slough, the trail would need to be a Street-based trail as it extends through the industrial and farmland uses to West Riverside Drive. Additional right-of-way may need to be acquired as there are no sidewalks or bike lanes in this area and Lee Road is fairly narrow and frequently used by large trucks.

South of West Riverside Drive, the proposed greenway trail would extend down an existing farm road. Easements and/or a land purchase would be required for this segment.

Nearby Destinations

- CA Department of Fish & Game Reserve
- Watsonville Slough Farm (Land Trust of Santa Cruz County)

Connecting Trails

- Harkins Slough Road Connector Trail (5.3)
- Watsonville Slough Connector Trail (7.2)
- Rail Trail Spine of the Monterey Bay Sanctuary Scenic Trail Network (11.2)

- North Pajaro River Levee Trail (1.1)

Name	Watsonville Slough Connector Trail	Segment #	7.2
Start	Lee Road	Distance	0.1 miles
Finish	Paso Drive	Trail Type	Greenway

Route Description

This short trail segment would connect Lee Road with the existing Lower Watsonville Slough Loop Trail (8.2) located east of Highway 1. The trail would extend along the underpass of Highway 1, adjacent to the north end of Couch Distributors and adjacent to the Watsonville Slough. An existing privately-owned dirt roadway exists that parallels Watsonville Slough.

Nearby Destinations

- Connections to the Ohlone Parkway residential area
- Manabe-Ow Business Park

Connecting Trails

- Lee Road (7.1)
- Lower Watsonville Slough Loop Trail (8.2)

Sub-area 8 – Lower City Sloughs

Figure 3-10: Sub-area 8 – Lower City Sloughs Trail Network

Source: City of Watsonville and RBF Consulting, 2012.

Note: There are numerous existing trails in Sub-area, as shown in Figure 3-10: Sub-area 8 – Lower City Sloughs Trail Network. Descriptions of only those trail segments that are proposed are discussed below.

Name	Lower Watsonville Slough Loop Trail	Segment #	8.2
Start	Ohlone Parkway	Distance	1.1 miles
Finish	Highway 1	Trail Type	Greenway

Route Description

This greenway trail is a loop trail that extends along the perimeter of the Watsonville Slough from Highway 1 north to Main Street. Significant portions of this trail have been constructed. Three new segments are proposed to create a connected loop.

The first proposed segment is along the eastern edge of Watsonville Slough west of Ford Street in a light industrial area of Watsonville. It would extend from the intersection of Ford and Kearney Streets, north under the Harkins Slough Road Bridge to Main Street.

The second proposed segment is located on the western side of Watsonville Slough north of the Las Brisas neighborhood and around the northern boundary of the existing auto demolition yard. As part of this segment, a bridge is proposed over the Watsonville Slough.

The third proposed segment would extend along Watsonville Slough from the southwest corner of the Seaview neighborhood (Paseo Drive) west to Highway 1.

The first two proposed segments would require either property acquisition or an easement from the respective property owners. The third segment already has an existing agreement whereby the land owner has agreed to convey the property to the City of Watsonville commensurate with construction of the planned Manabe-Ow Business Park.

Nearby Destinations

- Ramsey Park and the Wetlands of Watsonville Nature Center
- Seaview Park
- Las Brisas Park

Connecting Trails

- Ramsay Park Trail (8.3)
- Ford Street Street-based Trail (8.4)
- Las Brisas Neighborhood Connector Trail (8.5)
- Seaview Neighborhood Connector Trail (8.6)
- Manabe-Ow Connector Trail (8.7)
- Ohlone Parkway Trail (8.8)

Name	Fort Street Street-based Trail	Segment #	8.4
Start	Ford Street @ Kearney Street	Distance	0.8 miles
Finish	Main Street	Trail Type	Street-based

Route Description

This proposed trail segment is considered an alternate trail should it be found that the proposed segment of the Lower Watsonville Slough Loop Trail (8.2) to the northwest cannot be built. It would extend north on Ford Street, west on Rodriguez Way, and north on Rodriguez Street to Main Street. A second segment would also extend west on Walker Street over the Harkins Slough Road bridge.

Portions of this street-based trail already contain sidewalks. Walker Street and Rodriguez Way and Street are currently designated Class II Bike Lanes.

Nearby Destinations

- Ramsey Park and the Wetlands of Watsonville Nature Center

Connecting Trails

- Lower Watsonville Wetland Slough Loop Trail (8.2)

Name	Las Brisas Connector Trail	Segment #	8.5
Start	Pasadena Court @ Lower Watsonville Slough Loop Trail (8.2)	Distance	0.3 miles
Finish	Lower Watsonville Slough Loop Trail (8.2)	Trail Type	Street-based

Route Description

This proposed trail segment is a street-based connector trail that would extend west on Pasadena Court and then north through private property, roughly on the alignment of an existing private dirt roadway. It would surround a parcel that is currently vacant but entitled for residential development, as identified in the Manabe-Ow Specific Plan (approved 2010).

Acquisition of land and/or an easement on private property may be required for portions of this trail segment.

Nearby Destinations

- Las Brisas Park

Connecting Trails

- Lower Watsonville Wetland Slough Loop Trail (8.2)

Name	Manabe-Ow Connector Trail	Segment #	8.7
Start	Watsonville Slough	Distance	0.7 miles
Finish	Struve Slough /Westridge Business Park	Trail Type	Street-based / Greenway

Route Description

This proposed segment would extend through the planned Manabe-Ow Business Park. The first portion would extend along a proposed roadway through the North Business Park Planning Area as identified in the Manabe-Ow Specific Plan. At the terminus of the road, a greenway trail would extend east to the existing Lower Struve Slough Loop Trail (8.1) and to the west via a bridge over Struve Slough to the other end of the Lower Struve Slough Loop Trail (8.1).

Nearby Destinations

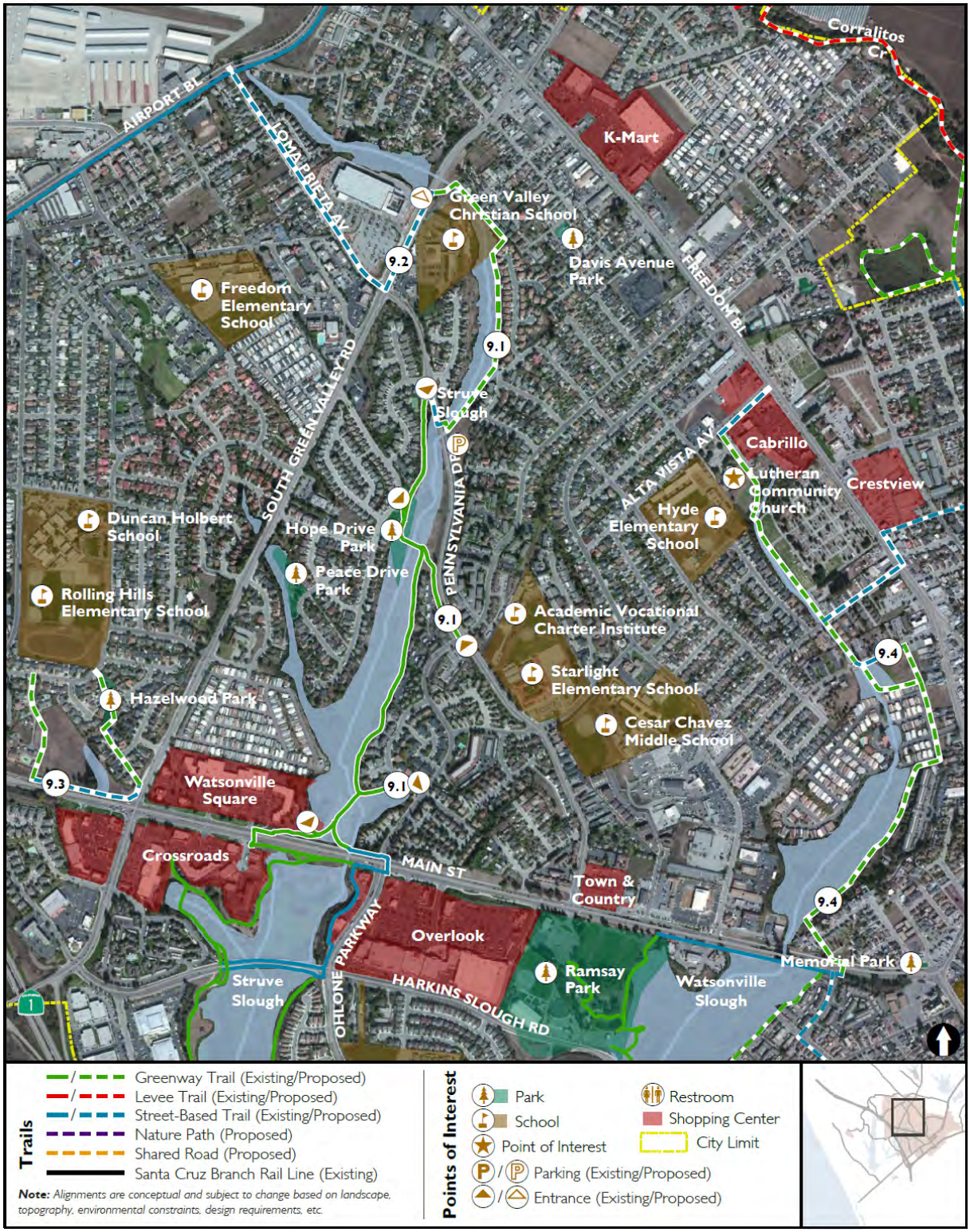
- Seaview Park
- Manabe-Ow Business Park

Connecting Trails

- Lower Watsonville Slough Loop Trail (8.2)
- Lower Struve Slough Loop Trail (8.7)

Sub-area 9 – Upper City Sloughs

Figure 3-11: Sub-area 9 – Upper City Sloughs Trail Network



Source: City of Watsonville and RBF Consulting, 2012.

Note: There are numerous existing trails in Sub-area, as shown in Figure 3-11: Sub-area 9 – Upper City Sloughs Trail Network. Descriptions of only those trail segments that are proposed are discussed below.

Name	Upper Struve Slough Trail	Segment #	9.1
Start	Pennsylvania Drive	Distance	0.6 miles
Finish	South Green Valley Drive	Trail Type	Greenway

Route Description

This proposed segment would extend the existing Upper Struve Slough Trail north along the easterly upper reach of Struve Slough.

Adjacent to Pennsylvania Avenue, there is an existing triangular parcel of privately-owned land, part of which could be for a future parking area and potential associated trail/recreation facilities.

Going north, an informal trail already exists on city-owned property along the backyards of several residential units. North from the intersection of Allston Way and Crescent Drive, the land is owned by the City of Watsonville and there is an existing sewer line and paved maintenance road that extends behind a row of houses along Crissara Drive.

The proposed trail would then extend north behind a number of apartment buildings and adjacent to the Green Valley Christian School, and terminate at South Green Valley Road. This property is owned by the Green Valley Christian Center of Watsonville.

Nearby Destinations

- Green Valley Christian School
- Davis Avenue Park

Connecting Trails

- Loma Prieta Avenue Street-based Trail (9.2)

Name	Loma Prieta Ave. Street-based Trail	Segment #	9.2
Start	South Green Valley Road	Distance	0.6 miles
Finish	Airport Boulevard	Trail Type	Street-based

Route Description

This proposed segment would serve as a connector trail between the Upper Struve Slough Trail (9.1) and the Airport Boulevard Street-based Trail (4.5).

The trail would extend south on South Green Valley Road and west on Loma Prieta Avenue. These roadways currently have sidewalks on both sides of the street and both are designated as Class II Bike Lanes.

No property acquisitions or easements would be required for this trail segment.

Nearby Destinations

- Green Valley Christian School
- Watsonville Municipal Airport
- Freedom Elementary School

Connecting Trails

- Upper Struve Slough Trail (9.1)
- Airport Boulevard Street-based Trail (4.5)

Name	Rolling Hills Connector Trail	Segment #	9.3
Start	Herman Avenue	Distance	0.6 miles
Finish	Herman Avenue	Trail Type	Greenway / Street-based

Route Description

This route would connect Rolling Hills Elementary School to Main Street via two routes. The first would be along a city-owned parcel with a storm drain and existing paved maintenance road from Herman Avenue between Vista and Inez Streets, and then through private property and a public roadway (Melwood Court) to Main Street. The trail would then extend east on Main Street before extending north through privately owned land to Eileen Street and then to Herman Avenue. Development of the north side of this trail would likely be as a condition of future development of the property.

Nearby Destinations

- Rolling Hills Elementary School

Connecting Trails

- None

Name	Upper Watsonville Slough Trail	Segment #	9.4
Start	Main Street	Distance	1.2 miles
Finish	Freedom Boulevard	Trail Type	Greenway

Route Description

This trail segment would provide a valuable alternate route for bicyclists traveling north and west through Watsonville and avoiding portions of Freedom Boulevard which is subject to heavy vehicular traffic conditions.

This proposed trail would extend along the northeasterly side of the upper Watsonville Slough north of Main Street. From Main Street, the trail would be street-based extending

northwest through a public alley street, cross Ninth Street and extend along an existing city-owned easement behind a row of single-family residential houses. From there, the trail would extend on privately-owned land through riparian woodlands along the eastern edge of the Watsonville Slough and behind the Valley Heights Retirement Community.

The trail would then "jog" east and then north on a private roadway on the east and north side of the Portola Heights mobile home park. At the northwest end of the mobile home park, the trail would either extend west and downhill along the edge of the mobile home park and back to the Watsonville Slough, and/or north along a private roadway behind a series of commercial buildings that front Freedom Boulevard.

The trail would then extend west along a drainage channel crossing Miles Lane and Marin Street on privately owned residential land. The trail would then continue along the drainage channel on the south side of Pioneer Cemetery, through the Lutheran Community Church property, and then east on Alt Vista Avenue to Freedom Boulevard. Additionally, a "spur" sidewalk trail would extend up Marin Street to Freedom Boulevard.

Nearby Destinations

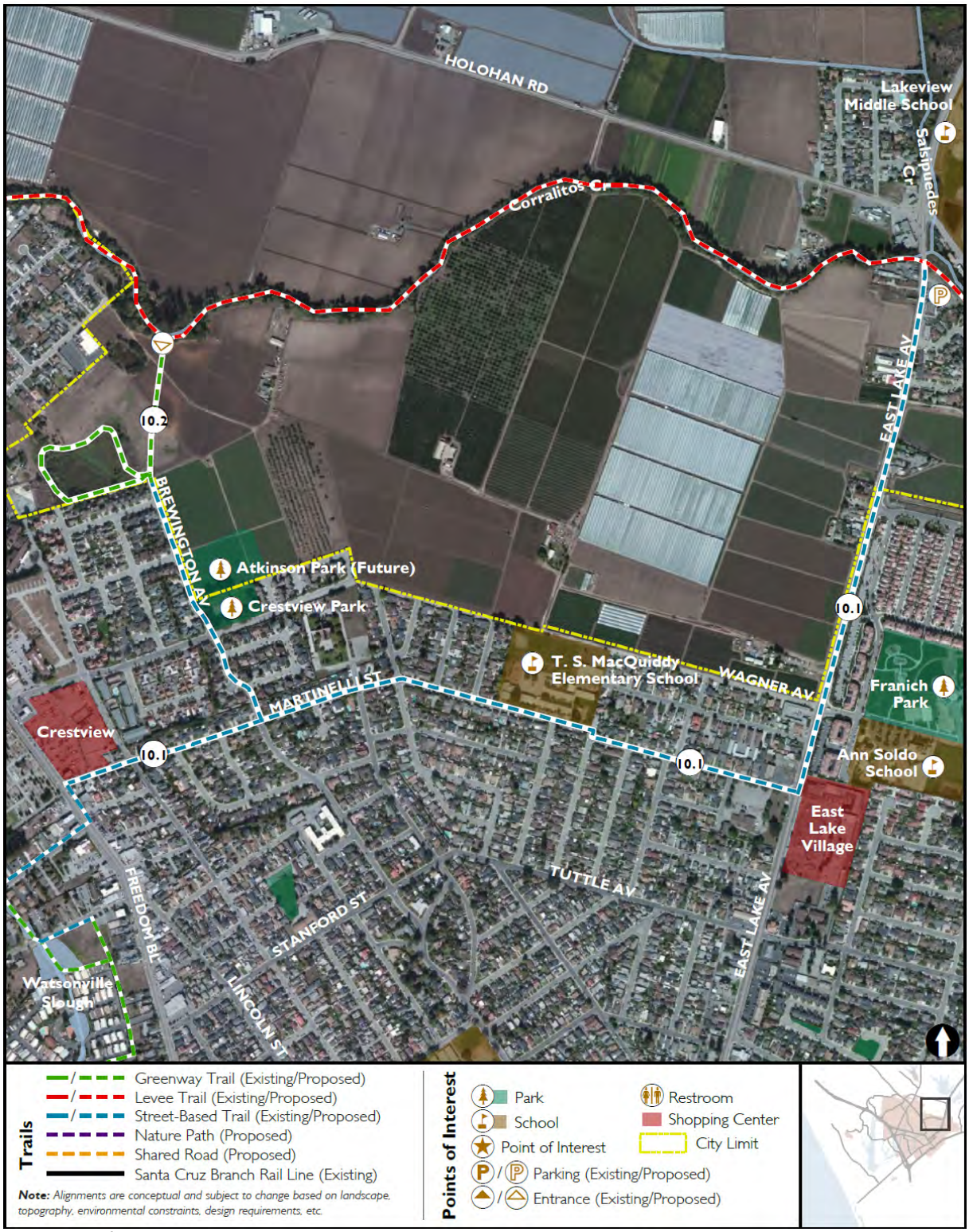
- Lutheran Community Church
- Hyde Elementary School
- Pioneer Cemetery
- Cabrillo and Crestview shopping centers
- Memorial Park

Connecting Trails

- Martinelli Street / East Lake Avenue Street-based Trail (10.1)
- Lower Watsonville Slough Loop Trail (8.2)

Sub-area 10 – Northeast Watsonville

Figure 3-12: Sub-area 10 – Northeast Watsonville Trail Network



Source: City of Watsonville and RBF Consulting, 2012.

Name	Martinelli Street / East Lake Avenue Street-based Trail	Segment #	10.1
Start	Freedom Boulevard	Distance	1.8 miles
Finish	East Lake Avenue	Trail Type	Street-based

Route Description

This street-based trail would provide a connection between the proposed Upper Watsonville Slough Trail (9.4) and the Corralitos Creek Trail (3.1). The trail would extend along Martinelli Street which has sidewalks on both sides of the street. To accommodate this trail, the roadway would need to be designated as a Class III Bike Route.

The trail would then turn north on Eastlake Avenue and terminate at Corralitos Creek. East Lake Avenue currently has a sidewalk on the east side of the street as far north as Coleman Avenue. There are no designated bikeways on East Lake Avenue.

Nearby Destinations

- TS Macquiddy Elementary School
- Ann Soldo Elementary School
- Lakeview Middle School
- Franich Park
- Crestview and East Lake Village shopping Centers

Connecting Trails

- Upper Watsonville Slough Trail (9.4)
- Brewington Avenue / Atkinson Trail (10.2)
- Corralitos Creek Trail (3.1)
- Salsipuedes Creek Trail (2.1)

Name	Brewington Avenue / Atkinson Trail	Segment #	10.2
Start	Martinelli Street	Distance	0.8 miles
Finish	Corralitos Creek Trail	Trail Type	Street-based / Greenway

Route Description

This proposed trail would link the Martinelli Street / East Lake Avenue Street-based Trail with Corralitos Creek via Brewington Avenue and then through the proposed Atkinson Lane Specific Plan (SP) area. Within the Atkinson Lane SP area, the greenway trail would loop around an existing pond.

Brewington Avenue has a continuous sidewalk on the west side and a sidewalk on the east side as far as Crestview Park.

Nearby Destinations

- Crestview Park

Connecting Trails

- Martinelli Street / East Lake Avenue Street-based Trail (10.1
- Corralitos Creek Trail (3.1)

Sub-area 11 – Regional Trails

Figure 3-13: Sub-area 11 – Regional Trails

Source: City of Watsonville and RBF Consulting, 2012.

Name	Shell Road Trail	Segment #	11.1
Start	Thurwachter Road	Distance	6.0 miles
Finish	San Andreas Road	Trail Type	Variable

Route Description

This coastal-based regional trail would start at the Pajaro River at the McGowan-Thurwachter bridge and extend west on the North Pajaro River Levee Trail (1.1) to the Pacific Ocean and Pajaro Dunes residential neighborhood. It would then turn north along or adjacent to Rio Boca Road or along an unimproved levee on the east side of the last mile of Watsonville Slough to West Beach Street. The street-based trail would then turn north on Shell Road and onto Sunset Beach Road where it would join and extend further north on San Andreas Road. Shell Road and Sunset Beach Road are located within Sunset State Beach on land that is owned by the State of California.

Depending on environmental conditions and easement/right-of-way requirements, some portions of this trail would be designed as a Greenway Trail and other portions would be designed as a Street-based Trail. For that segment that extends along the Pajaro River, it would be designed as a Levee Trail.

Depending on the final adopted trail alignment by RTC, this trail alignment may, at some future point, be part of the Monterey Bay Sanctuary Scenic Trail as well as part of the alignment of the California Coastal Trail.

Acquisition of land and/or easements on private/State property may be required for portions of this trail segment.

Nearby Destinations

- Sunset State Beach
- Palm Beach State Park
- Pajaro Dunes Residential Neighborhood (private)

Connecting Trails

- North Pajaro River Levee Trail (1.1)
- South Pajaro River Levee Trail (1.2)
- Rail Trail Spine of the Monterey Bay Sanctuary Scenic Trail Network (11.2)

Name	Rail Trail Spine of the Monterey Bay Sanctuary Scenic Trail Network	Segment #	11.2
Start	Davenport	Distance	32 miles
Finish	The Community of Pajaro	Trail Type	Rail Trail

Route Description

The Santa Cruz County Regional Transportation Commission (RTC) completed purchase the Santa Cruz Branch Rail Line in October 2012 for recreational rail, preservation and future transportation uses. Future transportation uses could include passenger rail service, transit, bicycle and pedestrian facilities, and freight rail service. The 136-year old transportation corridor parallels Highway 1 extending almost 32 miles from the town of Pajaro in Monterey County, to Davenport in Santa Cruz County. The right-of-way is generally 50 to 60 feet wide with 37 bridges and trestles, including a crossing of the Pajaro River. Adjacent land uses include residential, commercial, industrial, agricultural and park land/open space. The corridor links major tourism and activity centers as it traverses downtown Watsonville, Aptos Village, Capitola Village and the Santa Cruz Beach area near downtown Santa Cruz. Also adjacent to the corridor are many parks and recreational facilities.

Within the greater Watsonville area, the rail line extends along the western edge of Harkins Slough and then easterly and south of Watsonville Slough. Within the city limits, the rail line extends north and parallel to West Beach Road. Heading south on Walker Street, the line passes by the former Watsonville Train Station and continues across the Pajaro River. A trail may be considered within these areas.

Similar to the Shell Road alignment (11.1), depending on the final adopted trail alignment by RTC, this trail alignment may, at some future point, be part of the Monterey Bay Sanctuary Scenic Trail as well as part of the alignment of the California Coastal Trail.

Nearby Destinations

- Downtown Watsonville
- Pajaro Community / Pajaro Neighborhood Park
- Pajaro Middle School

Connecting Trails

- Multiple (see Figure 3-13: Sub-area 11 -- Regional Trails)

Bikeways Plan

Background

The mild climate and topography make the City of Watsonville a great place to travel by bike. Bicycling is an ideal mode of transportation because it is enjoyable, healthy, and environmentally sound. Bicycling provides an affordable, low-cost, easy, convenient and efficient mode of transportation. People who ride bicycles are also improving their health and well-being through cardiovascular exercise.

In addition, there are many other benefits associated with bicycle transportation, both for the individual and for society. Bicycle riders help us all by:

- Reducing air pollution
- Reducing traffic congestion
- Reducing wear and tear on our roads
- Reducing consumption of petroleum resources
- Reducing the need for additional roadway capacity and parking

Types of Bicycle Travel

The increased interest in bicycling has led to the development of various types of equipment. Today, all types of specialized bicycles and accessories are available: touring, racing, mountain and commuter bikes. Bicycling currently falls into four general use categories: commuting/utility, recreational, touring, and racing. Commuting/utility riders are those who regularly travel to and from a specific destination, usually as quickly and directly as possible, for very practical purposes, such as to purchase or transport goods and services or to travel to and from work, school, or events. Many people commute by bicycle for environmental reasons and for the pleasure of riding.

Recreational cyclists include those who take day long local excursions and are generally riding for pleasure or fitness. Off-road mountain bicycling is a very popular recreational activity. Touring, on the other hand, extends over longer periods of time. Touring requires more planning since the destination and routes are important factors. Racing is a specialized sport and race courses may use public roadways with appropriate public agency approval and permits.

To accommodate all cycling types, route systems should be accessible and frequent enough to be within a few blocks of all residents. They should be understandable and have adequate signs and graphics to make clear where routes are, and where they are going. Route systems should also be safe, visible, and have adequate lane width. In addition, it's important to keep in mind that excessive motor vehicle traffic and speed make bicycling less safe and less fun. There is a need to design transportation systems that provide more balance between modes, a more efficient use of energy in the movement of people, and a more harmonious interaction between transportation and the environment.

Commuter Bicycle Use

According to the U.S. Census Bureau - American Community Survey (ACS)(2009), the City of Watsonville has a total of approximately 19,518 commuters of which 0.9% (139) are bicycle commuters. In comparison, the City of Santa Cruz has a much higher bicycle use as shown on Table 3-2: Commuter Bicycle Use.

Table 3-2: Commuter Bicycle Use

Area	Total Commuters	Total Bicyclists	Bicycle % of Commuting
Santa Cruz County	121,533	3,496	3.1%
Santa Cruz	28,250	2,469	8.5%
Capitola	4,886	119	1.6%
Scotts Valley	5,152	43	0.4%
Watsonville	19,518	139	0.9%

Source: US Census Bureau – American Community Survey, 2009

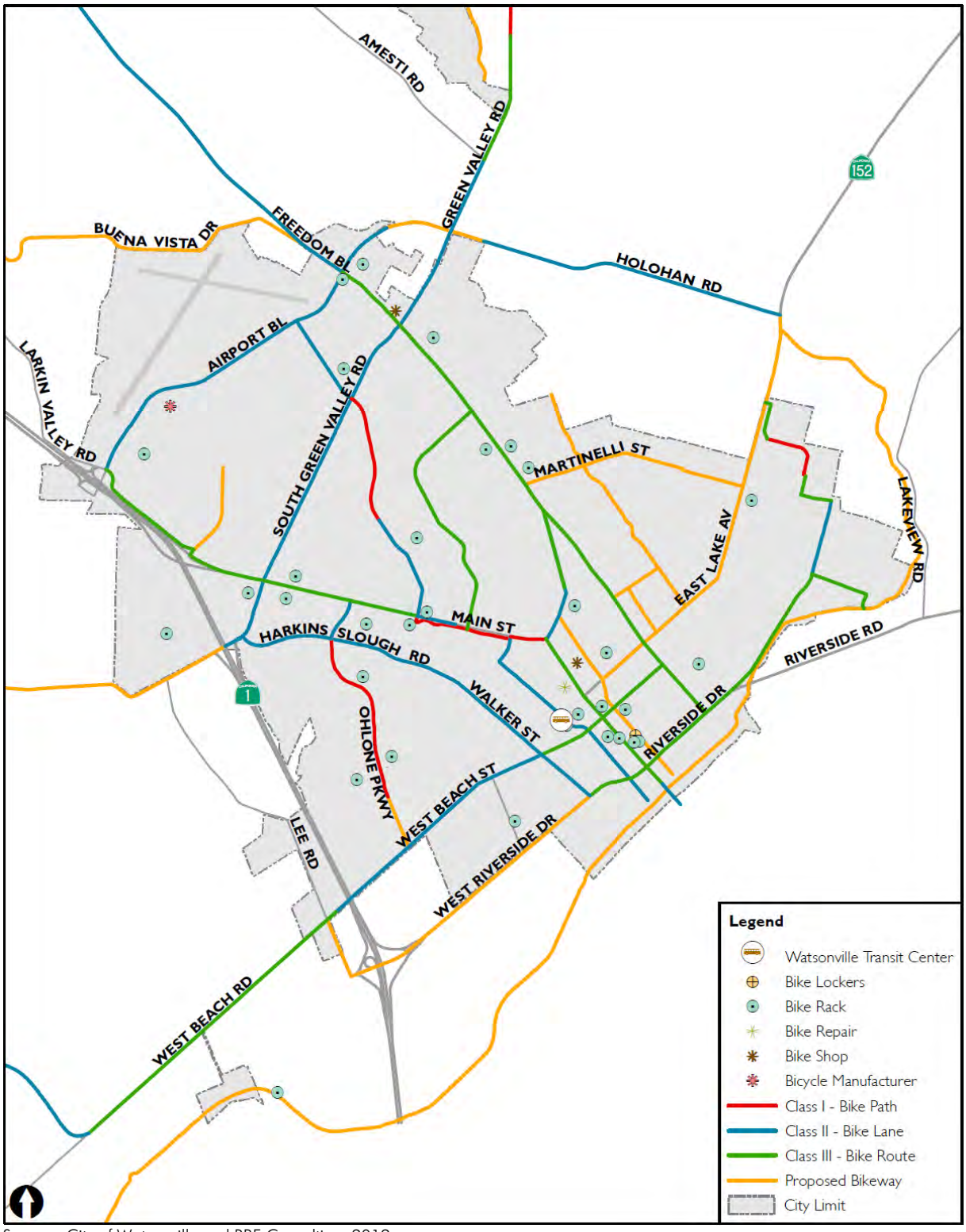
Previous planning efforts, including those undertaken by both the City of Watsonville and the Santa Cruz County Regional Transportation Commission, have sought to increase the bicycling component of commuter traffic to 20%. A key objective of the 2010 Santa Cruz County Regional Transportation Plan is to increase bicycle use to 20% of all work trips and to increase general bicycle trips to 5% of all trips by the year 2035. A similar increase in bicycle commuting is also a goal of this Master Plan

Existing and Proposed Bicycle Network

Many of the City's major collector and arterial roadways have, over the years, been established as Class II bikeways (bike lanes) with a focus on development in high density urban areas and urban corridors. Figure 3-14: Existing & Proposed Bicycle Network and Transit Facilities, the City of Watsonville illustrates the network of Class I, II, and III bikeways throughout the City. Significant Class I Bike Paths extend along portions of Pennsylvania Drive, Ohlone Parkway, and Main Street. Significant Class II Bike Lanes extend along Airport Boulevard, Holohan Road, South Green Valley Road, Walker Street and West Beach Road.

These City designated bikeways are connected to a regional network of county bikeways. Significant bikeway connections to Watsonville are a Class II Bike Lane along Freedom Boulevard, a multi-class (I,II, and III) on Green Valley Road, and a Class II Bike Lane on West Beach Road. The RTC publishes the Santa Cruz County bikeway map which provides a detailed map of existing bike lanes and paths throughout the County, informational items on bicycling tips and laws, and local bicycle resources. The map is available from the RTC web site (www.sccrtc.org).

Figure 3-14: Existing & Proposed Bicycle Network & Transit Facilities



Source: City of Watsonville and RBF Consulting, 2012.

Existing and Proposed Bicycle Parking and Support Facilities

There are several additional components to a successful bicycle network besides bike lanes. As shown in Figure 3-14: Existing & Proposed Bicycle Network and Transit Facilities, facilities and amenities that support and encourage bicycling include secure and convenient bicycle parking facilities, employee shower and changing facilities, bike sensitive signals at intersections to allow cyclists the ability to trigger the signal, and intermodal connections allowing bicyclists to transfer between modes of travel. The City of Watsonville's zoning codes establish bicycle parking requirements for new development. Rates vary according to the type of use. Although current regulations do not mandate that a certain number of bicycle spaces be secure lockers for employees, the City encourages enclosed bicycle parking at shopping centers, civic centers and businesses.

The Santa Cruz County Regional Transportation Commission also administers a program to help fund the installation of secure bicycle racks and lockers in high use commercial and public facility areas. Since 1993, the "Bike Secure" program has funded 52 local agencies and businesses and provide over 2,000 new bicycle parking spaces. Locations of new bicycle racks are constantly being added to provide bicycle parking facilities.

Bike Parking and Other Amenities

Currently, there are few public places for changing and storing bicycle clothes and equipment. To encourage commuter bicycling use, some jurisdictions have adopted ordinances which require new employment-generating uses to provide onsite bicycle parking, lockers, and facilities for showering and changing clothes. These types of requirements for new or expanded development provide incentives for employees to use bicycling as a commuting alternative. Site design requirements for worksites have not been adopted in the City nor County. If considered in the future, ordinances should include requirements for bike storage, showers, and clothes lockers to further encourage bicycle commuting.

Park-And-Ride Lots

Currently, there are no park-and-ride lots within the City of Watsonville. However, five park-and-ride lots exist in all of Santa Cruz County, including locations at the Scotts Valley Transit Center, Pasatiempo in Santa Cruz, Quaker Meetinghouse in Santa Cruz, Soquel Drive/Paul Sweet Road in Santa Cruz, and Resurrection Church in Aptos.

Existing and Proposed Bicycle Intermodal Facilities

Connections between the various transportation modes allow people to use a combination of transportation modes for daily trips. People can combine bicycling with bus (i.e. via the Watsonville Transit Center), automobiles, carpooling, vanpooling, train travel, and walking for their commuter and recreational trips. Facilities that can help cyclists combine transportation modes include: bike racks on buses, vanpools, and bike racks and lockers at transit stops and park and ride lots, train stations, and parking structures.

Bicycle Safety and Education Programs

The City of Watsonville is serviced by many safety and education programs, as well as advocacy groups. Bicyclists need to know the vehicle laws and they also need to develop good cycling skills, so that they can coexist safely with motorists. Motorists need to know that cyclists have a legal right to the roadways and they need to learn coexistence strategies, as well. Education programs can provide motorists with valuable information they need and bicyclists with on bike training. The safety benefits of helmets and other protective measures also need to be stressed. Some of the more active local non-profit organizations are listed below:

Santa Cruz County Regional Transportation Commission - Plans for, funds, and supports numerous bicycle projects. A RTC Transportation Planner serves as a Bicycle Coordinator and staff person for the Bicycle Advisory Committee; handles bicycle hazard reporting (of potential or existing hazards on roadways or bikeways), applications for Bikes Secure, providing bicycle parking at private lots, vanpools and other locations (http://www.sccrtc.org/). The RTC also produces the Santa Cruz County Bikeways Map which is distributed free to the public.

Commute Solutions - A RTC rideshare program that provides callers with commute information, such as carpool and vanpool matching, transit schedules, bicycle commuter brochures, bikeway maps, and route suggestions, amongst other resources (http://www.commutesolutions.org/).

Bicycle Advisory Committee– advises the Santa Cruz County Regional Transportation Commission (RTC) on bicycle planning and policy related issues. The Committee provides technical review of proposed bicycle projects and funding applications as well as theft prevention, bicycle parking programs, education and safety, and other bicycling related issues (http://www.sccrtc.org/ros-bike.html).

Ecology Action – a non-profit environmental consultancy that offers bicycle education and safety programs, technical support, and incentive programs to encourage active transportation. Ecology Action works closely with local jurisdictions, schools and businesses, and is an active presence in the community (http://www.ecoact.org/Programs/Transportation/index.htm).

Bike to Work/School Program - Offers two County-wide Bike to Work/School Day events per year as well as the Spring Bike Week. These events are fun, inclusive, and educational, and encourage, support, and promote more people to bicycle for transportation.

Bike Smart – A Safe Routes to School program run by the Transportation Division of Ecology Action, a local non-profit organization. Bicycle safety training is done in the classroom and outside where youth of all ages participate in “Bicycle Rodeo” obstacle courses.

Community Traffic Safety Coalition - a public safety organization representing over 30 community and government organizations, as well as the South County Bike/Pedestrian Workgroup that is funded by a grant from the State Office of Traffic Safety. Some of its activities include: "Share the Road" with bicyclist signs, low-cost helmet distribution,

outreach and education of enforcement agencies, Latino Community outreach, night-riding education (http://www.sctrafficsafety.org/).

Ride n' Stride Bicycle and Pedestrian Safety Program – Teaches elementary school children to safely ride their bicycles and walk. The program covers traffic and safety laws including helmet use and proper street crossing.

Bicycle Traffic School – A program aimed to hold bicyclists who receive traffic violations responsible for illegal behavior and educate them so the behavior is not repeated. Bicycle traffic safety classes are offered to individuals who receive traffic violation tickets in lieu of paying the fine.

People Power - a grass-roots advocacy group that monitors and advocates for positive bicycle associated issues (http://peoplepowersc.org/).

Bicycle Plan Consistency with Other Regional Plans

WatsonvilleVista 2030 General Plan

The WatsonvilleVista 2030 General Plan Transportation and Circulation Element includes objectives, policies and implementation measures to develop a safe and efficient bikeway system. The preparation and implementation of a Bikeway Plan facilitates achieving these objectives by developing an action plan that can be used as part of the County, regional and statewide funding and grant programs. The Bicycle Plan is in support of the following WatsonvilleVISTA 2030 Transportation and Circulation Element goals and policies:

- Plan for and provide a safe, convenient network of bicycle facilities that serves both local and regional travel. (Goal 6.5.0)
- The City shall plan for, and implement a comprehensive network of bicycle facilities in order to promote the bicycle as an alternative to the private automobile. (Policy 6.5.1)
- The City shall encourage bicycle facilities in new developments, as an incentive for bicycling as a commute alternative. (Policy 6.5.3)

Santa Cruz County Regional Transportation Plan

The 2010 Regional Transportation Plan (RTP) also seeks to increase bicycle travel, reduce conflicts between bicycles and other modes of travel and increase the potential of combining bicycle travel with other modes of transportation. The RTP seeks to develop bikeway systems, including bike lanes, which provide for safe bicycle travel. This Plan is consistent with RTP bicycle planning policies that seek to update bikeway plans and implement projects to close gaps in the bikeway network and provide safe bicycling facilities. The RTC is currently updating the RTP and is scheduled for public release in 2014.

Monterey Bay Unified Air Pollution Control District 2008 Air Quality Management Plan

The 2008 Air Quality Management Plan also seeks to increase bicycle travel as this mode of transportation is the single most efficient form in terms of energy and resulting air pollution. Projects that consist of any new or improved bicycle facility constructed,

increases the opportunity for more commuters to choose the bicycle as their mode of transportation instead of motorized transportation. The improvement projects as outlined in this bicycle plan achieve these goals.

4 | DESIGN GUIDELINES

In this Chapter:

- Introduction
- ADA Requirements
- Wayfinding & Signage
- Trail Details and Standards
- Ancillary Trail Facilities & Amenities

Introduction

This chapter provides design guidelines for future development of the greater Watsonville trail network. These guidelines are based on best practices in use throughout the United States, as well as accepted national trail and bikeway facilities.

The guidelines should be used with the understanding that each trail is unique and that design adjustments will be necessary in certain situations to achieve the best results. Each proposed segment should be evaluated on a case-by-case basis, in consultation with Santa Cruz County and Monterey County (where relevant), the respective land owners, the appropriate stakeholders, a qualified engineer, and, where appropriate, a landscape architect.

Trail design is a broad topic that covers many issues. This section provides guidelines for typical facilities and is not a substitute for more thorough design and engineering work. For more in-depth information and design development standards, the following publications should be consulted:

Greenways: A Guide to Planning, Design and Development
Published by Island Press, 1993
Authors: Charles A. Flink and Robert Searns

Trails for the Twenty-First Century
Published by Island Press, 2nd ed. 2001
Authors: Charles A. Flink, Robert Searns, Kristine Olka

Guide to the Development of Bicycle Facilities
Updated in 2012 by the American Association of State Highway Transportation Officials (AASHTO)

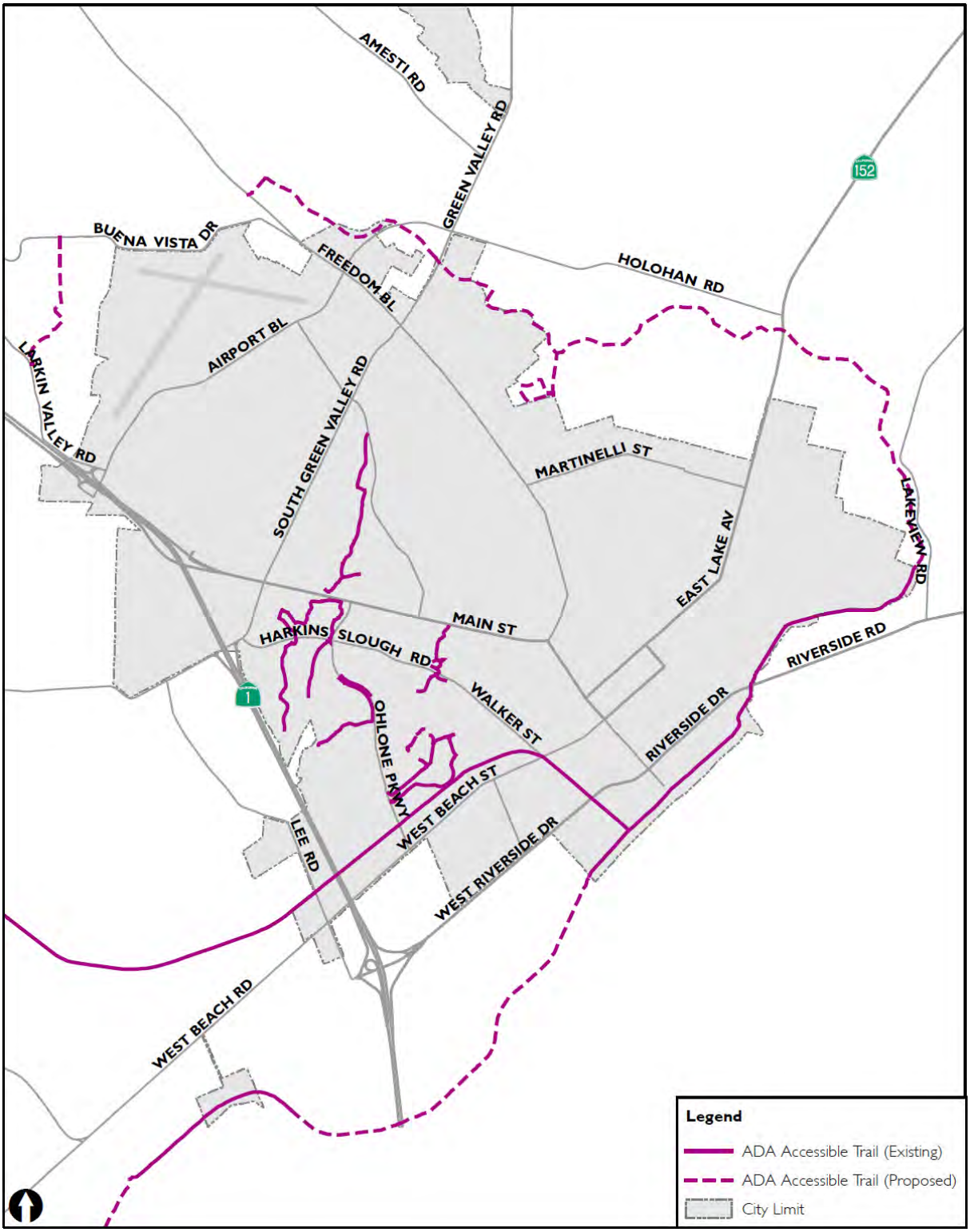
Manual on Uniform Traffic Control Devices (MUTCD)
Updated in 2012. Published by the U. S. Department of Transportation, Washington, DC

Universal Access to Outdoor Recreation: A Design Guide
Published by PLAE, Inc., Berkeley, CA, 1993

ADA Requirements

The Americans with Disabilities Act requires that portions of the Watsonville trail network be accessible to persons with varying motor skills and abilities. Perhaps the best way to comprehend the importance of ADA is to understand that most of us, at some time in our life, will experience a temporary disability which will affect the way in which we make use of outdoor resources. ADA benefits all Americans by making the outdoor environment more accessible. A map showing the existing and proposed greenway and levee trails that are ADA accessible is shown in Figure 4-1: ADA Accessible Greenway and Levee Trails.

Figure 4-1: ADA Accessible Greenway and Levee Trails



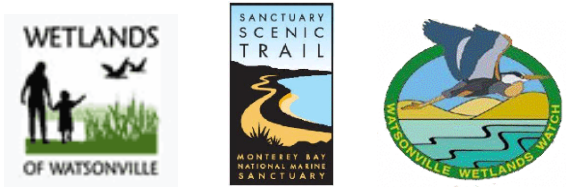
Wayfinding & Signage

A comprehensive system of signage is required throughout the project to ensure information is provided to trail users regarding the safe and appropriate use of all facilities, both on-road & off-road. It is essential that the future trail network be designed seamlessly with other alternative transportation routes, such as designated bicycle routes, and wherever possible, bus routes.

Signage includes post- or pole-mounted signs and pavement striping. Signage is further divided into information signs, directional signs, regulatory signs and warning signs. Trail signage should be developed to conform to the (2012) Manual on Uniform Traffic Control Devices and the American Association of State Highway Transportation Official Guide for the Development of Bicycle Facilities.

The city has an existing set of trail signs that will continue to be used as part of the development of future trails. These types of signs and where and how they should be used are described in Table 4-1: Wayfinding and Signage Recommendations.

Table 4-1: Wayfinding and Signage Recommendations

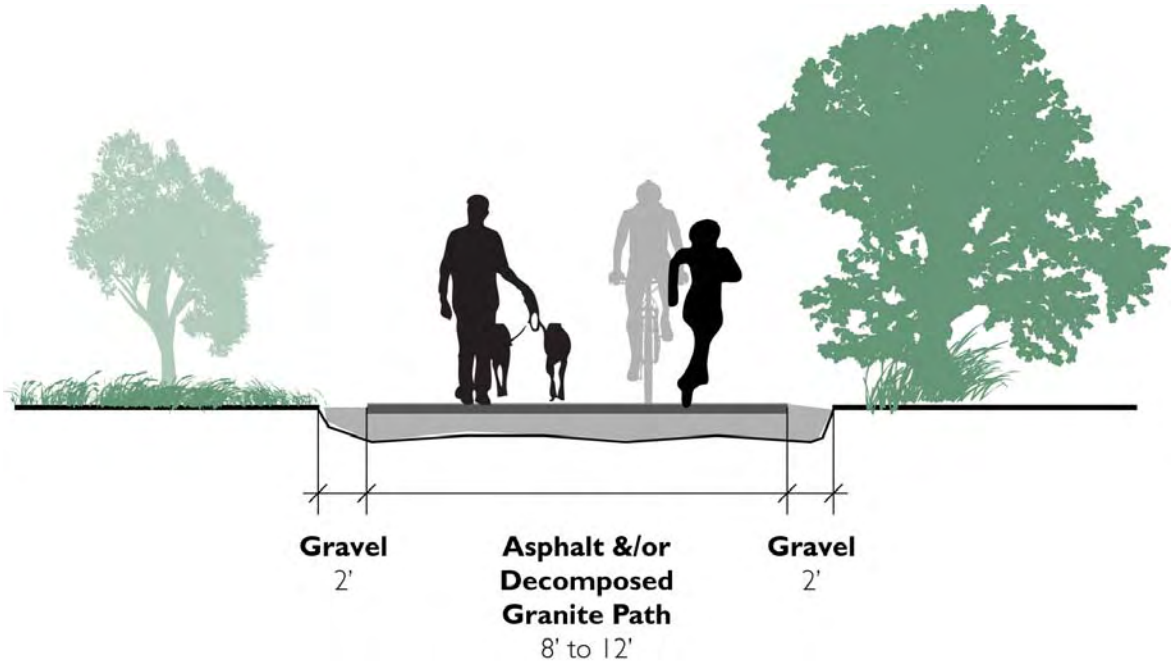
		Description	Recommendations
Trail Identity		The Watsonville trail network logo should be used to aid in reinforcing the trail's identity. Additionally, local trail logos, such as the Monterey Bay Sanctuary Trail should complement all Watsonville trail network signage.	Logos should be used as a consistent element throughout the trail network. They should be placed at all trail entrances and along the trails as appropriate. Signage should be simple, direct, and easy to identify.
Directional Signage		The Watsonville trail network map should be located at each trail entry. It should be post-mounted and viewable by adults, children, and people in wheelchairs. It should identify your location ("You are here"), other trail entrances, and associated trail facilities such as parking and restrooms.	Directional signs should be written in both English and Spanish. They should be resistant to graffiti and constructed with durable materials.
Educational Signage		Educational/interpretive signage should be placed at trail entrances and environmentally significant areas. These signs should include information about the trail, history of the surroundings, and/or other information that is easy to read for a variety of ages.	Educational signs should be written in both English and Spanish. They should be durable and resistant to graffiti. Additional site-specific signage should be considered, particularly at locations that have unique cultural and/or environmental resources.

		Description	Recommendations
Location Signage		Location signage should be placed along trail routes. These can be used to let users know how far they have traveled and/or how much father until they reach their destination. They can also be used to let emergency services know where a trail user is in case of an emergency.	Location signage used should be constructed of high quality, durable materials and may include trail logos and/or trail names. They should be spaced consistently along trails to most accurately inform users. Consider online maps with signage locations that would allow users to go on self-guided tours.
Shared Use Guidelines		Shared use signage should be used to clearly indicate permitted users and rules of conduct. This includes user types (pedestrian, bicyclists, equestrian, etc.) as well as speed control, cleaning up after your pet, "Don't litter, etc. They should also be used to indicate changing trail conditions such as grade, cross-slope surface conditions, etc.	Signage should be grouped with other signage as appropriate. Signs should be provided in an easy to understand format with limited text and graphics that are understood by all users

Trail Details and Standards

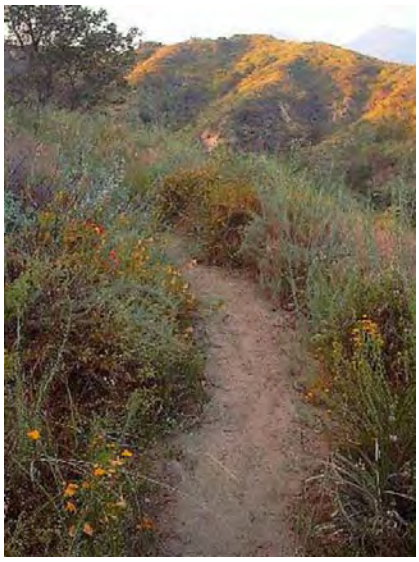
Greenway Trail

A greenway trail is an off-street trail designed for multiple users, including pedestrians, bicyclists, and other non-motorized users. A greenway trail is an eight to twelve-foot wide multi-use trail, typically located in a natural, or green setting (e.g. through open space) but may also be located in more urban areas such as residential neighborhoods. These trails should be comprised of a permeable material such as decomposed granite or other similar materials, wherever feasible. This type of trail is recommended for areas expecting frequent and heavy use.



Nature Path

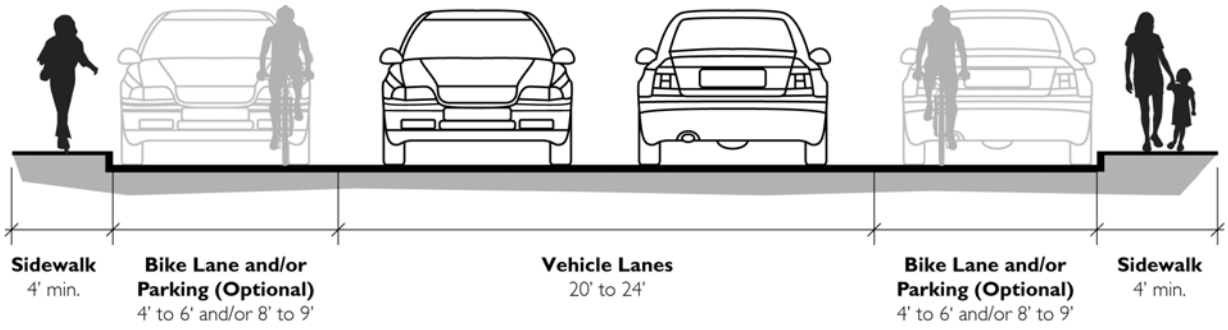
A nature path is a pedestrian only walking/jogging path comprised of a permeable material such as decomposed granite, earth or polymer stabilized earth, or similar material. Nature paths are relatively narrow (1.5′ to 5′) and recommended in low-density natural areas and open space and should be designed to minimize erosion potential.



Street-based Trail

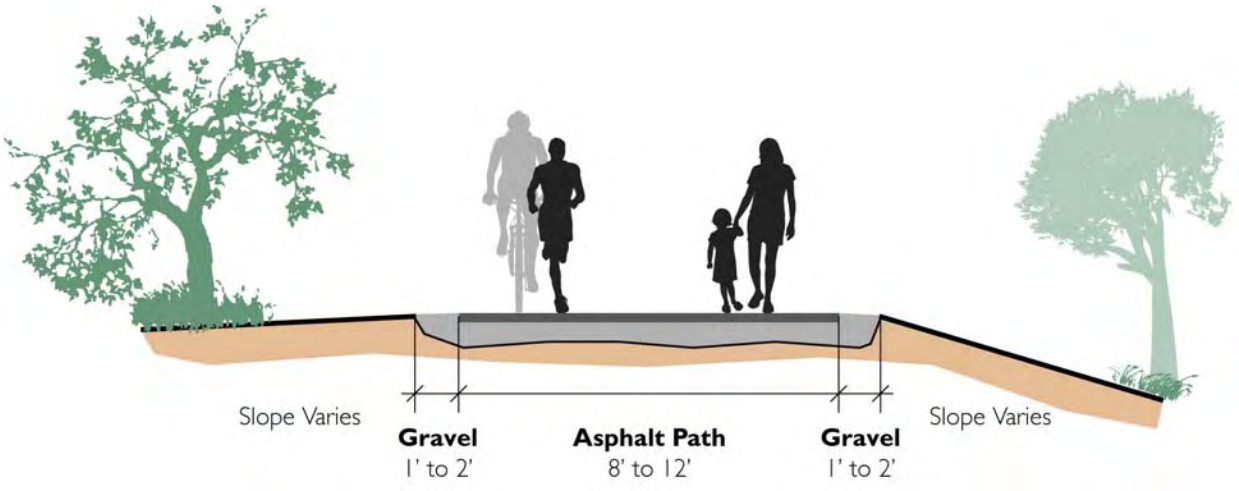
Some sidewalks and bicycle-friendly roadways are recommended as routes in order to preserve overall network connectivity, where off-road trails are not feasible. These portions of trail are referred to as street-based trails or on-road routes, providing trail users and local residents with safe routes to connect to and from off-road trail segments. Street-based trails typically feature sidewalks (with a 4' minimum width) and where necessary and feasible, bike lanes.

If a street-based trail has adequate right-of-way and infrequent cross streets and driveways, a sidepath can be used. Sidepaths have similar characteristics to paved trails, only they are located along roadways rather than natural corridors.



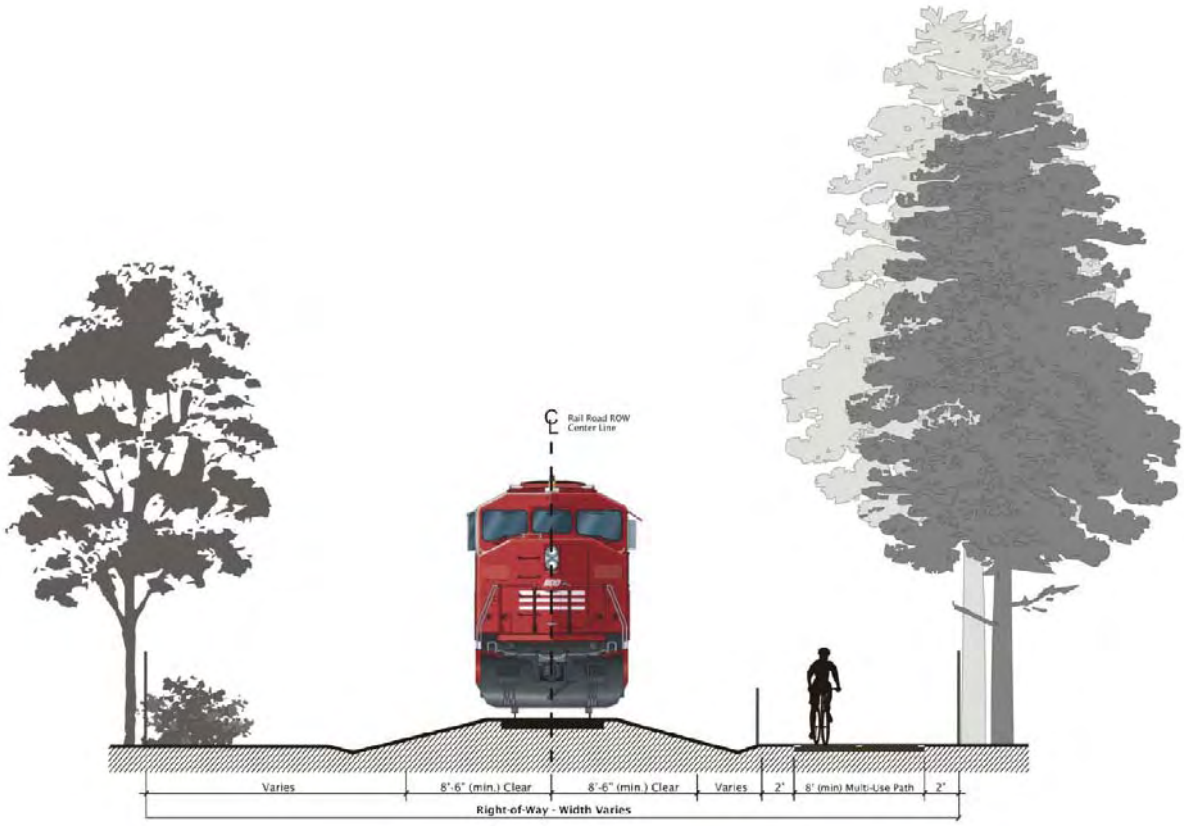
Levee Trail

Levee trails are designated along existing and proposed levees along the Pajaro River and Salsipuedes and Corralitos creeks. They are designed as multi-use trails comprised of asphalt, and in limited areas, concrete. Given their setting, levee trails are anticipated to be high-use trails.



Rail Trail

A rail trail is envisioned to be a regionally-serving trail that extends within the right-of-way of the existing Santa Cruz Branch rail line. The rail property is now owned by the RTC but specific plans for future uses have not been finalized. However, future transportation uses could include passenger rail service, transit, bicycle and pedestrian facilities, and freight rail service. It is envisioned that this trail will be the spine of MBSST trail network alignment.



Monterey Bay Sanctuary Scenic Trail

Part of the rail trail will likely be integrated with the broader, regionally-based Monterey Bay Sanctuary Scenic Trail. This multi-use trail is envisioned to span the coast of the Monterey Bay National Marine Sanctuary from the San Mateo/Santa Cruz County line to Pacific Grove, in Monterey County.

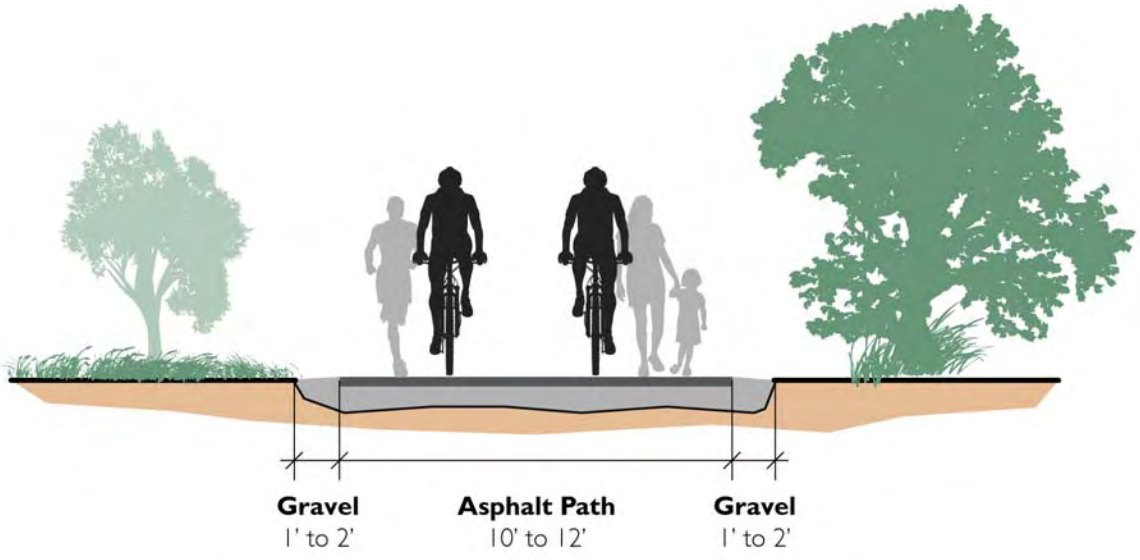
Trail types will vary in size and type, depending on conditions, right-of-way, etc. However, all trails will be designed as multi-use facilities capable of supporting both pedestrian and bicyclists, as well as other non-vehicular forms of transportation.

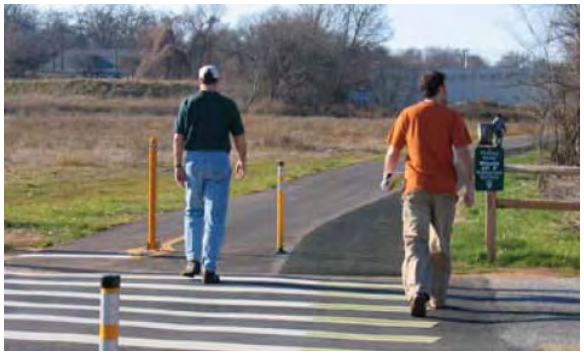
Monterey Bay Sanctuary Scenic Trail Project Corridor – Santa Cruz County Segment (Source: RTC, 2012)

Bikeways

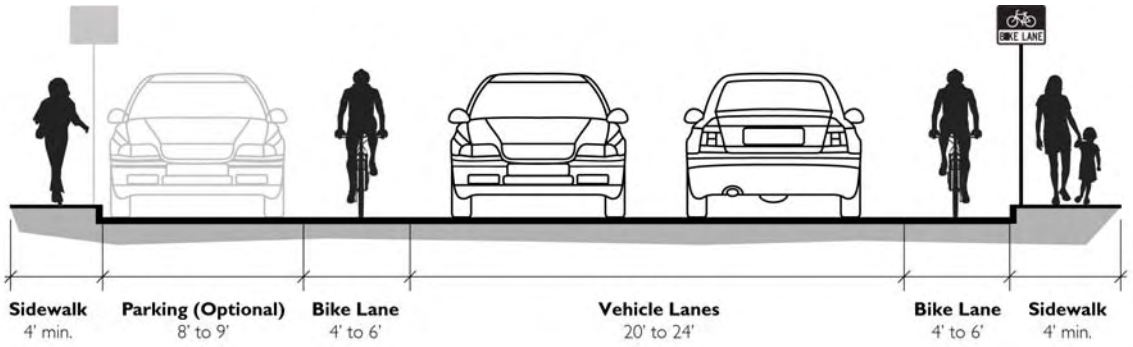
Bikeway is a general term used to refer to facilities that provide mobility access primarily for bicycle travel. The Caltrans Bikeway Planning and Design section (Chapter 1000 of the State of California Highway Design Manual) categorizes bikeways into three types:

Class I Bikeways are generally referred to as **Bike Paths** and provide a completely separated right-of-way for the exclusive use of bicycle and pedestrian traffic with cross-flow minimized. An example of a Class I bike path is the pedestrian/bike path on the west side of the Ohlone Parkway.





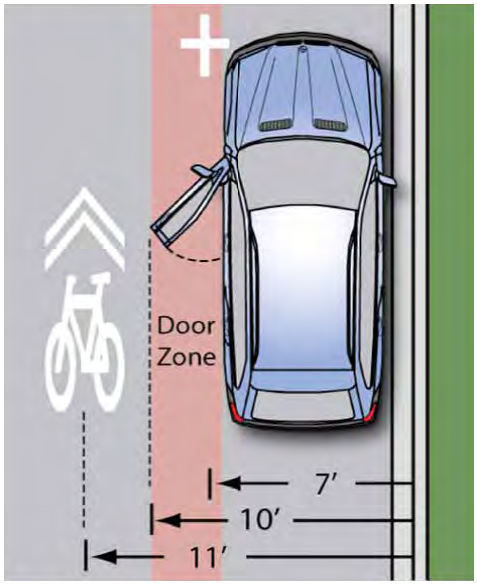
Class II Bikeways are referred to as **Bike Lanes** and provide a striped lane for one-way bike travel on a street or highway, and typically includes signs placed along the street segment. Examples include Airport Boulevard, South Green Valley Road, and Walker Street.

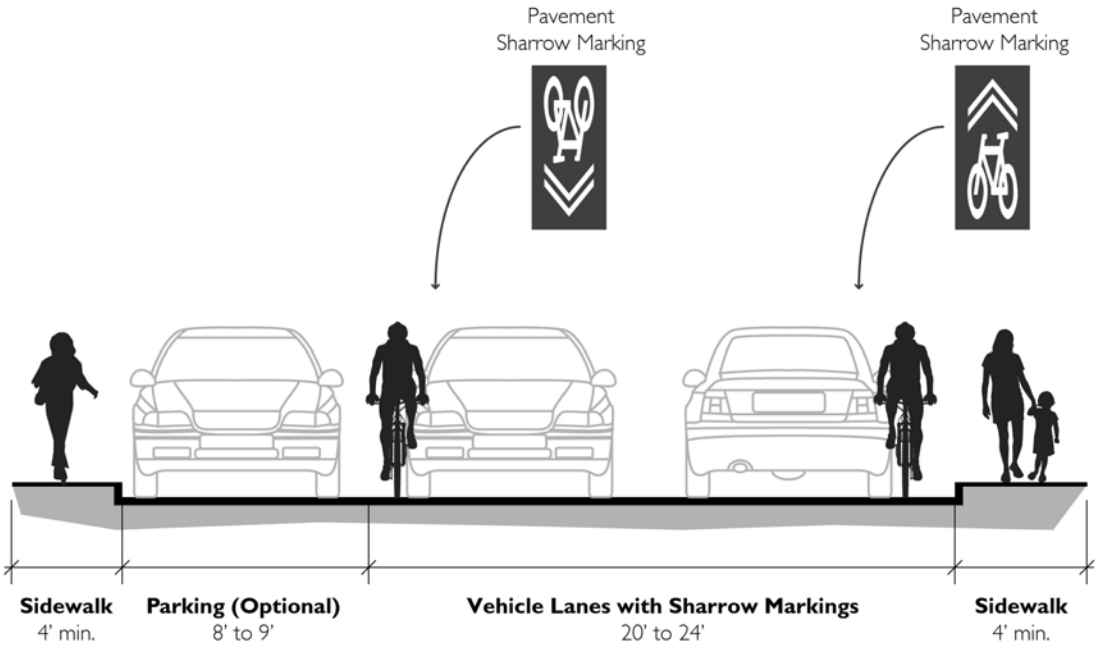


Class III Bikeways are referred to as **Bike Routes** and provide a shared use with pedestrian or motor vehicle traffic. Typically these facilities are city streets with signage designating the segment for Bike Route without additional striping or facilities.

Shared Lane Pavement Marking (Sharrows)

A sharrow is a Class III street marking that is placed in the center of a travel lane to indicate that a bicyclist may use the full lane. Sharrows assist bicyclists with lateral positioning in lanes that are too narrow for a motor vehicle and a bicycle to travel side by side within the same traffic lane. They also alert motorists of the location bicyclists are likely to occupy within the traveled way and encourage safe passing of bicyclists by motorists.



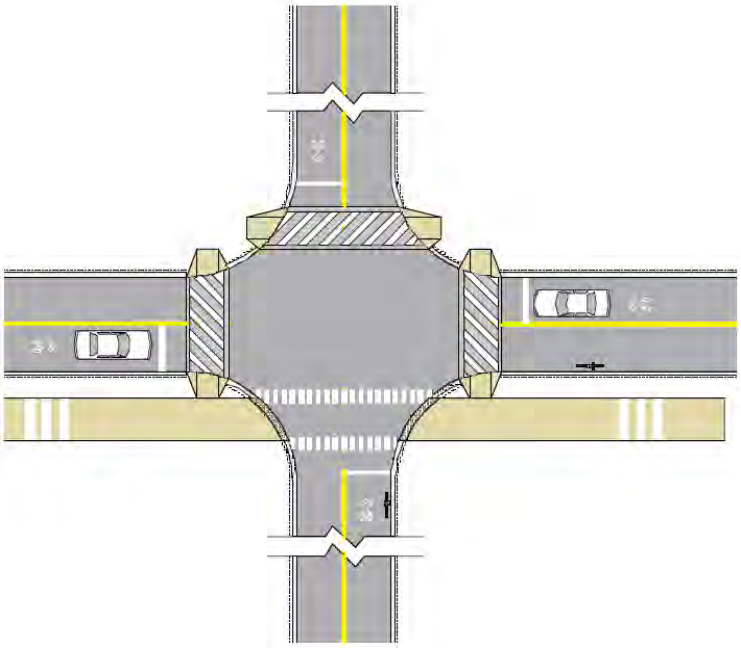


Ancillary Trail Facilities & Amenities

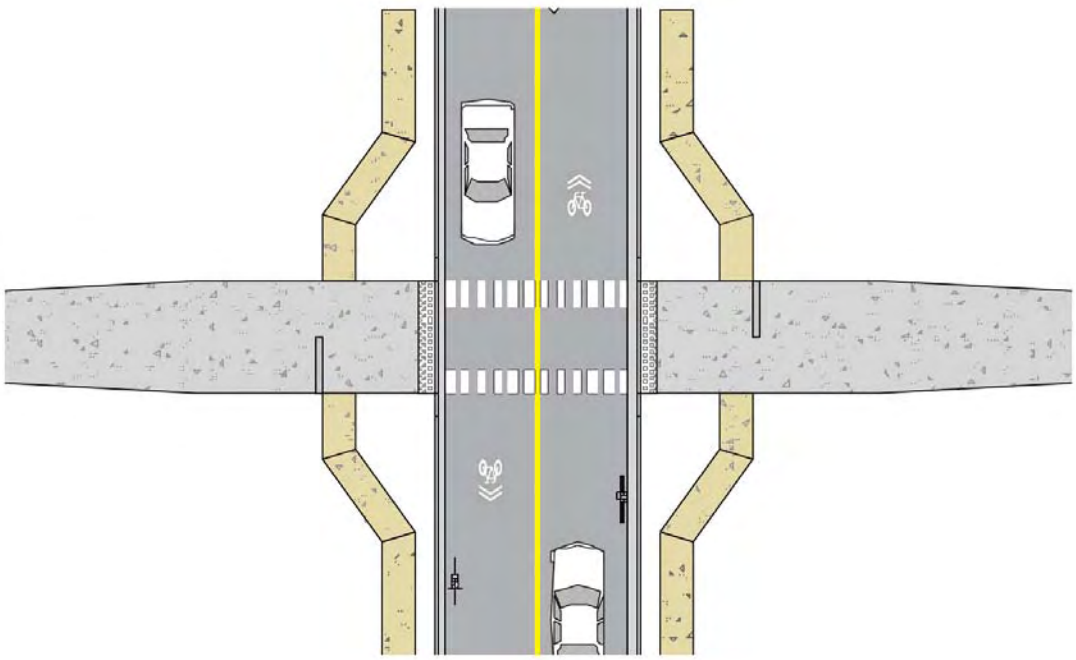
Ancillary trail facilities and amenities are described below and in Table 4-2.

Trail Intersections

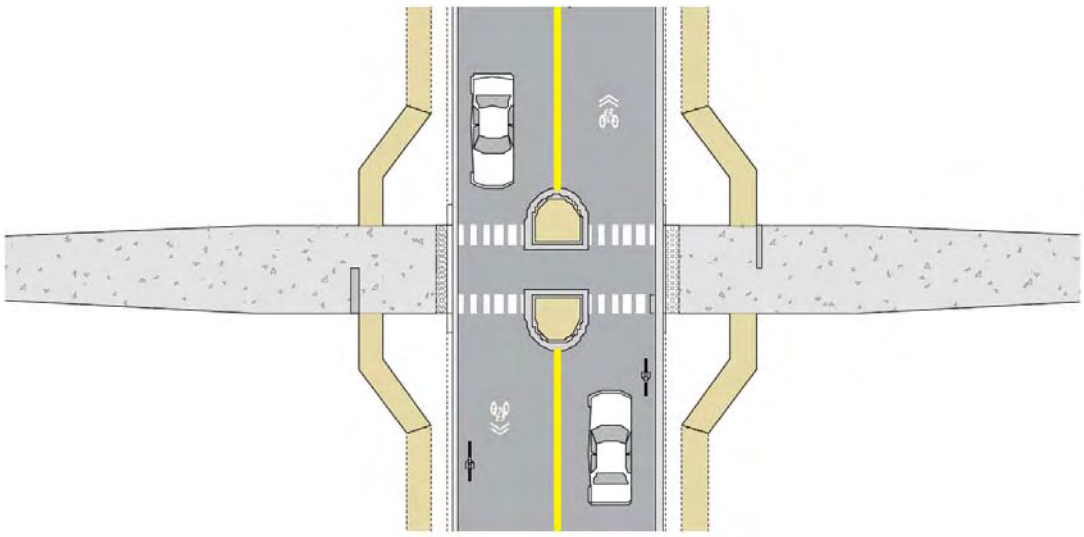
Trail intersections are important in making the trail system continuous. The following illustrations give examples of different intersection scenarios.



Trail Intersection at a 4-way Stop
Shared Use Path



Mid-Block Intersection
Share Use Path with Sidewalks



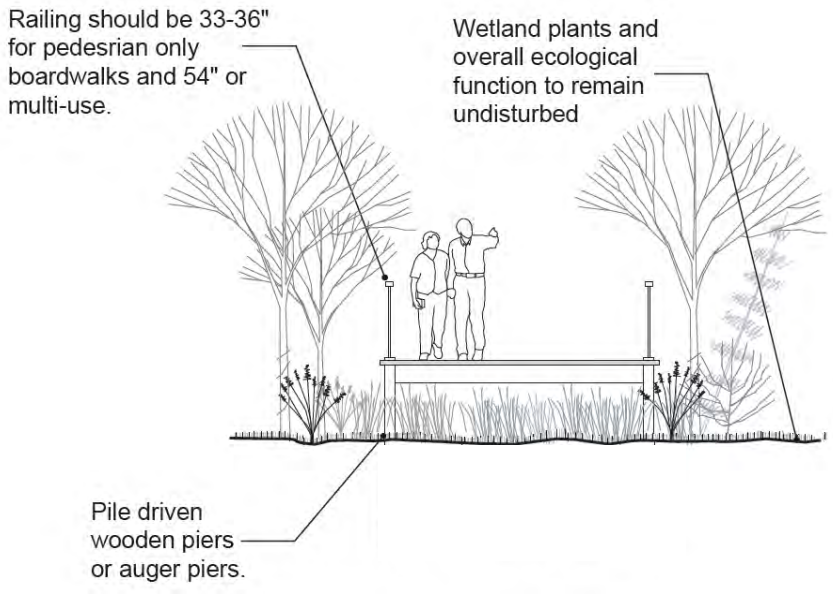
Median Refuge
Shared Use Path with Sidewalks

Trail Structures

Throughout the trail network, a number of structures will be required, particularly when crossing over water and/or unstable soil conditions.

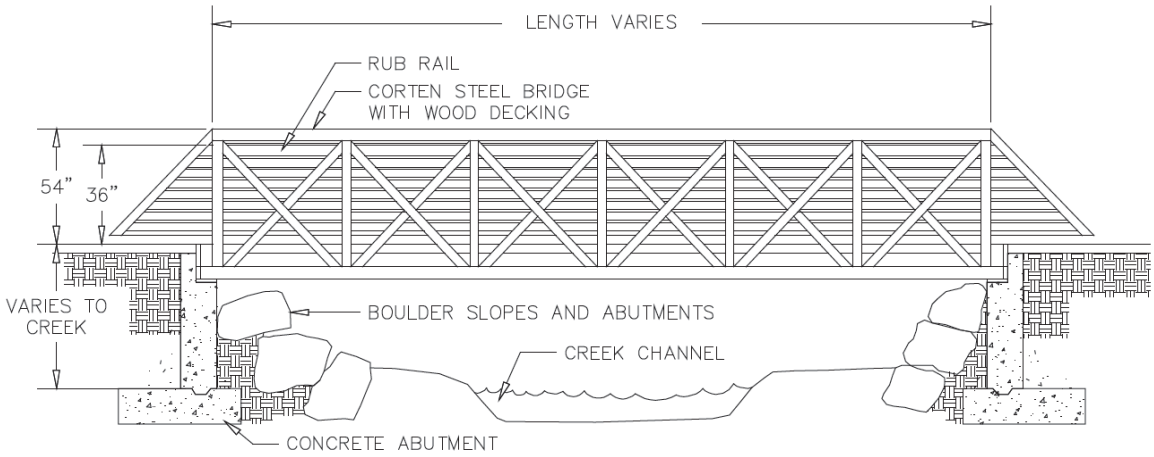
Boardwalks

Boardwalks are used in environmentally sensitive areas where they function as “mini-bridges”. When the height of a boardwalk exceeds 30”, railings should be installed. The thickness of the decking should be a minimum of 2”. Decking should be either non-toxic treated wood or recycled plastic. The foundation normally consists of wooden posts or auger piers (screw anchors). Screw anchors provide greater support and last longer. Opportunities exist to build seating and signage into boardwalks. In general, building in wetlands should be avoided.



Pedestrian / Bicycle Bridges

The function of a bridge in an off-road, multi-use trail situation is to provide access to the user over certain natural (i.e. wetlands, sloughs, creeks) or man-made (i.e. roadways) features. In general, a trail bridge should be able to support a minimum of 6.25 tons. Bridges should be constructed using high-quality and durable materials such as steel iron and/or wood. There are many options in terms of high quality, prefabricated pedestrian and bicycle bridges available.



Observation Decks

Observation decks provide an opportunity for trail users to stop and rest. They also provide opportunities for looking out over scenic vistas and observing wildlife. Observation decks should be incorporated into future trails where feasible. They should be located at the water's edge (i.e., along sloughs or creeks) and at high points that provide a scenic vista. Interpretative signage should be incorporated.

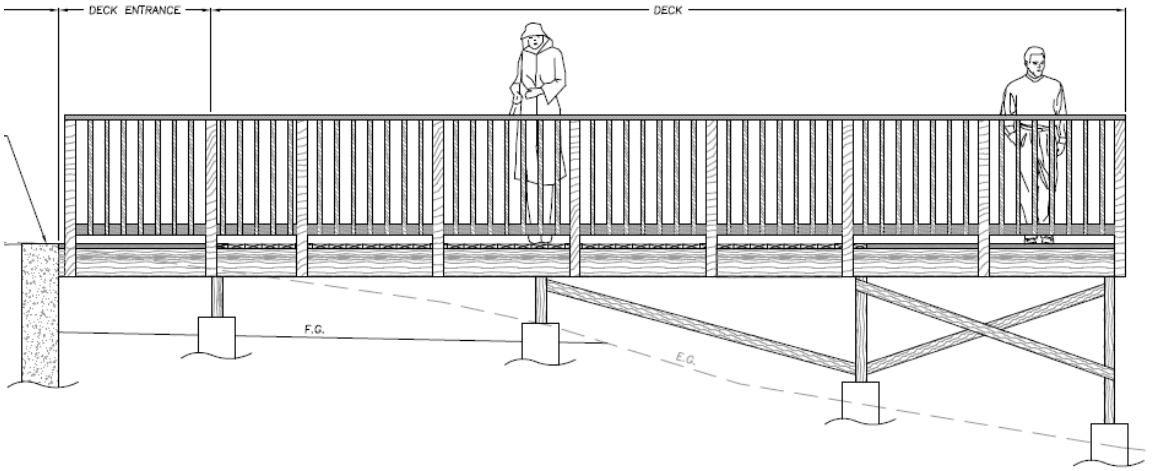
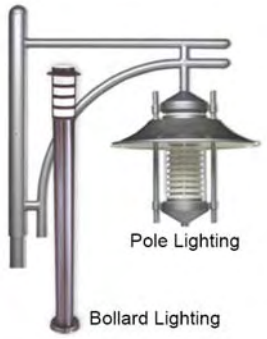


Table 4-2: Ancillary Trail Facilities and Amenities Recommendations

		Description	Recommendations
Benches		A wide variety of benches exist for use along trails. Style and material selection should be based on desired design and cost, or standard set by the City of Watsonville or other authority.	In general, benches should have back rests and arm rests on both sides (with optional arm rests in the middle). Benches should generally be 16" to 20" above the ground, 18" to 20" in depth, and 60" to 90" in width. Benches should be placed along trail routes and near trail entrances.
Other Seating		Additional seating opportunities exist for trails and associated rest areas, vistas, parks, and parking areas. Seating arrangements such as picnic tables and chairs invite users to relax and recreate.	Seating should reflect the intended use and design of other associated facilities and amenities. Picnic tables and chairs should be located in areas where users may congregate and unique seating furniture should be used in areas for dramatic effect.
Lighting		Two basic types of lighting are generally appropriate for trails: pole lighting and bollard lighting. Pole lighting is used in high use areas and where the trail interfaces with as parking areas, street intersections, etc. Bollard lighting is used along the trail to illuminate the ground for safety but not detract from the night sky.	Lighting should generally be focused at trail entrances, junctions, activity areas, and where obstacles are present. Lighting is generally not necessary or desired where there is little or no development adjacent to the trail. Solar-powered lighting may be appropriate. Lighting should be made of durable materials.

		Description	Recommendations
Waste Recepticles		Waste receptacles for trash and recyclables help reduce litter.	In general, trail entrances and activity areas should have waste receptacles. The location of receptacles should be easily accessible by service vehicles.
Bicycle Racks		Bicycle racks should be located in trail-associated parking facilities and at selected trail heads that are located at parks or other significant recreation facilities.	Bicycle racks should be placed near activity areas. They should be constructed using durable materials and resistant to vandalism. Pole lighting should be provided in bicycle parking areas.
Fencing		Fencing may be used to ensure that users stay on the path, particularly when approaching roadways or other potential safety hazards. They should also be used to discourage user access to private property.	Fencing material should be made of natural materials whenever possible to maintain a natural look. They should be durable and generally resistant to vandalism.

		Description	Recommendations
Restrooms		Restrooms should be provided in high-use areas such as at trail heads located adjacent to a parking lot.	Restrooms should be constructed of durable materials such as steel and/or wood. Pre-fabricated facilities should be considered to help minimize design and construction costs. Drinking fountains and trash receptacles should be included.

5 | IMPLEMENTATION

In this Chapter:

- Introduction
- Implementation Measures
- Phasing of Trail Projects
- Operations & Maintenance
- Trail & Greenway Acquisition Strategies

Introduction

This chapter addresses issues associated with implementation of the proposed trail network. Trails can be implemented in a variety of ways besides fee-simple acquisition of land and use of open space dollars for construction and maintenance. Partnering with other agencies, including federal, state and non-governmental organizations (NGOs), as well as private developers, can stretch limited funds. In addition, the City of Watsonville has been very successful in using grants to plan and construct new trails.

Implementation Measures

A number of actions are recommended as part of the implementation of this Master Plan. These include the following:

1. Develop a prioritization plan for trails in the city utilizing the new trail construction priorities outlined in this Master Plan.
2. Develop a trail promotion program which includes developing new/additional trail brochures, providing information on the city's web page and providing information at activity centers such as the city's community centers and parks, on the location of trails within the city and connections to regional trails surrounding the city.
3. Create a program to identify and acquire public ownership or easement of trail corridors and access points needed to develop an effective trail network.
4. Maintain the City's GIS-based trail map with parcel information so that the city can track existing and required easements.
5. Incorporate off-street trail rights-of-way/easement acquisition and trail development into the city's Capital Improvement Program.
6. Apply for grants and alternative funding sources for trails for various state and federal sources, particularly via local transportation organizations such as the RTC.
7. Establish an "Adopt a Trail" program for ongoing trail construction, maintenance and patrol activities.
8. Coordinate the city's trail system planning, implementation and management efforts with those of regional jurisdictions and public agencies.
9. Identify partnership opportunities with neighborhood groups, private individuals and local businesses as a means to acquire various trail amenities.
10. Ensure that trails and bike lanes are included in plans for new transportation projects such as bridges and overpasses.
11. Identify potential tax-related incentives and seek funding for other inducements for private property owners to allow and support public trails.

Phasing of Trail Projects

The entire integrated trail system is described in Chapter 3. New proposed trail segments will be developed incrementally, based on a prioritized hierarchy as easements and/or property acquisition occurs, as part of other projects, and as grant funds become available.

Proposed trail segments were prioritized according to a number of factors. These include the facility segment's ability to provide connectivity, if it provides access to underserved areas, property ownership (particularly if already city-owned land), constructability, aesthetic and recreational value, environmental constraints (or lack thereof), etc. Routes suggested in previous planning efforts, and recommendations from the public, stakeholders, and the Trails & Bicycle Master Plan Advisory Committee were also given a high priority.

Table 5-1: Prioritization of Proposed New Trail Segments identifies each of the trail segments and ranks them according to their priority, acquisition effort, design and development costs, and number of permits that will be required.

The priority ranking of "high", "Medium", and "Low" will help to determine those segments that are considered the most important and most likely to be constructed in the next 5-10 years. Engineering-level detailed design plans for some of these high priority segments will be prepared in the near future so that as grant funds or other financial resources become available, they are ready for construction. It is hoped that development efforts will occur within the next 3 years for these trails. These projects are specific improvements that will facilitate an immediate increase in connectivity, access, safety, and promotion of the network.

Table 5-1: Prioritization of Proposed New Trail Segments

Segment #	Segment Name	Length (miles)	Connections & Significant Destinations	Priority Ranking	Acquisition Effort [1]	Cost [2]	Permits Required [3]
1.1	North Pajaro River Levee Trail	4.2	7	H	H	H	L
1.2	South Pajaro River Levee Trail	6.0	5	M	L	H	L
2.1	West Salsipuedes Creek Trail	1.4	6	M	L	M	L
2.2	East Salsipuedes Creek Trail	1.5	3	L	L	M	L
3.1	Corralitos Creek Trail	2.8	8	H	H	H	L
3.2	Green Valley Road Street-based Trail	0.8	5	L	M	M	L
3.3	Pinto Lake Trail	1.3	3	L	L	H	L
3.4	North Airport Boulevard Street-based Trail	0.3	4	L	L	L	L
4.1	Freedom Blvd./Buena Vista Dr. Trail	0.6	4	L	H	M	L
4.2	Buena Vista Park Trail	0.6	3	L	L	M	M
4.3	Larkin Valley Road Trail	0.7	4	L	H	M	M
4.4	West Watsonville Municipal Airport Trail	1.1	4	L	M	H	L
4.5	Airport Boulevard Street-based Trail	0.7	6	L	L	M	L
4.6	Upper West Branch Spur Trail	0.3	3	L	L	M	L
5.1	Pajaro Valley High School Connector Trail	1.1	5	H	L	H	M
5.2	Pajaro Valley High School Loop Trail	0.5	4	M	L	M	L
5.3	Harkins Slough Road Connector Trail	0.3	3	M	L	M	L
6.1	West Harkins Slough Trail	0.9	4	M	M	H	H

Segment #	Segment Name	Length (miles)	Connections & Significant Destinations	Priority Ranking	Acquisition Effort [1]	Cost [2]	Permits Required [3]
6.2	East Harkins Slough Trail	1.3	3	L	L	M	M
7.1	Lee Road Trail	3.0	6	M	L	H	H
7.2	Watsonville Slough Connector Trail	0.1	3	L	L	L	L
8.2	Lower Watsonville Slough Loop Trail	1.1	9	H	H	M	H
8.4	Fort Street Street-based Trail	0.8	2	L	L	L	L
8.5	Las Brisas Connector Trail	0.3	2	M	L	L	L
8.7	Manabe-Ow Connector Trail	0.7	4	M	L	L	L
9.1	Upper Struve Slough Trail	0.6	3	M	M	M	M
9.2	Loma Prieta Ave. Street-based Trail	0.6	5	L	L	L	L
9.3	Rolling Hills Connector Trail	0.6	1	L	H	M	L
9.4	Upper Watsonville Slough Trail	1.2	7	H	H	H	M
10.1	Martinelli Street / East Lake Avenue Street-based Trail	1.8	9	L	L	M	L
10.2	Brewington Avenue / Atkinson Trail	0.8	3	L	M	M	M
11.1	Shell Road Trail	6.0	6	H	H	M	M
11.2	Rail Trail Spine of the Monterey Bay Sanctuary Scenic Trail Network	32	10 +	H	L	H	L

Notes:

(1) Acquisition Effort: Low = 0-5 easements; Medium = 5-10 easements; High = 10 or more easements. Other variables may apply.

(2) Cost: Low = $0 - $200K; Medium = $200K - $1M; High = $1M +. Costs do not include purchase of land or easements, engineering or design services, or permitting fees. Fencing is included for all trails that abut residential areas and abut agricultural land at-grade level. Levee trails include demolition and re-paving even if there is existing AC. Trails that do not have existing AC did not include demo.

(3) Permits Required: Low = 0-2 permits; Medium = 3-5 permits; High = 5 or more permits and/or permits will likely be difficult to obtain.

Operations & Maintenance

Overview

Successful operation will rely on a continued and regular program of maintenance of the trail and associated support facilities. Proper maintenance will not only ensure a quality recreational or travel experience for the trail user but is also an essential ingredient of risk-avoidance for the city and will extend the life of the trail. Sufficient manpower and resources must be devoted to a regular maintenance schedule in order to meet these goals.

The maintenance guidelines that follow are meant as a general framework and should be re-evaluated over time as conditions warrant. The maintenance implications of trail improvements should be reviewed carefully when considering capital improvements. One particular area of concern, given the existing landscape conditions, is the problem of drainage and flooding that can quickly undermine pavement structures. Money saved during the trail development process may be spent many times over if inadequate design and development creates a greater than normal maintenance burden. Trail maintenance is an important aspect of the City of Watsonville's overall responsibilities in that it is related to overall trail safety, attractiveness, and image. The city risks liability for accidents or if maintenance is ignored or negligently executed.

Roles and Responsibilities

In most cases, the agency or group that constructed the trail will have primary responsibility for its operation and maintenance. This may include the City of Watsonville, Santa Cruz County, the RTC, etc. who may cooperate together in maintaining the quality of the overall trail system.

Maintenance Tasks and Operations

Important maintenance tasks that must be considered are indicated in the following maintenance tasks as follows:

Law Enforcement and Safety

Trail managers should take necessary steps to provide both a safe trail for the users and to protect themselves from liability claims. Where possible, hazardous conditions and attractive nuisances should be identified and removed during the original construction of the trail. Those that cannot be removed should be fenced off and/or have warning signs posted.

If trail segments are opened in phases, as is recommended in this study, clear mention should be made at all trail entrances and in any printed/electronic material (especially trail signage, maps, guidebooks and pamphlets) that portions of the trail are still not yet fully developed nor open to the public and that users must exercise the necessary care when using the trail.

An effective maintenance program is critical for trail safety. The maintenance program should provide for regular inspections of the trail. Proper tree trimming and vegetation management are an important part of the safety program. This includes trimming of

vegetation to maintain adequate sight distance for traffic safety and crime prevention purposes.

In addition to reducing trail hazards, documentation of trail maintenance activities is essential in combating possible liability claims. Through written records of good maintenance practices, trail managers will be able to protect themselves from liability claims. In terms of property ownership and liability, it should be noted that California's recreational use laws largely protect landowners from liability related to recreational use of their properties. As long as no fee is charged and the trail owner uses due diligence to maintain the trail and/or warn recreational users of any safety hazards.

With the ever-increasing use of cell phones by the general public, including trail users, aspects of security have changed in recent years. Users are very well prepared to report and locate questionable activity on or within trail corridors. User surveillance tends to deter potential criminal activity.

Trail Facilities and Orientation Systems/Markings

A trail marking and orientation system benefits both users and trail managers. Signs should be erected at all cross streets identifying the name of the cross street. The trail marking system could also help save lives in the event that emergency services might be required.

Recommended Maintenance

Different types of trails will differ greatly in their maintenance requirements. All trails, however, will require a variety of maintenance activities at different points in their lives. Table 5-2: Recommended Trail Maintenance Program outlines some general guidelines for maintenance activities and the frequency at which they should be performed. This table is a guide only, and the trail manager will know best when certain maintenance activities should be performed.

Table 5-2: Recommended Trail Maintenance Program

Frequency	Maintenance	Performed by
As needed	Tree/brush clearing and mowing Sign replacement Map/signage updates Trash removal/litter clean-up Replace/repair trail support amenities (parking lots, benches, restrooms, etc.) Repair flood damage: silt clean-up, culvert clean-out, etc. Patching/minor regrading/concrete panel replacement	Volunteers, trail operator
Seasonal	Planting/pruning/beautification Culvert clean-out Installation/removal of seasonal signage	Volunteers, trail operator
Yearly	Sealcoat asphalt trails Surface evaluation to determine need for patching/regrading Evaluate support services to determine need for repair/replacement	Trail manager
5-year	Repaint or repair trash receptacles, benches, signs, and other trail amenities, if necessary	Volunteers, trail operator
10-year	Resurface/regrade/restripe trail	Hired contractor, trail operator, volunteers
20-year	Replace/reconstruct trail	Hired contractor, trail operator, volunteers

The following is a more detailed description of maintenance requirements:

- Mowing - (3-4 times annually) 4-foot min. wide each side of trail where applicable.
- Pruning - (Annually) Prune woody vegetation 4-feet back from sides of trail – 14-feet vertical clearance – remove invasive plants.
- Removal of Trees/Limbs - (Annually) Evaluation/ removal of unhealthy or dead trees and limbs. Fallen trees may remain as access control and to minimize disturbance.
- Signage - (periodically as required) Maintain directional and informational signs and permanent signs.
- Access Control - (periodically as required) Replace damaged access control devices. Estimated frequency: 10% annually due to vandalism.
- Trail Surface on local roads - (periodically as required) Resurface based on public works programing schedule.
- Trail Surface on gravel road - (periodically as required) Repair surface damage from vehicles, erosion, etc. based on public works programing schedule.
- Trail Surface, boardwalk - (periodically as required) Replace damaged areas.
- Drainage Structures - (Minimum - Annually) Clean inlets, keep swales clear of debris. Complete rehabilitation during construction would dramatically reduce necessity for this type of maintenance after storms.
- Litter Pick Up - (Weekly or as required) Trailside-litter pickup. Access area litter pickup. Encourage continued user "carry-in, carry-out" policy.
- Trash Collection - (Weekly) Removal of trash from receptacles at access areas.
- Bridge Inspection - (Every 2 years) Maintenance of bridge to ensure structural integrity.

Trail Surface Maintenance Guidelines

Asphalt trails can be expected to hold up well under most conditions. Particular care should be taken to fix holes and cracks. Left without repair, holes and cracks in asphalt pavement get larger, eventually causing safety hazards. During the yearly evaluation, preferably in spring, special attention should be given to marking and repairing breaks in the surface.

Granular trails may be severely impacted by runoff. After floods or heavy rains, the trail surface may become rutted. If left alone, subsequent floods or rains will follow the same ruts, making them larger and more hazardous. The surface of granular trails should be periodically raked back into place to maintain a smooth surface for trail users.

Natural surface trails will also be affected by runoff. Such a trail, whether used by hikers, equestrians, bikers, or service vehicles should be properly designed to minimize erosion, but periodic repair will need to be performed. If culverts of any kind are used, they may need to be "re-embedded," since repeated runoff can undermine them. In addition, any

rutting of the trail should be filled in with soil and compacted. For natural surface trails that are used by motorized vehicles, the wheels of the vehicles themselves can cause rutting. As necessary, the trail should be re-leveled with compacted soil to prevent the ruts from becoming too deep.

Concrete trails, though primarily used in urban environments for pedestrian-only (sidewalk) facilities, have periodic maintenance requirements, as well. Concrete is bound to crack in places that were not anticipated. In most cases, these small cracks will not be a serious problem if a quality sub-base was prepared. If cracks become severe, affected areas should be replaced. Concrete walks should be evaluated for cracks (or differences in settlement between panels) that might prove a hazard for children, the elderly, persons in wheelchairs, and other persons with less than average mobility.

Maintenance Costs

Maintenance costs will vary greatly depending on the type of trail, amount of volunteer labor use, available services, and geographic location of the trail. These costs, however, must be considered during the trail planning process, to ensure that trail owners can pay for the ongoing maintenance of the trails they develop.

Maintenance costs are rarely broken down into specific tasks such as those listed in Table 5-2: Recommended Trail Maintenance Program. Estimated costs, therefore, are broken down by the type of maintenance performed. There are three basic types of maintenance:

1. **Routine Maintenance** includes all the general activities -- such as brush clearing, trash collection, and sweeping — that may take place on a regular basis throughout a season.
2. **Minor Repairs** refer to activities that can be expected every five years or so, such as amenity replacement, trail sealcoating, repainting, or restriping.
3. **Major Reconstruction** refers to significant expenditures involving resurfacing or reconstruction. These activities are the most costly trail maintenance activities and should be planned for in advance.

Routine Maintenance

Most of the routine maintenance of a trail facility will be performed by an existing agency (e.g. the City of Watsonville and/or Santa Cruz County) or a volunteer group). Respective trail owners should include trail maintenance into their parks or public works maintenance budgets and activities. Activities that should be considered as routine maintenance include:

- Yearly facility evaluation to determine the need for minor repairs
- Tree/brush clearing
- Mowing
- Map/signage updates
- Trash removal/litter clean-up

- Repair flood damage: silt clean-up, culvert clean-out, etc.
- Patching, minor regrading, or concrete panel replacement
- Planting, pruning, and general beautification
- Installation and removal of seasonal signage

The yearly cost for routine maintenance depends on the maintenance capabilities already in place by the trail owner and the amount of volunteer labor used. In general, yearly routine maintenance costs can be estimated at $10,000 per mile. This cost is estimated in year 2012 dollars, and will be affected by inflation.

Minor Repairs

The need for minor repairs should be determined by a yearly facility evaluation. Minor repairs may include the following activities:

- Replacement, repair, or repainting of trail support amenities, such as restrooms, signage, benches, trash receptacles, or hitching posts
- Replacement of a portion of the trail
- Restriping of trails
- Sealcoating of asphalt trails

The cost for replacement, repair, or repainting of trail amenities is based on the initial cost of those amenities. Records should be maintained of the general costs of trail amenities as a means of estimating future repair and replacement costs. If custom elements, such as lighting, decorative railings, or benches, are used in trail design, the trail owner should consider ordering extra elements at the time of construction and storing them for future use, thereby defraying the cost of single-runs later. Replacement of a portion of a trail may be necessary if severe flooding, continual erosion, or weak soils cause periodic difficulties with trail maintenance.

Restriping of trails will cost the same (in year 2012 dollars) as the original striping. Records should be keep of the original bid to determine the price of restriping a trail using contracted labor. In many cases, it is cost effective to perform restriping along with other trail or highway maintenance

Sealcoating of asphalt trails should take place approximately every five years. This will increase the longevity of the trail and provide a quality riding surface. When performed, sealcoating will cost approximately $20,000 per mile for a 6-foot pedestrian trail and approximately $32,000 per mile for a 10-foot multi-use (i.e. Greenway Trail). These costs should be included in the capital improvement program to ensure that adequate funding is available.

Major Reconstruction

There are essentially two activities that are considered to be major reconstructions:

- Resurfacing of asphalt trails
- Complete replacement, regrading, and resurfacing of all trails

Asphalt trails will need to be resurfaced approximately every 20 years, depending on how well they have been maintained. A resurfacing typically involves placing an asphalt overlay on an existing asphalt surface in order to erase cracks and bumps. It is not a perfect solution, as weak underlying soils or tree root penetration will eventually affect this top layer, but it does offer a lower cost means of extending a trail's life. Asphalt surfacing costs approximately $2 per square foot for a 2-inch depth. Asphalt overlays should have a depth of 1 to 2 inches.

Complete replacement of a trail involves removing the existing trail, regrading the trail base, and resurfacing the facility. This kind of comprehensive maintenance will be necessary approximately every 40 years, regardless of trail type. Even natural surface trails may need to be fully regraded after 20 years of use. Trail costs for reconstructions are the same as the cost of a new trail plus the cost of demolishing the existing trail.

As with any major trail project, however, a detailed cost estimate should be performed during the project planning stages. The best guide for estimating the replacement cost of a trail is to consider the original construction cost.

A major cost such as trail replacement should be considered well in advance. It may be more difficult to secure large state or federal grants for trail reconstruction. Funding for the eventual replacement of the trail should be budgeted for this significant maintenance activity.

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APPENDIX

In this Appendix:

Appendix A
Bicycle Plan Proposed Projects

Appendix A
City of Watsonville Bicycle Plan
Proposed Projects

Project	Priority	Project Benefits			Plans	Cost & Funding	
		Existing Traffic & Road Conditions*	Existing Gap in Bikeway System	Destinations		Projected Cost	Potential Funding
BIKEWAYS							
Martinelli St (Class III) from Freedom Blvd to East Lake Avenue	H	2 lane collector street, moderate speeds	Connects E. Lake to Freedom Blvd	Elementary school, connect major commercial areas along E. Lake and Freedom Blvd	[2], [4], [5]	$35,000	BTA, SR2S, Local
Madison St (Class III) from Lake St to Palm Ave.	L	2 lane local street	Connects schools, neighborhoods	Elementary and middle schools, connects to commercial area on East Lake	[2], [4]	$2,000	Local, BTA, SR2S
Brewington Avenue (Class III) from East Lake to end	H	2 lane local street/ collector street	Connection to neighborhoods	Elementary and middle schools, connects to commercial area on East Lake.	[2], [4], [5]	$30,000	BTA, SR2S, Local
Palm Avenue (Class III) from Lincoln St to Brewington Ave.	L	2 lane collector street	cconnects schools, neighborhoods	elementary and middle schools	[2], [4], [5]	$5,000	BTA, SR2S, Local
Buena Vista Drive (Class II) from Freedom Boulevard to Harkins Slough Road	M	2 lane collector, high speeds	connects Larkin Valley to Freedom Blvd -mostly in County	Neighborhood commercial, high school	[1], [2], [5]	$2,000,000	BTA, AB2766, Local
Union /Brennan Street (Class III) from Pajaro River to Freedom Blvd	H	2 lane collector street	Parallel route to Main St from Riverside Dr. to Freedom Blvd	Elementary school, Cabrillo College, public services, commercial areas	[2], [4], [5]	$20,000	BTA, SR2S, AB2766, Local
Riverside Drive (Class Unspecified) from Lee Road to Walker Street	M	State Route 129, high speed/traffic volume, variable shoulder widths		Commercial and industrial areas	[2], [4], [5]	$40,000	BTA, AB2766
Lee Road (Class III) from Beach St. to Riverside Dr.	M	2 lane collector	Commercial, industrial and agricultural business connections	Industrial and agricultural area		$8,000	Local, BTA, AB2766
Holm Rd (Class III) from Larkin Valley Road to Anna Street	M	2 lane collector street	Connects from Main St to schools and into neighborhoods	Middle school	[2], [4], [5]	$12,000	BTA, SR2S, Local
East Lake Avenue (class unspecified) from Holohan Road to Brennan St	H	SR 152, high volume, variable shoulder widths	connects to bicycle facilities	Commercial areas, middle school, bus routes	[2], [4], [5]	$35,000	BTA, AB2766, Local
Ohlone Parkway Class II Watsonville Slough to Beach	M	2 lane arterial	connects to bicycle facilities	Connects to future industrial park	[2], [4], [5]	$5,000	BTA, AB2766, Local

Appendix A
City of Watsonville Bicycle Plan
Proposed Projects

Project	Priority	Project Benefits			Plans	Cost & Funding	
		Existing Traffic & Road Conditions*	Existing Gap in Bikeway System	Destinations		Projected Cost	Potential Funding
TRAILS AND SHARED PATHS							
Corralitos Creek Trail from East Lake Avenue to west of Airport Boulevard		Levee Trail - Segment 3.1	Connects East Lake Avenue, Green Valley Rd and Airport Blvd	Levee Trail, Pajaro River	[2], [4], [5]		BTA, AB2766, Local
Pinto Lake Trail from Pinto Lake Park/ Green Valley Road to Pinto Lake County Park		Greenway Trail - Segment 3.3	Connect to Green Valley Rd	Pinto Lake County Park, Pinto Lake Park	[2], [4], [5]		
Freedom Blvd./Buena Vista Drive from Pinto Lake Park (Watsonville) to Pinto Lake County Park		Greenway Trail - Segment 4.1	Connects outlying residential neighborhoods to Freedom Blvd.	Calabasas Elementary School			
Buena Vista Park Trail from Buena Vista Drive to Larking Valley Road		Greenway Trail- Segment 4.2		Buena Vista Park (future)			
Larkin Valley Road Trail from Buena Vista Park (future) to Airport Boulevard		Greenway Trail/Bikeway - Segment 4.3	Connects to Airport Blvd.		[2], [4], [5]		BTA, AB2766, Local
West Watsonville Municipal Airport Trail from Buena Vista Drive to Larkin Valley Road		Greenway Trail - Segment 4.4		Watsonville Municipal Airport	[2], [4], [5]		
Upper West Branch Spur Trail from Airport Boulevard to Technology Drive		Greenway Trail - Segment 4.6	Connects to Airport Blvd.	Watsonville Community Hospital, services and business area	[2], [4], [5]		
Pajaro Valley High School Connector Trail from Airport Boulevard/Hwy 1 to Harkins Slough Road	H	Greenway Trail - Segment 5.1	Connects from Airport Blvd to Pajaro Valley High School	Pajaro Valley High School, Fitz Wetlands Educational Resource Center	[2], [4], [5]		SR2S, AB2766, Local
Lee Road Trail from Riverside Drive to So. Pajaro River Levee Trail		Greenway Trail - Segment 7.1	Connects Harkins Slough Rd, Rail Trail, West Beach St, and Pajaro River Levee	Pajaro Valley High School, California Department of Fish and Game Reserve, Pajaro River	[2], [4], [5]		
Watsonville Slough Connector Trail from Lee Road to Paseo Drive		Greenway Trail - Segment 7.2		Business Park, Wetlands of Watsonville Slough Trails			
Lower Watsonville Slough Loop Trail from Ohlone Parkway to Highway 1		Greenway Trail - Segment 8.2	Connects to Ohlone Parkway	Seaview Park, Ramsey Park, Wetlands of Watsonville Nature Center			
Ford Street Trail from Kearney Street to Main Street		Bikeway - Segment 8.4	Connects Residential areas to park and Slough Trails				BTA, AB2766, Local
Manabe-Ow Connector Trail from Watsonville Slough to Struve Slough/Westridge Business Park		Greenway Trail/Bikeway - Segment 8.7		Business Park, Wetlands of Watsonville Slough Trails			
Upper Struve Slough Trail from Pennsylvania Drive to South Green Valley Road		Greenway Trail - Segment 9.1	Connects from Pennsylvania Dr. to Green Valley Road	Green Valley Christian School			

Appendix A
City of Watsonville Bicycle Plan
Proposed Projects

Project	Priority	Project Benefits			Plans	Cost & Funding	
		Existing Traffic & Road Conditions*	Existing Gap in Bikeway System	Destinations		Projected Cost	Potential Funding
Rolling Hills Connector Trail from Herman Avenue looping around		Greenway Trail/ Bikeway - Segment 9.3		Rolling Hills Middle School			
Upper Watsonville Slough Trail from Freedom Blvd to Main St		Greenway Trail - Segment 9.4	Connects Main St to Alta Vista Ave	Shopping Center, Hyde Elementary School			
Monterey Bay Sanctuary Scenic Trail							
Santa Cruz Branch Line Rail Trail							
OTHER BICYCLE PROJECTS							
Bike Storage (racks, cages, and lockers)	H						SCCRTC
Bike Loop Detectors						$40,000	AB2766
Bike Route Signage Program							SCCRTC, TDA
COMPLETED PROJECTS							
Walker Street /Harkins Slough Road Class II bike lanes from Riverside Drive to Green Valley Road		• 2-lane arterial • Alternative route to Main St (SR 152)		Connects to Wetlands of Watsonville trails, Ramsey Park and Nature Center			RSTPX, Local
Main St Bike Path (Class I) from Pennsylvania Dr. to Freedom Blvd.				Ramsay Park			
Rodriguez Street (Class II) from West Beach to Riverside Drive		2 lane arterial, high traffic volume, parallel route to Main Street, connects SR 152 to SR 129	Completed last segment of bike lanes along Rodriguez St: Main St to Front St	Links Ramsay Park and Downtown; Transit Center on Rodriguez at Beach; Civic Plaza at 2nd St			
Freedom Blvd (Class II) from High St to Lincoln St.		High traffic volumes; two lane major arterial with center turn lanes and on street parking: Class II & sharrows		Callaghan Park, residential and commercial areas		$40,000	RSTPX, Local
Green Valley Road (Class II) from Main St to Freedom Blvd.		4 lane arterial		Bus routes, commercial areas			ARRA, CMAQ
Pennsylvania Dr.; Bike Path, Class 1 from Clifford to Green Valley; Class II from Main St to Clifford		Asphalt path		Wetland Trails, Starlight Elementary School, Green Valley Road, bus routes			
Airport Blvd (Class II) Freedom Blvd to Larkin Valley Road		4 lane arterial					STIP

Planning Documents Code:
[1] Regional Transportation Plan (RTP) Short Range
[2] RTP Long Range
[3] Regional Transportation Improvement Plan (RTIP)
[4] City of Watsonville Capital Improvement Program
[5] City of Watsonville Adopted General Plan
[6] City of Watsonville Parks and Recreation master Plan

Funding Sources:
BTA Bike Transportation Account Local
Local Funds
STIP State Transportation Improvement Program
AB 2766 Air District Vehicle Surcharge Fee
TDA Transportation Development Act
SR2S Safe Routes to School
CMAQ Congestion Mitigation and Air Quality

Appendix B
Bicycle Plan Criteria to Meet State Requirements

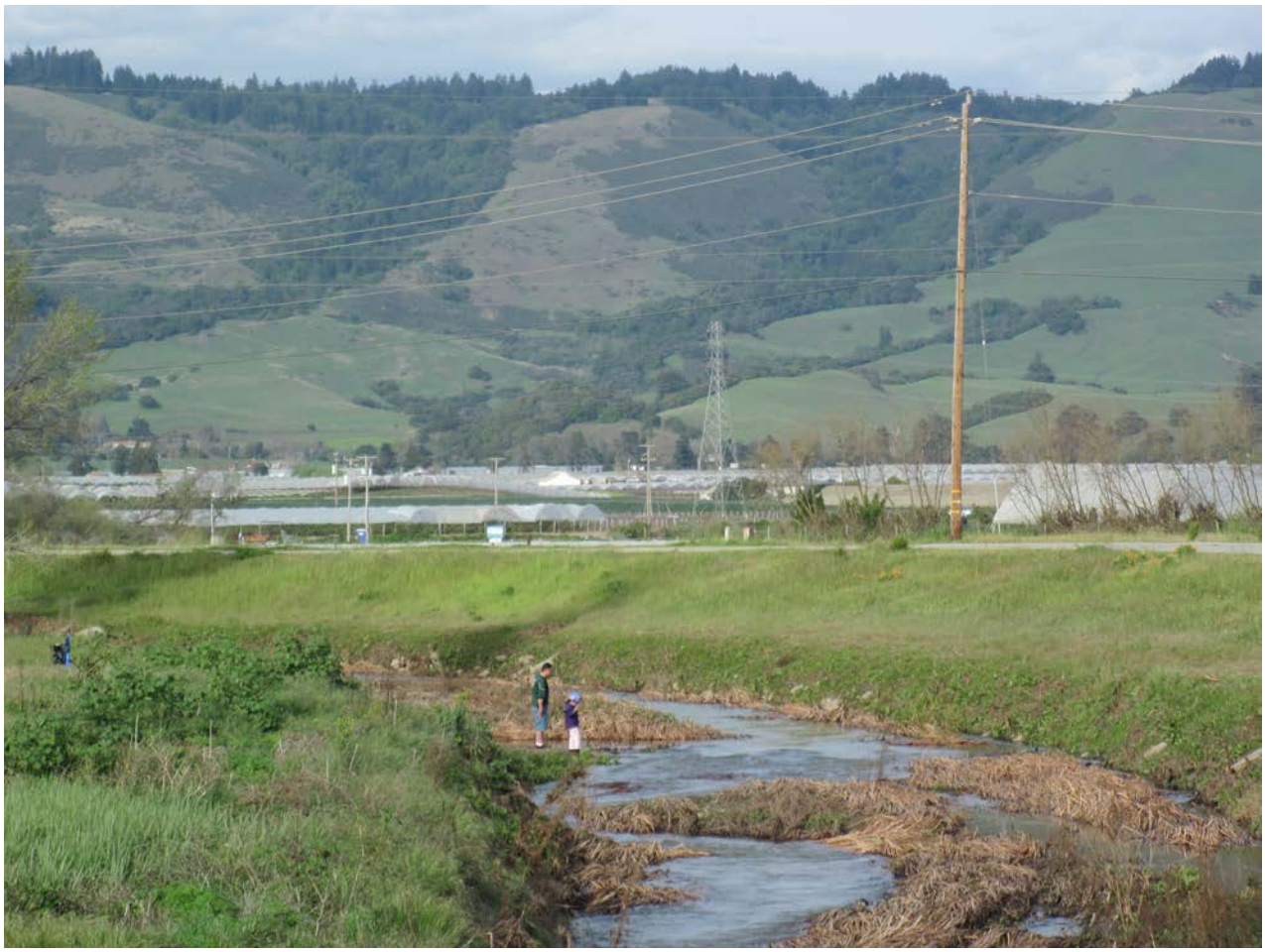
The Bicycle Transportation Account (BTA) is an annual program providing state funds (via Caltrans) for city and county projects that improve safety and convenience for bicycle commuters. In accordance with the Streets and Highways Code (SHC) Section 890-894.2 - California Bicycle Transportation Act, projects must be designed and developed to achieve the functional commuting needs and physical safety of all bicyclists. Local agencies first establish eligibility by preparing and adopting a Bicycle Transportation Plan (BTP) that complies with SHC Section 891.2. The BTP must be approved by the local agency's Regional Transportation Planning Agency. A BTP prepared by a city or county shall include, but not be limited to, the following elements:

Requirement	Location in Document
a. The estimated number of existing bicycle commuters in the plan and the estimated increase in the number of bike commuters resulting from implementation of the plan.	Page 83; Table 3-2
b. A map and description of existing and proposed land use and settlement patterns which shall include, but not be limited to, locations of residential neighborhoods, schools, shopping centers, public buildings, and major employment centers.	Page 10; Figure 2-1
c. A map and description of existing and proposed bikeways.	Figure 3-14 and Chapter 3; Appendix A.
d. A map and description of existing and proposed end-of-trip bike parking facilities. (Parking at schools, shopping centers, public buildings, and major employment centers)	Page 85; Figures 3-2 to 3-14
e. A map and description of existing and proposed bike transport and parking facilities for connections with and use of other transportation modes. (Transit stops, rail and transit terminals, park and ride lots, and provisions for transporting bikes on transit or rail)	Page 85, Figures. 3.2 – 3.13 and 3-14
f. A map and description of existing and proposed facilities for changing and storing clothes and equipment. (Lockers, restroom, and shower facilities near bike facilities)	Pages 83-85 and Figure 3-14
g. A description of bicycle safety and education programs conducted in the area included within the plan, efforts by the law enforcement agency of the area, and the resulting effect on accidents involving bicyclists.	Pages 86-87
h. A description of the extent of citizen and community involvement in development of the plan (letters of support)	Page 7
i. A description of how the bike plan has been coordinated and is consistent with other local or regional transportation, air quality, or energy conservation plans.	Pages 87-88
j. A description of the projects proposed in the plan and a listing of their priorities for implementation.	Pages 39-81; Table 5-1; Appendix A.
k. A description of past expenditures for bicycle facilities and future financial needs for projects that improve safety and convenience for bicycle commuters in the plan area.	Appendix A


HARKINS SLOUGH RD
5.1
9.3
SOUTH
Watsonville Slough
EAST LAKE AV
9.1
MAIN ST
9.4
11.2
5.2
8.3
West Branch
Struve
Slough
6.1
5.3
8.4
8.1
RIVERSIDE DR
8.7
8.8
8.5
11.2
1.1
Hanson

C2.

Habitat Restoration & Enhancement for Trail Corridors



Habitat Restoration and Enhancement Assessment and Plan for Trails Corridors

City of Watsonville Trails & Bicycle Master Plan

The author of this plan is Jonathan Pilch, Director of Restoration Programs, for Watsonville Wetlands Watch. Valuable support for the creation of this document was provided John Moreno, John Pritchard, and Mary K. Paul on the Watsonville Wetlands Watch restoration staff.

We would like to gratefully acknowledge many individuals who provided instrumental assistance with this project, including Bob Geyer, Assistant Director of Public Works for the City of Watsonville, Michelle Templeton, Wetlands Program Coordinator for the City of Watsonville, Rex Boyes and David Rosenow in the City of Watsonville Geographic Information Systems department, as well as a number of individuals who helped with historical and biological information, including Lynn Oliver Gonzales for her countless hours of historical research, the City of Watsonville library and California Agricultural Workers History Center and the Pajaro Valley Historical Society.

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Introduction

The City of Watsonville is currently developing a Trails & Bicycle Master Plan. The goal of this plan is to add an additional 33 miles of new trails to the existing Wetlands Trail System. These trails will cover portions of the City and adjacent high priority recreational areas in southern Santa Cruz County. This expanded plan presents an important opportunity to develop a comprehensive and robust vision for natural lands management and restoration of native habitats and ecosystem functions throughout the network of trail system. With this in mind, an assessment of opportunities for enhancement of existing habitat resources and restoration of new habitats within the trails system corridors was undertaken.

Field work for this project was conducted in the fall of 2011 through the summer of 2012 and included an assessment of each proposed trail segment. Existing habitat conditions were assessed in order to identify opportunities to enhance existing resources and develop opportunities for expanding and restoring habitat areas. Invasive plant species were mapped along the trail alignments as were areas of significant native habitat resources. Because the geographical extent of this project is at the watershed scale, the habitat resource inventory was limited to the trail corridors themselves and focused on management needs within the existing habitat resources.

Environmental Setting

The environmental setting for the Trails Master Plan includes several important river, wetlands, creeks, streams and their associated upland marsh, woodland, riparian, and grassland habitats, including the Watsonville Slough System, the Pajaro River, Salsipuedes Creek, and Corralitos Creek. Through their diverse habitats, these ecosystems support 23 native plant and wildlife species listed as threatened, endangered, or as species of special concern.

The Watsonville Slough System

The Watsonville Sloughs ecosystem is recognized as the largest and most significant wetland habitat between Pescadero Marsh (San Mateo County) and Elkhorn Slough (Monterey County). One of the last remaining large coastal freshwater ecosystems in California, the Watsonville Sloughs includes approximately 800 acres of freshwater marsh, seasonal wetland, and estuarine habitat with six major slough branches, which drain to the Pajaro River. The slough system supports over 249 permanent and migratory bird species, 5 federally listed fish and wildlife species, and 16 species of special concern, including the California red-legged frog (federally listed threatened), tricolored blackbird (California species of special concern), and Santa Cruz tarplant (Federally listed endangered).

The Watsonville slough system and its associated upland habitats are recongized as a critically important ecosystem, have been of significant interest to conservation groups and have been a key area of focus for conservation. Several conservation planning efforts have been undertaken to assess conservation opportunities in the slough system, including the California Department of Fish and Game's *Watsonville Wetlands Conceptual Area Protection Plan* (CAPP), 2002 and Santa Cruz County's *Watsonville Sloughs Watershed Resource Conservation and Enhancement Plan*, 2003, funded by the California Coastal Conservancy and the U.S. EPA. In 2006, the Watsonville Sloughs were established as a Critical Coastal Area by the California Coastal

Commission. The sloughs have received priority within the Santa Cruz County Integrated Watershed Restoration Program and the Santa Cruz County Resource Conservation District. Despite these efforts there exists a need to continue current conservation and resource enhancement and restoration efforts. Watsonville Slough is currently listed on the California 303(d) list as an impaired waterbody for bacteria, nutrients, and pesticides and sediments, and there are significant opportunities for improvement of habitats, and ecosystem functions throughout the slough system.

Pajaro River, Corralitos Creek, and Salsipuedes Creek

The Pajaro River has a 13,000 square mile watershed area and runs 12 miles through the Pajaro Valley. The river is fed by Corralitos Creek and Salsipuedes Creek, two tributary creeks which are fed by smaller creeks, streams, and lakes, including Green Valley Creek, Browns Valley Creek, Casserly Creek, Jesus Creek, Pinto Lake, College Lake, Drew Lake, and Tynan Lake. The Pajaro River supports a diversity of wildlife species, including federally and state listed threatened, endangered and special status species, including important habitat for steelhead trout (federally listed threatened), tidewater goby (federally listed endangered), and the California red-legged frog (federally listed threatened). Much of the lengths of these waterways are characterized by bands of woody riparian forests of cottonwood, willow, alder, elderberry, box elder, and sycamore trees which form an important wildlife corridor throughout the valley. The river and creek habitats are greatly impacted by surrounding urban and agricultural land uses. Flood control practices, in particular on the Pajaro River, have had significant impacts on the river's habitats as early as the levee construction in 1949, and most recently as a result of the flood control efforts after the floods of 1995. The Pajaro River, Corralitos Creek, and Salsipuedes creek waterways form critical habitat areas within the Pajaro Valley and have long standing connections to the historic geologic, biologic, and cultural development of the Valley.

Enhancement and Restoration of Habitat Resources

Opportunities to preserve, enhance, and restore native habitat throughout the trails corridors are numerous, both within the City limits as well as within the parts of the trail system that are less developed outside of the city limits. The benefits of this work are critically important and wide-ranging. They include expanded habitat for native plants and wildlife species including threatened, endangered, and species of special concern, support for ecosystem functions such as groundwater recharge, flood control and filtration of surface waters, urban beautification, and the expansion of a natural lands system that supports passive and active recreation, transportation, and tourism.

There is a vital nexus between ecosystem functions and services and support of human services and industry. Ambitious ecosystem restoration projects will require a comprehensive and robust process to engage stakeholders and meet multiple objectives and outcomes. Stakeholders include: local landowners, public agencies who have jurisdiction over these lands, including the City of Watsonville, Santa Cruz County and the California Coastal Commission, agricultural interests, local, State, and Federal conservation organizations and the general public.

Extensive biological surveying, environmental impact reporting, and other analysis has been done to date on the environmental features within the Master Trails Plan area. These included the Watsonville Sloughs Watershed Conservation and Enhancement Plan, environmental impact reports for the Pajaro River, Corralitos Creek, and Salsipudes Creek, the Sierra Club's *Connections to the Pajaro River* report, and the Watsonville Sloughs Critical Coast Areas report. These documents were consulted through this process and will provide valuable information for future planning efforts for habitat enhancement and restoration within and adjacent to the trails corridors. A detailed reference list appears at the end of this document
.

A large sycamore tree along Corralitos Creek

Historical Ecology of the Pajaro Valley's Wetlands

Historical ecology interprets the current and historical natural landscape to understand the past distribution of environmental features, habitats, and ecosystem services. This understanding can provide valuable information for current approaches to habitat restoration and land use planning. It is particularly valuable for use within the Pajaro Valley's wetland environments, as they have been modified greatly over the past two centuries. The historical ecology framework provides an understanding for these changes, lends perspective to the ecosystem services provided and how they have been impacted over time, and provides a lens for understanding and interpreting today's landscape. The study of historical ecology can also provide useful and interesting information for interpretation to the public, such as through interpretive signs within the trails network.

The written historical record for the Pajaro Valley is well documented beginning in the late 1700's and early 1800's with European settlement in the area. Information on culture and life prior to this point is well described and documented by the Pajaro Valley Ohlone Indian Council and others in the field of archeology. Several recent studies have looked at the historical ecology of the Pajaro Valley, including a recent primer written by the San Francisco Estuary Institute on the subject. Pinto Lake has been a focus for this study as well, in an effort to understand sedimentation rates for lakes on the California Central Coast. Early maps, journals, and newspaper articles provide valuable information.

The earliest written references to the Pajaro Valley describe abundant wildlife and wetlands throughout the Valley. An early statement by William Brewer, a surveyor with the U.S. Geological Study, described the conditions in the following way:

> *"More species could be collected in one mile of that coast than in a hundred miles of the Atlantic Coast…Birds scream in the air – gulls, pelicans, birds large and small, in flocks like clouds…. [there are some] enormous birds that would probably weigh fifty or sixty pounds, and I frequently picked up their quills over two feet long… A whale was stranded on the beach, and tracks of grizzlies were thick about it."*
>
> *-William Brewer, Up and Down California, 1860*

Habitat Changes: An Overview

The recent study of Pinto Lake, *Climate and human impact on lowland lake sedimentation in Central Coastal California: the record from c. 650 AD to the present*,2005, is one of the most comprehensive approaches to interpreting habitat changes within the recent historical landscape. The change of plant communities surrounding the lake was studied through deep soil cores and the pollen buried within these layers of sediment in an effort to describe the short and long term trends of sedimentation in the lake. This study found that while there were slight changes of the marshes and hydro-period of the lake documented between the years 650 and 1750, most likely due to climatic changes, the changes seen in the hydro-period and habitats were greatly amplified beginning in the early 1800's.

Pinto Lake and Corralitos Lagoon were named the 'land of lakes and hazelnuts' by Juan Crespi in the 1770s because of the abundance of hazelnut trees (Mayers 2001). Pollen analysis showed that between 1844 and 1860, coinciding with the establishment of Rancho Corralitos and the beginning of a large scale logging industry, the plant communities around Pinto Lake shifted from a redwood, hazelnut, willow scrub and oak woodland habitat type to a more open grassland and open range habitat type.

In their study, these authors write:

> *"By the early 1860s, following the decline in gold mining after 1852, the Watsonville area developed as an agricultural center. However, the effects of intense grazing between 1850 and 1863, coupled with the 1862 flood and the 1863–1864 drought (Engstrom 1996), brought with it the search for alternative prospects for land in the form of cereal cultivation (Lantis 1970). This trend of agricultural expansion led to further destruction of woodland, with American settlers clearing trees for firewood and to make the land suitable for arable purposes (Gordon 1996). From the mid-19th century, large- scale farming stretched for miles along the Central Coast valleys, characterized by extensive* plowing*,* channelized *drainage and irrigation. By the end of the century, a diversified agricultural economy had, therefore, replaced grazing as the dominant economy."*

The role of logging and cultivated agriculture, including controlled grazing and plowing, had a dramatic influence on the natural habitats in the Pajaro Valley. Within the slough system, the marshes were drained for the planting of crops through the establishment of a channel drainage system, as reported by the Register Pajaronian.

> *"…the branch drainage ditch through the lands of McLean and Harkins is being made by a party of Watsonvillians, and they are pushing their work along at a good pace. When this branch ditch is opened a fine body of land will be wrested from the swamp and will be soon ready for cultivation."*
>
> *-Register Pajaronian, June 16 1892*

While significant draining of the sloughs likely did not occur much earlier than 1880s there was likely widespread cattle grazing throughout the slough system as well as cultivation of summer dry cereal crops within the sloughs and surrounding upland terraces. This is reflected in the extensive crop production in the Pajaro Valley, in which by 1887 over 33,000 acres were in agricultural use. Much of the habitats of the sloughs were likely seasonal marshes, which would flood in winter and spring months and dry in summer months, with the exception of small spring fed slough channels. This type of habitat


MONTEREY COUNTY
SAN BENITO COUNTY
Rº CORRALITOS
Rº SALSIPUEDES
Rº SAN ANDREAS
Rº BOLSA DEL PAJARO
LAGUNA DE LAS CALABESAS
DE LAS
37
53
40
48
47
50
51
39
49
38
Watsonville
Pajaro
Vega
Sand Cut
Chittenden
Pajaro River
VANCAI PEAK
Mt PAJARO
Thompson
Kelly
Peter Zils
M. Quirk
M. Leonard
J. Leonard
Leonard
Harkins
Martin Bros
C. Connell
B. Phillips
W. McGrath
Dias
Walker
Bredenstein
J. D. Driscoll
M. Cassin
J. Foster
N. D. Kidder
Division of Maps
Library of Congress

would have been easily converted from seasonal wetland and marsh to land under cultivation. While open-water habitat may not have changed dramatically due to the use of horse-drawn implements through the 1800s and early 1900s, and their reduced ability to drain or manage deeply inundated marshes and wetlands, it may be the case that sedimentation from surrounding cultivated flat and sloped lands resulted in some sediment deposition and a change of vegetation type and cover. While sedimentation has been seen to be a significant impact on the nearby Elkhorn Slough, studies of Watsonville Slough by Hagar and Watson in 2005, with California State University of Monterey Bay, did not find major impacts from sedimentation. In light of this, it is possible that sedimentation within the Watsonville sloughs post farming activities have had locally significant impacts, but that these impacts are not widespread.

The presence of plants not native to California have been documented in adobe bricks from the earliest missions, such as Red Stem Filaree from the period 1755 – 1760 in the Santa Barbara area. From this period through the early 1800's, cattle ranching and logging were the dominant land use practices that resulted in a change of vegetation communities. The growth of the residential areas of Watsonville and Corralitos would have demanded use of local woods (Oliver-Gonzales pers. comm.) and within the lower Pajaro Valley, the pattern of use of wood likely mirrored building construction patterns. Portions of the slough system were likely once more wooded than they appear today. However, the heavy clay soils found throughout the upland terraces surrounding the sloughs almost certainly predominately supported grasslands and other open range habitats.

By 1931, when the first survey of native marsh and wetlands plants of the Pajaro Valley was undertaken by Stanford University masters student Ida Hayward, the sloughs had been channelized and their margins had been put into cultivated agriculture. Hayward identified a number of native plant species that are not currently found in the sloughs, including a rare type of wetland rein orchid, and her survey provides the first direct description of the Pajaro Valley's wetland plant communities. Through this study, she describes well the seasonal marshes, springs, drainage canal network, and cultivated terraces, providing a window into a view of the sloughs at that time.

> "Standing on the hill at the back of the nursery of the H.A. Hyde Company one looks out over a series of rolling hills, the sloughs hidden in the troughs and the crests covered with field crops. In the first trough which is the upper end of the Watsonville Slough can be seen the characteristic appearance of the region: in the center a ditch with a luxuriant swamp vegetation along its edges; on either side fields of lettuce, onions, celery, or bulbs; on the outer portions remnants of swampy growth such as ruddy docks and somber green rushes. We will begin our study here taking up each branch of the slough in turn and ending with the salt marsh near the beach. On the north side is a little spring which feeds a horse trough that overflows into a depression which leads south into the upper end of the Watsonville Slough."
>
> -The Marsh and Aquatic Plants of the Pajaro Valley, Ida Hayward, 1931

Historic Wetlands Creeks and Rivers

The historic extent of the slough system is not well documented, though there are some valuable early maps which show old meanders of the lower section of Watsonville Slough, including the Coastal T-sheet, created in 1853, and the 1889 map of the Pajaro Valley and greater Santa Cruz County. Some of these maps appear in the appendix of this document. From a historical perspective, we can be certain that the construction of the tide gates at Shell Road had a significant effect on the estuarine habitats of

the Pajaro River and Watsonville Slough west of the City of Watsoville, and that the creation of an extensive drainage system throughout the slough system to support the growing agricultural economy was a large force of change on the landscape of the wetlands and sloughs found in the valley. More recently, urban growth has been its own driver of change.

Within the current city limits, a seasonal creek or slough drainage may have once flowed by what is now Callahan park (personal comm. V. Mattulich), crossing where Saint Patricks Church is now located and entering into Watsonville Slough. There is also remote possibility that Corralitos Creek and the slough system were connected by overland flow during large winter storm events, prior to the residential and commercial developments on the eastern side of Watsonville. Possibly the historic creek or slough near Callahan Park or Watsonville Slough itself would have been connected to Corralitos Creek during these large winter flood events, providing an opportunity for steelhead trout to migrate into the slough system and out to the ocean. At this point, this is speculative, and further study is needed to assess this scenario as very few existing landscape features today support this view, with the exception of the existing wetlands just east of Freedom Boulevard at Atkinson Lane and the historical flooding of Corralitos Creek beyond its banks in high storm events.

Early Trails

The first trails through the Pajaro Valley were from the San Juan Mission to the Santa Cruz Mission. Trails that followed connected the various adobes and ranchsteads. According to F.W. Atkinson, *in 100 Years in the Pajaro Valley from 1769 to 1868*, most of the trails were passable only in summer months as they passed through swampy lands and creek bottoms. Below is the earliest graphic depiction of trails in the Pajaro Valley.

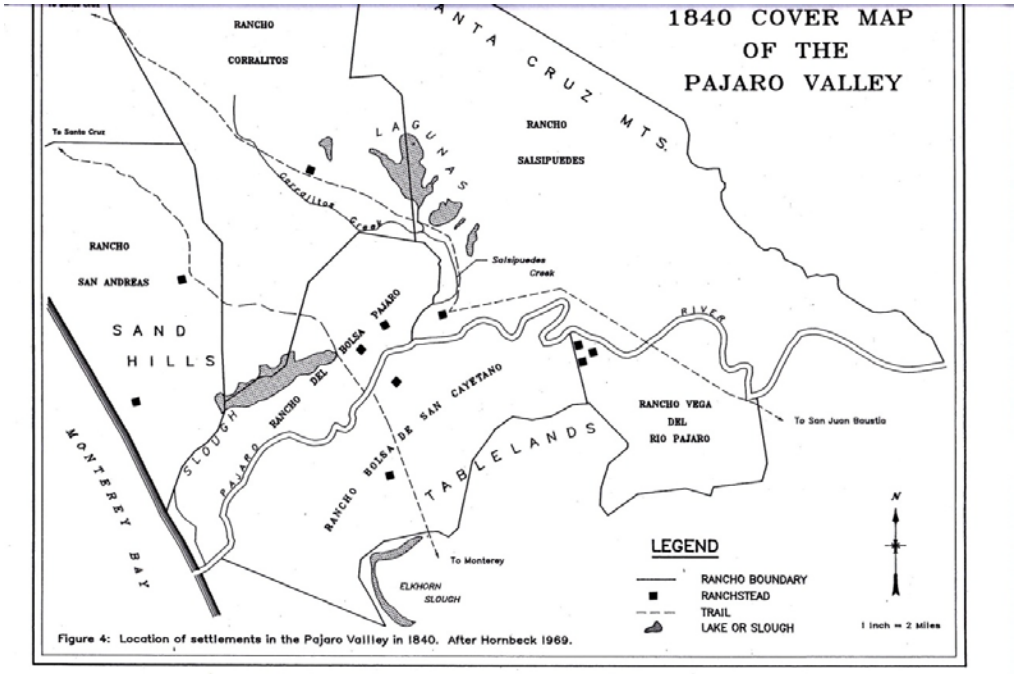


Figure 2. Map of early trails in the Pajaro Valley, from *An Assessment of the Cultural Resources of the Lower Pajaro River Basin, California, with Selected Preliminary Field Study*, Edwards, Farley, 1974.

The landscape we see today holds the stories of geologic and cultural actions and actors and has been shaped in profound ways on both the geologic and far more recent timeframes. Further work with a focus on the historical ecology and geography of the City of Watsonville and greater Pajaro Valley would be worthwhile for land use and habitat restoration planning, public interpretive signs and education programs, and neighborhood beautification projects. This information could be further developed to support an expanded historical geography walking tour for the City of Watsonville and could be a valuable addition to urban greening efforts.

Habitat Enhancement and Restoration Assessment for Trail Segments

Looking east over Struve Slough from the California Department of Fish and Game Owned, Watsonville Sloughs Ecological Reserve

1.1, 1.2 North and South Pajaro River Trail

Photo A.

Photo B.

Photo C.

Existing Conditions: The Pajaro River is one of the most scenic natural areas within the trails master planning area. The watershed of this river spans 13,000 square miles and runs the length of 12 miles through the Pajaro Valley. The river's course within the valley formerly had much greater meander and a far greater undeveloped and natural floodplain that has been greatly modified for urban and agricultural use over the past century. Due to the proximity of the current levees, the habitat of the river is generally confined to the riparian canopy directly along its bank. The existing riparian vegetation includes several willow species, cottonwood, sycamore, and dogwood trees, with a native understory of California blackberry, California bee plant, mugwort, coast gooseberry, and others (Photo A). Between the levee and the riparian canopy there is typically a small man made bench that is covered in grasses that is mowed seasonally where some native herbaceous and grassland species can be found, such as hill dweller sedge, sneezeweed, and others. The sides of the levees are kept bare of vegetation, in order to maintain stability of the levee (Photo B).

A number of State and Federally listed wildlife species of concern utilize the habitats of the river and its riparian habitat, including California red-legged frog, (Federally listed threatened), Western Pond Turtle, (FT), yellow warbler, (CSC), and Steelhead trout (FT), tidewater goby, (FT).

There are significant habitat impairment issues within the existing river corridor which should be addressed. These include large scale infestations of invasive plants, such as Cape Ivy and poison hemlock, fragmented and limited riparian habitat, significant litter, and water quality impairment.

Opportunities for Restoration and Enhancement:
Habitat restoration efforts should focus on control and eventual eradication of Cape Ivy, though this will take an extremely long term effort, as Cape Ivy is present to some extent along all riparian rivers and creeks within the Pajaro Valley and is especially abundant along both the southern and northern banks of the Pajaro River as well as the adjoining Corralitos creek (Photo C). Opportunities to expand the habitat areas either in conjunction with the on-going flood control efforts or independently should be explored as there may exist opportunities to enhance floodplain functions and habitats on adjacent farmland where there are willing landowners. Any work in this regard would need to be conducted in conjunction with the appropriate jurisdictional bodies and flood control planning efforts. There may however, exist opportunities that can be conducted independently and are worth exploring, such floodplain easements outside of the levee boundary as well as enhanced on-farm habitat enhancement projects which can benefit the river's riparian habitat by providing complimentary habitat within a close proximity.

2.1,2.2 Salsipuedes and Corralitos Creek Trail

Photo A.

Photo B.

Photo C.

Existing Condition: Similar to the Pajaro River, the riparian habitats of Corralitos and Salsipuedes creeks provide a critical linkage between the habitats along the coast and the habitats of the Santa Cruz Mountains, allowing a diversity of species to migrate and move through the landscape. Corralitos Creek provides important habitat for many fish species, including anadramous fish such as pacific lamprey and steelhead trout. Coho salmon have been observed in the Pajaro River and Corralitos Creek as recent as the 1960's, but they are thought to have been strays from the San Lorenzo River hatchery. Other freshwater fish include Sacramento blackfish, Sacramento sucker, three-spined stickleback, and Sacramento pikefish. Corralitos Creek joins Salsipuedes Creek near the confluence of Pinto and Salsipuedes creek just south of the outlet of College Lake. Salsipuedes Creek provides an important wetland and riparian link for fish and wildlife passage between the Pajaro River and College Lake.

The condition of the riparian habitat along the creek changes dramatically from east to west, as the creek approaches the Pajaro River. Dense riparian trees are nearly eliminated approximately 1.7 miles to the east of East Lake Boulevard, though this habitat returns near its confluence with the Pajaro River (Photo A.) In the portions of the creek where the riparian habitat has been removed, native herbaceous vegetation including creeping wildrye and Santa Barbara sedge grow thickly throughout the creek's bank (Photo B.) Within the channel, dense stands of cattails have formed which could support tricolored blackbird (CSC), and other marsh associated birds. The loss of tree cover in the southern portion of the creek limits the available habitat for riparian associated birds. The land use surrounding the levees is largely irrigated agriculture (Photo C.).

Opportunities for Restoration and Enhancement: As significant woody riparian habitat has been lost in this portion of the creek, there is an opportunity to re-plant some native trees in coordination with flood control management efforts, which would serve to benefit riparian associated bird species as well as fish species by maintaining cooler temperatures in the creek. The current mowing regime on the creek side of the levee is generally beneficial to the native rhizamatous plants growing there. Certain invasive plants should be removed, such as periwinkle and poison hemlock. The mowing regime should also be altered around some of the sedge and rush species that do not take well to regular mowing. These areas could be diversified with native plantings which would improve habitat for bird and amphibian species and improve the trail user experience. Diversification may also have secondary benefits to the surrounding agricultural operations. There are also opportunities to work with surrounding agricultural operations to improve points of drainage near the creek and provide on-farm habitat complimentary to the current habitats along the creek. Additional set-backs and buffers, where possible, between the farming operations and creek corridors would serve to diversify the habitat of the creek corridor and benefit a large suite of wildlife species.

3.1 Corralitos Creek Trail

Photo A.

Photo B.

Photo C.

Existing Conditions: Corralitos Creek, at segment 3.1 (Photo A.), runs through northern Watsonville, southeast along the agricultural fields to the east of the City limits and under East Lake Blvd. The adjacent land uses range from urban residential and commercial (Photo C) to agricultural (Photo B), with various associated impacts to the creek and riparian corridor. The riparian vegetation is predominately limited to the areas within 50 feet of the creek, there are a few larger sections with up to 170 feet of riparian vegetation on the western side of the creek. Migratory steelhead trout utilize this section of the creek through the winter months, as they regularly spawn and rear in the upper Corralitos Creek watershed. Relatively shallow pools, due to a lack of downed trees and vegetation complexity within the creek channel, limit opportunities for spring and summer mobility for steelhead. However cool water temperatures and sufficient water flows in winter months make this section of Corralitos Creek an important component of the creek's steelhead run.

The riparian habitat consists of mainly willow, alder, sycamore, dogwood, and cottonwood trees, with an understory of California blackberry and dense growth of cape ivy, an invasive weed species along with other weedy non-native invasive plant species, such as poison hemlock, spring mustard, and perriwinkle. A diversity of bird species utilize the riparian canopy including downy woodpecker, merlin, red shouldered and coopers hawk, yellow warblers, and song sparrows.

Opportunities for Restoration and Enhancement: Cape ivy grows throughout this trail segment, limiting the structural and floral diversity within the riparian understory. Control of this species will help to provide a richer riparian habitat. Enhancement and increased restoration of the riparian corridor would provide a large suite of benefits for a diversity of plant and animal species of conservation importance, including the California red-legged frog (FT) and white-tailed kite (FPS). Because much of this trail segment is located adjacent to agricultural fields, there is an opportunity to improve the existing riparian corridor by increasing the width of riparian vegetation, diversifying the habitat complexity and supporting an increase in wildlife values for both terrestrial and aquatic species. Increased riparian habitat and associated wildlife use would also improve the trail user experience and provide opportunities for more complex trail alignments, including overlooks and interpretive amenities.

3.2,3.3 Pinto Lake and Green Valley Road Connection

Photo A.

Photo B.

Photo C.

Existing Conditions: This trail segment crosses nearest to the habitats of Pinto Lake and Pinto Creek, a part of the Pajaro Valley's diverse lake and creek habitats on the eastern side of the valley. Four large lakes (Pinto, Kelly, Drew, and Tynan), and many small ponds are found throughout this watershed area. Important drainages run into and out of these lakes, and provide an overlap of riparian, wetland, and upland habitats supporting some of the greatest diversity of wildlife found in the county aside from the slough system.

The riparian habitats surrounding Pinto Lake provide a rookery for great blue heron as well as winter migration and spring nesting habitat for waterfowl species. Recently, bald eagles have begun to use the riparian habitats surrounding the lake. The waters of Pinto Lake exit the lake at its western boundary and run underneath Green Valley rd. through an approximately 48" culvert (photo A.) where they form Pinto Creek. Pinto Creek runs through what is a predominantly agricultural landscape until it crosses underneath Hollahan Rd. and reaches Corralitos Creek (photo B.). Pinto Lake was dammed sometime between 1948 and 1952 and the waters of Pinto Creek have therefore been altered from that time forward.

Pinto Lake is a highly impaired waterbody and Pinto creek has been impacted to a large extent by surrounding land uses. Pinto Lake was recently found to have the highest concentration of DDT in carp found in lakes throughout the State (CA Regional Water Quality Control Board, Surface Water Ambient Monitoring Program,2009). Each year, algae and microcyctin bacteria bloom in the lake presenting a dire situation for waterfowl and presenting a health and safety issue for the many people who utilize the lake for recreation.

Opportunities for Restoration and Enhancement: These trail segments provide a variety of opportunities for restoration and enhancement including enhancement of the riparian habitats surrounding Pinto Lake, which would include removal of invasive plant species found growing throughout the Park, in particular in the Santa Cruz County portion of the park and surrounding private parcels. Improvement to the water quality of the lake is paramount and is considered a high priority within the habitats in the planning area of the Master Trails Plan. Improvements to the riparian habitats surrounding Pinto Creek, represent an important opportunity. Floodplain easements to compensate interested landowners should be explored and may be required to facilitate the enhancement of these habitats.

As the trail travels westward from Pinto Lake along Green Valley Rd. it passes through residential and agricultural areas, native plant hedgerows should be planned to separate the agricultural fields from a greenway trail. This is currently a heavily used trail, though foot and bicycle traffic is predominantly on the existing farm road (photo C.).

4.2 Buena Vista Park Trail

Photo A.

Photo B.

Photo C.

Existing Conditions: The Buena Vista park site is a 39 acre parcel purchased for use as future park. It is located within the headwaters of Harkins Slough and contains valuable native grassland and woody riparian habitat. Approximately 12.4 acres of the upper portion of the property is currently used as cultivated pasture. The lower portion of the property contains 3.7 acres of native woody riparian habitat in which a meandering creek flows, 0.83 acres of seasonal freshwater wetland/marsh, 0.82 acres of coast live oak woodland, and several stands of remnant native grassland within an approximately 14 acre stand of annual grassland. There are also stands of coyote brush scrub and a dense eucalyptus grove on the western side of the property.

The overlap of habitat types of this property are known to support a diversity of wildlife species including California species of special concern and grassland dependant birds, such as northern harrier, white-tailed kite, short-eared owl, and golden eagle. The wetland complex could support California red-legged frog (FT), the Santa Cruz long-toed salamander and the Califonria tiger salamander (FT), as these species are known to occur on the near-by wildlife reserves owned and managed by the U.S. Fish and Wildlife Service and California Department of Fish and Game.

In addition to the wildlife benefits, the seasonal wetland and creek likely contribute to ground water recharge and annual replenishment of the aquifer.

Non-native, invasive plants grow throughout the property, including French broom, jubata grass, teasel, and wild fennel.

Opportunities for Restoration and Enhancement: Due to the size of this property and the diversity of habitats, there are significant opportunities for enhancing wildlife habitat. Enhancement of ruderal grasslands and the remnant stands of coastal prairie would benefit grassland dependant bird species. The soils and plant community would likely be supportive of an introduction of Santa Cruz tarplant (FE, ST). The wetland on the south-west boundary of the property could be deepened to better support breeding of special status amphibian species, in particular, if those species are found to utilize the property. Invasive plant species should be removed as a part of a long term stewardship approach, in an effort to improve the grassland, oak woodland, and riparian habitats. There is a small isolated cape ivy stand located in the riparian corridor which should be removed before it spreads further.

4.4 West Watsonville Municipal Airport Trail

Photo A.

Photo B.

Photo C.

Existing Conditions: Much of this trail segment occurs along an existing roadbed or footpath extending south from Airport Blvd. towards Larkin Valley Road (photo A.). The trail runs through approximately 24 acres of diverse native riparian habitat intermixed with several large and dense stands of Eucalyptus (photo B). Supporting the riparian plant community is a seasonal drainage that is a tributary to Harkins Slough. Native riparian plants include creekside dogwood, arroyo willow, elderberry, and California blackberry. Invasive plant species, in addition to Eucalyptus include Himalayan blackberry, fennel, English ivy, and Italian thistle. Adjacent to the riparian habitat is a significant grassland which supports remnant stands of coastal prairie including a large population of Santa Cruz tarplant (FE, ST).

This mixture of riparian woodland and coastal prairie/ open range grassland habitat is greatly valuable to wildlife species, including raptors, such as redtail and red shoulder hawks, American kestrel, white tailed kite, and other riparian associated bird species, as well as mid size to large mammals, including coyote and bobcat, which were observed during the assessment of the trail segment. The Buena Vista area, in which this segment occurs, is also known to support both deer and mountain lion.

Opportunities for Restoration and Enhancement: There are a variety of opportunities for restoration and enhancement in this trail segment. Replacement of the ruderal grasslands where a variety of invasive plant species are dominant is one of the most significant opportunities, such as the ruderal slopes nearest to the industrial developments. These grassland habitats are large enough in size to function as significant native habitat adjacent to riparian and wetland habitat, as seen in photo C. Removal of Himalayan blackberry would be a very beneficial, particularly when growing within an open range/grassland habitat . Invasive plants should be removed throughout the riparian habitat, including giant reed (Arundo donax), english ivy, and fennel. The dense stands of Eucalyptus should be evaluated for removal. They are presently supporting a variety of raptor species. Their removal may aid in watershed-wide approaches to control of this species and may have benefits to the oak woodland and willow scrub habitat on the site. The grassland habitat is managed in a manner similar to the habitat on the neighboring airport, which has been seen to be supportive of a diversity of native plants, including the federally listed, endangered Santa Cruz tarplant. There are opportunities to expand habitat of the Santa Cruz tarplant and other rare native coastal prairie plant species within the grassland habitat areas. Working with the neighboring businesses and installing native vegetation landscaping surrounding the building footprint offers a significant opportunity to benefit the surrounding habitat areas as well as demonstrate the integration of wildlife habitat and drought tolerant native landscaping with facilities of the local business community.

4.6 Upper West Struve Slough Spur Trail

Photo A.

Photo B.

Photo C.

Existing Conditions: There are several small tributaries to West Struve Slough within its upper watershed area, including a small seasonal pond (photo A.) and drainage between Airport blvd. to the north-east and Westgate blvd. to the west. A relatively intact riparian corridor grows within this drainage, in which oak, eucalyptus, acacia, willow and other species exist. Portions of riparian corridor may have been a part of past mitigation projects for surrounding development. The pond appears to be man-made, however, as a seasonally drying off-channel pond within close dispersal distance from known sightings of California red-legged frog, it may provide habitat for that species. The pond is located just to the west of the critical habitat designation for this species. However, there is no current documentation of California red-legged frog use of this habitat feature.

The riparian habitat has a diverse structure and likely supports a variety of raptors and other bird species. It also likely serves as an important corridor for wildlife mobility. A great-horned owl was observed during the survey of this site. There is a walking path/access trail that currently exists on the property. A small grassland is located on the south side (photo B) of the habitat area, though no native plant species were identified. Several non-native plant species grow throughout this area, including jubata grass (Photo C.), eucalyptus, and others.

Opportunities for Restoration and Enhancement: Habitat restoration efforts should focus on control of invasive tree and shrub species as well as jubata grass. As the eucalyptus is functioning for raptor habitat and potentially nesting habitat, it may be best to leave some of these in place. Assessment of the outlet structure on the wetland and monitoring of the dry-down period would help to determine it's suitability to support breeding of California red-legged frog. Restoration of native grasslands would benefit this site, but is not a high priority within the over-all suite of projects within the scope of the Watsonville Scenic Trails Network planning area.

5.1, 5.2 Pajaro Valley High School Connector Trail, Loop Trail

Photo A.

Photo B.

Photo C.

Existing Conditions: 80 acres of natural habitat areas surround Pajaro Valley High School and are owned by the City of Watsonville with conservation easements placed over these parcels. A biological restoration plan was prepared for this property in 2002, which provided restoration requirements that have been implemented by the Pajaro Valley Unified School District and the Watsonville Wetlands Watch beginning in 2004.

The property supports 12.6 acres of seasonal wetland, 33.5 acres of ruderal grassland, 7 acres of riparian woodland and 0.5 acres of remnant native grassland. Approximately 2.3 acres to the west of the school were restored from active irrigated agricultural fields beginning in 2005 (photo A) to woody riparian habitat and approximately 31 acres were seeded with native grassland species. Prior to cultivated agriculture, the property was used in conjunction with the neighboring properties as rangeland for dairy production.

A portion of the headwaters for West Struve Slough occur on this property and the plant community of the seasonal marsh is one of the most diverse marsh plant communities in the slough system. Several native marsh plants are only found at this location. Pools remain in the deep channels left from historic agriculture, which are used by California red-legged frog (FT). Prior to the construction of the Harkins Slough Rd. bridge just east of Pajaro Valley High, this site was one of frequent observance for California red-legged frog. A seasonal pond is found just north of the high school, one of the only seasonal upland ponds known in the slough system (Photo B). The headwaters of Hanson Slough are found on the western side of the property.

The habitats support a diverse array of wildlife including coyote, fox, occasional deer, and a wide range of bird species of conservation value such as nesting ducks in spring months, burrowing owl in winter months, and regular white tailed kite, coopers hawk, savannah sparrow, and American kestrel.

Opportunities for Restoration and Enhancement:
As one of the largest protected open space parcels within the scope of the Watsonville Scenic Trails Networks, this property offers a diverse array of opportunities for restoration and enhancement. Efforts should focus on continuing to improve and restore native grassland habitat, enhance the remnant native coastal prairie populations, and enhance the seasonal marsh of West Branch of Struve Slough through the removal of key non-native plant species and by ensuring that priority invasive plants do not establish on the property such as eucalyptus and jubata grass. Protection of native marsh habitats on adjacent properties and restoration of surrounding lands to compliment and add value to this open space are of high priority as well.

7.1 Lee Road Trail

Photo A

Photo B

Photo C

Existing Conditions: Several restoration efforts have been undertaken by the City of Watsonville, including the restoration of wetlands and associated habitats in a former landfill in Ramsey Park and the Manabe restoration project. Restoration work is continuing between Ohlone Parkway and Highway 1, which will serve to continue the effort to widen the Watsonville Slough channel closer to a more open water feature, improving water quality, fish, and amphibian passage, and increasing flood water storage capacity (Photo A, looking upstream toward the Manabe restoration site). West of the highway, Watsonville Slough returns to a drainage channel. An access road is located on its northern bank (Photo B) and the slough is bounded by commercial buildings. Just downstream of Lee Road, the slough channel is bounded by warehouses to the north and agricultural fields to the south (Photo C). The Watsonville Slough channel was constructed in the mid to late 1800's as a means to drain the surrounding marsh lands and convert them for agricultural uses. The impact however, has been a loss of historic marsh, seasonal wetland, and floodplain habitat. Concentration of nutrients in the water in the channel has also resulted in a impaired water quality. Watsonville Slough supports a wide diversity of wildlife species of special concern and is one of the most significant habitats for waterfowl, such as mallard, teal, and bittern, in Santa Cruz County.

Opportunities for Restoration and Enhancement: Continuing the widening of the Watsonville Slough channel from just east of Highway One to the portion west of the highway would have significant water quality and wildlife habitat benefits. As commercial uses bound the slough channel just downstream of the highway, developing a natural landscape management approach that is supportive of wildlife habitat and growth of native riparian vegetation would improve the riparian habitat value along the slough channel. Further downstream, several floodplain easements have been established. Establishing a floodplain buffer with a native marsh habitat component and improving the hydrology of the slough channel would greatly benefit a wide diversity of native birds and amphibian species, improve water quality, and serve to link two significant areas of wetland habitat preservation and restoration. Improving the channel maintenance practice under Highway 1, and upgrading the culvert underneath Lee Road would allow for enhanced water flow along this reach and improve the connection between these two sections of Watsonville slough.

9.1 Upper Struve Slough Trail

Photo A.

Photo B.

Photo C.

Existing Conditions: Struve slough emerges as a seasonal seep just above its intersection with Airport Blvd. It runs underneath Airport Blvd. and through a series of culverts, winding its way along a narrow course towards Green Valley Rd. Through this stretch, a minimal riparian corridor grows along its bank, comprised of primarily arroyo willow, California blackberry, and Himalayan blackberry. As the slough nears Green Valley Rd.it begins to widen and then passes through a series of culverts under Green Valley Rd (Photo A.) and continues southwest toward Pennsylvania Avenue. There is a small grassland habitat on the western boundary upstream of Green Valley Rd.that has been invaded by jubata grass and other invasive plant species.

South of Green Valley Rd., the width of the slough channel, is about 15 feet wide and appears to be a remnant of an old agricultural ditch used for farming before residential development replaced it. The sides of the channel are eroding where the channel has begun to take a more sinous path. There are several well-developed foot paths along the slough and the riparian vegetation continues to be primarily arroyo willow, California blackberry, and Himalayan blackberry (Photo B.). The extent of the riparian vegetation continues to widen as the slough heads southwestward.Eventually the defined slough channel surrounded by a dense riparian canopy becomes a more open emergent marsh with large stands of open marsh habitat (Photo C.) before returning to a smaller riparian canopy with closer residential development. From there, the slough travels through a series of culverts and under Pennsylvania Avenue.

Opportunities for Restoration and Enhancement: While the riparian vegetation throughout the length of the upper reach of Struve Slough provides important habitat for raptors, song sparrows, and a diversity of other riparian dependant bird and amphibian species, the open marsh habitat is a rarer habitat type in this part of the slough system. While there is not a great diversity of native plants, there is good structural diversity, which likely provides important habitat for raptors and other marsh associated wildlife. The dense riparian vegetation could support California red-legged frog (FT), known to occur in Struve Slough. While the slough may have at one time supported fish species in its upper reaches in winter months, the number of culverts may prevent this from occurring now.

Opportunities for restoration and enhancement include stabilization of the slough channel just below (south) Green Valley Rd. through installation of erosion control measures and native plants; invasive plant removal, in particular Jubata grass removal, throughout the length of the trail segment, targeted invasive plant removal in the emergent marsh habitat above Pennsilvania Ave. for veldt grass and other priority invasive plants; installation of native plants near residences in order to improve the transitional habitat between the residences and the slough's habitats, and removal of garbage and litter, in particular, just below Green Valley Rd.

9.4 Upper Watsonville Slough Trail

Photo A.

Photo B.

Photo C.

Existing Conditions: Watsonville Slough emerges as an ephemeral seep just below its intersection with Freedom Blvd., at the eastern most corner of the western unit of the Pioneer Cemetery. In most years, this is a perennial seep that flows through a narrow channel, beginning behind the cemetery and traveling south-west as an open channel, running through a series of culverts and under several roads (photos A and B at right). At several points, down cutting of the channel sides were observed. The water is mostly clear, and while the habitat area surrounding it are mostly confined to maintained landscape vegetation and residences, in most areas there is some type of setback from the slough channel (as seen in photo A). Once the slough reaches Miles Lane, the slough is surrounded by greater habitat. The section of the slough between Miles Lane and the mobile home park was at one time grazed and likely planted in pasture, as old fence posts and barbed wire fencing cuts across property boundaries. There is a storm drain outlet which has created what appears to be a small seasonal branch of the main slough channel. The only native plants in this reach are species tolerant of a high water table and inundation, such as marsh goldenrod. There is potential to widen the slough channel and restore the surrounding native habitat in some locations.

As the slough enters into the mobile home park, it is confined by the residential uses, though remains a wide channel, with a modified outlet and gate valve (Photo C). As the slough continues south west, the riparian habitat widens, quickly becoming a minimum of 400 ft at its cross section. Substantial native woody riparian habitat exists, as no residences appear to be located in the floodplain until the slough reaches Main Street. There is a significant amount of garbage in several locations along the slough's length, in particulary along Pioneer Cemetery and as the slough approaches Main St.

The most significant stands of native riparian vegetation along this trail segment exist below Crespi Rd. in the mobile home park. Invasive plants grow throughout this habitat unit. The ruderal grasslands just south west of Miles Ln. do have some open range habitat value, but the presence of cats, as well as the proximity of houses and streets likely restrict ground nesting opportunities for bird species. Enhancement of native grasslands and wet meadow habitat would improve the prey base and over-all conditions for raptors in this habitat area.

Opportunities for Restoration and Enhancement: Opportunities include invasive plant removal and habitat improvements along the length of the slough channel, channel stabilization along the slough channel through the installation of native vegetation, widening of the slough channel between Miles Ln. and the mobile home park, enhancement to the existing riparian habitat along the channel in order to diversify the habitat structure, enhancement of the existing ruderal grassland and wet meadow habitats, and removal of garbage and litter.

10.2 – Brewington Ave/Atkinson Lane Trail

Photo A.

Photo B.

Photo C.

Existing Conditions: The Atkinson Lane wetland complex currently includes a portion of Corralitos creek, seasonal wetland, perennial wetland, annual grassland habitat, as well as agricultural fields (Photo B.) and urban development. The biological resources of this site are well documented and described in the Atkinson Lane housing development Environmental Impact Report and Specific Plan.

The most significant wetland complex is located west of Corralitos creek and south of Atkinson Lane (Photo A). Surrounded by annual grassland habitat, this combination of habitat types supports a diversity of special status plant and animal species including a population of Western pond turtle (CA species of special concern), and the Santa Cruz tarplant (Federally listed threatened, State listed endangered), and is well within the dispersal distance of the California red-legged frog (Federally listed threatened). The wetland complex may have once been larger than it is currently, and it is possible that historically this wetland complex linked Corralitos creek to the Watsonville Sloughs near its current confluence with Freedom Blvd. in winter months for wildlife dispersal.

While the land surrounding the wetland complex is currently planned to be developed, some of the natural resources on site are planned to be preserved as described in the project's specific plan. Aside from the species mentioned above, these natural areas support a diversity of wildlife species. Wildlife species that likely utilize this site include white tailed kite, great blue heron, great horned owl, several bat species and many others.

Opportunities for Restoration and Enhancement: There are significant opportunities to restore natural features, including restoration of coastal prairie, seasonal wetland, freshwater marsh, and oak woodland habitats. Most critically, however, due to the likely future development, vegetation management and enhancement activities must be conducted to not impact the integrity of the habitat areas that will be preserved within the site. The site will likely provide a migration corridor between seasonal wetlands and Corralitos creek, which will benefit Western pond turtle and potential California red-legged frogs (FT). The life cycles of theses sensitive species must be the major consideration for vegetation management along the trail, as well as a key consideration in trail location alignment. The man-made depression at Crestview park provides an opportunity to create a more nature oriented park that has increased seasonal wetland features and more bird friendly landscaping.

Existing Open Space – Apple Hill

Photo A.

Photo B.

Photo C.

Existing Conditions: Apple Hill is located directly southof the intersection of Green Valley Rd. and the Hwy 152 exist of Hwy 1 (Photo A). It is one of the more intact remnant native coastal prairies within the planning area of the Trails Master Plan. Approximately 4.5 acres of grasslands support California oatgrass, sun-cups, and the Santa Cruz tarplant (FE, ST) (Photo B). The Santa Cruz tarplant population is managed by CalTrans and has fluctuated between 248 individuals in 1993 to 4598 individuals in 2000 to 351 in 2003, a fluctuation that can be typical of this species population dynamics. The grassland was bisected by the construction of the Hwy 152 exit. A small seep is located on its east facing slope, where box elder and willow grow.

Opportunities for Restoration and Enhancement: The native grassland offers an opportunity to improve habitat for the Santa Cruz tarplant while managing for increased wildlife habitat. While there is little value for ground nesting birds, the open grassland, likely provides some significant upland values to wildlife in the area, particularly due to its proximity to Upper West Branch Struve Slough and the Pajaro Valley High School ESHAs. Eucalyptus and other non-native invasive plants should be removed and a mowing regime should be established that is more supportive of ground nesting bird use, if possible within the Caltrans maintenance program.

Historic Creek: California Street at Sudden Street

Photo A.

Photo B.

Photo C.

Existing Conditions: There is a possibility that a seasonal creek or drainage ran into once Watsonville Slough in winter months near the current Calahan park. At some time in the early to mid 1900's, the creek may have beenplaced underground, where there is now a large storm underneath a series of alleyways which extend east toward Wagner street. While some of the alleys are closed to the public, several of the alleys are open and used by neighbors and bicyclists. Some areas which were likely a part of this historic creek are now located within what is now Callahan Park. The creek likely ran by Saint Patricks Church on Main Street. There is a remote possibility that this creek was a connection between Corralitos Creek and the Watsonville Sloughs in very high water years, which would have been highly valuable for anadramous fish and other wildlife populations, however little visible connection remains and it is difficult to state if this was the case. No riparian vegetation or remnants of this waterway exists at this time. The alley ways are maintained annually to keep weeds and brush from growing and forming a fire hazard.

Opportunities for Restoration and Enhancement: If confirmed, it would be extremely difficult to daylight this creek, based on the limited width currently available between the existing residential development. This should continue to be explored however, as this would be a highly ambitious project with great value to wildlife, water quality and urban green space development. There may exist limited locations where it would be possible. A more likely project would be to utilize the alley way network as a bicycle pedestrian way and recall the historic creek by developing this space to mimic and remind its users of the historic wetland and riparian functions that once ran in this central location near downtown Watsonville. Recreational amenities could include planting native trees and riparian plants, painting the bicycle and walkway blue, murals which recall the historic views of and from that location, and historic and interpretative signage.

Existing Trails Network

Photo A.

Photo B.

Photo C.

Struve Slough South of Main Street

Existing Conditions: While Struve Slough was once an interconnected slough which extended from its headwaters near Airport Blvd. to the confluence with Watsonville Slough, near the railroad track crossing west of Highway 1, several streets were designed to bisect it. Some of those streets have recently been removed and bridges have been built in their place, such as on Harkins Slough Road., others closed, such as at Lee Road, and some remain such as Main Street.

Below Main Street, Struve Slough is a wide body of water which currently rarely dries in summer months (Photo A). The connection however between the portion of the slough northof Main Street and southof it has been significantly altered. The only connection is made during high winter flows when the water passes through a drainage channel and under Main Street via a culvert. A large channel, approximately 15' in height and 5' wide was constructed at the outlet of the culvert (Photo B, C). .

Opportunities for Restoration and Enhancement: Invasive plants growing throughout this area should be removed and the area should be re-planted with a diversity of native wet meadow plant species. The channel should be monitored infrequently to check that portions of it does not become erosive.

Existing Trails Network

Photo A.

Photo B.

Photo C.

Upper Struve Slough Wetland and Marsh Complex

Existing Condition: A small wetland and surrounding marsh lie directly to the north of Main Street at its intersection with Ohlone Parkway and Clifford Drive. Due to the previous channelization for past agricultural uses and the construction of Main Street, a relatively isolated seasonally drying pond is located between two open channels. Just upstream is the large open water habitat of Struve Slough (Photo A.) which will often dry in summer months. Throughout the lower portion of this wetland complex, there are remnants of former native habitats, where several native plants are found including spike rush, water plantain, and bog rush. The pond is well within the dispersal distance of recent and historical California red-legged frog (CRLF) sightings, and may have once or may continue to support CRLF breeding. The native plant community represents a remnant native marsh with potential for increased habitat value.

Opportunities for Restoration and Enhancement: While the pond is located within a relatively developed area, its isolated nature may provide the conditions to support CRLF breeding (Photo B). Surveys for existing use by CRLF should be conducted. A simple modification to the ponds inlet could be developed to reduce or eliminate fish from the pond, increasing the likelihood of survival of CRLF egg masses. The native plant communities should be enhanced through continued invasive plant removal, including removal of the hemlock surrounding the pond and re-planting the area with a diverse native plant community. Just east of the seasonal pond is a ruderal weedy strip of land adjacent to the neighboring homes (Photo C.). This space could be utilized for a native habitat demonstration project and/or a seating and viewing area with a bench. The marsh directly to the north is currently managed by the City of Watsonville during the existing trail vegetation management. Seasonal mowing should continue, so as to foster growth of native plant species and the marsh should be diversified with a greater diversity of low stature native herbaceous plants, such as sedge and rush species, allowing for enhanced dispersal by CRLF and greater wildlife use by a diversity of bird, mammal, amphibian and reptile species.

Prioritized List of Restoration Sites

Segment #	Segment Name	Length	Resource Benefit/Enhancement Opportunity	Cost	Resource Enhancement Rank (1-5)*	Ease of Implementation Rank (1-5)**	Easement/ Acquisition needed
1.1	North Pajaro River Levee Trail	4.2	Surrounding resources, in particular riparian habitat, are greatly impacted by previous flood control efforts as well as proximity of adjacent urban and agricultural land uses. There exists significant opportunities for enhanced floodplain functions and habitat, improved riparian habitat, and significant opportunities to improve the habitat values and functions of the confluence of Corralitos creek with the Pajaro River to benefit a large suite of species including several listed and special status species.	M-H	5	5	Y
1.2	South Pajaro River Levee Trail	6	Surrounding resources, in particular riparian habitat, are greatly impacted by surrounding agricultural practices as well as presence of the invasive species, Cape Ivy. The brackish estuary at the confluence of Watsonville Slough with the Pajaro River occurs within this trail length. There exists significant opportunity to enhance floodplain function and riparian habitat along the river course and in particular to enhance the habitats either within or adjacent to the estuarine habitats of the Watsonville Slough System during the construction of the trail alignment which connects trail 1.2 with the West Beach Road crossing.	M-H	5	5	Y
2.1	West Salsipuedes Creek Trail	1.4	Riparian habitat throughout this trail length has been resricted for flood control purpose. There do exists stands of native wet meadow and riparian habitat whose enhancement would benefit ecosystem function within this trail slignment. Opportunities to improve floodplain function, enhance habitat on surrounding lands, and add woody riparian habitat in conjunction with flood control planning and management, would benefit a large suite of native plant and animal species, including several listed and special status species.	M-H	5	5	Y
2.2	East Salsipudes Creek Trail	1.5	Trail section contains some mature riparian habitat, though invasive plant species grow throughout. The riprarian habitat has in other places been greatly limited by surrounding land uses and flood control efforts. Opportunties to improve floodplain function, enhance habitat on surrounding lands, and add woody riparian and herbaceous riparian habitat in conjunction with flood control planning and management, would benefit a large suite of native plant and animal species, including several listed and specail status species.	M-H	5	5	Y
3.1	Corralitos Creek Trail	2.8	Surrounding resources, including woody riparian habitat, herbaceous riparian habitat, native grassland, wet meadow, and marsh habitat have been limited by surrounding land use practices. Opportunities to restore these habitats in conjunction with interested parties and landowners, as well as to improve existing riparian habitats along the creek, would benefit a large suite of native plant and animal species, including several listed and special status species.	M-H	5	5	Y

3.2	Green Valley Road Street Based Trail	0.8	Opportunty to establish a greenway and restore some riparian habitat adjacent to Green Valley Rd.	M	2	3	Y
3.3	Pinto Lake Trail	1.3	Opportunity to improve riparian habitat surrounding Pinto Lake, remove invasive plant species, and improve surrounding land use connections to the lake if determined to be beneficial for water quality or habitat.	M	3	3	Y
3.4	North Airport Boulevard Street-based Trail	0.3	Little opportunity exists for enhancement of natural resources.	L	1		N
4.1	Freedom Blvd./ Buena Vista Drive Trail	0.6	Little opportunity exists for enhancement of natural resources.	L	1		N
4.2	Buena Vista Park Trail	0.6	Oportunity for enhancement of wetland, native riparian, oak woodland, and native grassland habitats. This property is an important open space property within the Buena Vista area and Harkins Slough watershed important for a large suite of native plant and wildlife species. There exists an additional opportunity for protection and preservation of adjacent open spaces to create a more robust preserve and enhance habitats for a diversity of threatend, endangered, and special status species.	M-H	5	3	N
4.3	Larkin Valley Road Trail	0.7	Little opportunity exists for enhancement of natural resources.	L	1		N
4.4	West Watsonville Municipal Airport Trail	1.1	Opportunity to improve native riparian habitat in the upper Harkins Slough watershed, including removal of invasive plant species. Opportunity to enhance native upland habitat surrounding the riparian habitat complex, including coastal prairie resources and habitat for the Federally threatened, Santa Cruz tarplant. Opportunity to work with nieghboring business park to install wildlife friendly landscaping.	M	4	2	N
4.5	Airport Boulevard Street based Trail	0.7	Little opportunity exists for enhancement of natural resources.		1		N
4.6	Upper West Branch Spur Trail	0.3	Opportunity to enhance wetland and riparian habitat throughout the trail segment, including invasive plant removal and enhancement of the isolated pond for increased storage capacity and habitat.	M	3	2	N
5.1	Pajaro Valley High School Connector Trail	1.1	Opportunity to enhance coastal prairie habitat and adjacent seasonal wetland habitat by re-seeding native coastal prairie on the uplands and removing invasive plant species throughout the seasonal wetland.	M	4	1	N
5.2	Pajaro Valley High School Loop Trail	0.5	Opportunity to continue to further develop existing restoration work within the upper Hanson Slough watershed.	M	3	1	N

5.3	Harkins Slough Road Connector Trail	0.3	Opportunity to construct a trail within agricultural set-backs and install native plant hedgerows along a recreational trail.	M	3	1	N
6.1	West Harkins Slough Trail	0.9	Opportunity to remove regionally important invasive plant populations, such as one of two cape ivy populations within the Watsonville Sloughs. Opportunity to enhance upland habitat through the removal of Eucalyptos and the restoration of native oak woodland habitat, in the uplands north of Harkins Slough. Adjacent to the US Fish and Wildlife Service, Harkins Unit Reserve.	L - M	4	3	Y
6.2	East Harkins Slough Trail	1.3	Opportunity to construct a trail within agricultural set-backs and install native plant hedgerows along a recreational trail.	L - H	3	1	N
7.1	Lee Road Trail	2	Opportunity to enhance seasonal freshwater wetland habitat through improvements to the Watsonville Slough channel and culverts under Lee Road. Opportunities to connect habitat restoration within this trail segment with surrounding enhancements to the Middle Watsonville Slough wetland complex.	L - H	5	4	Y
7.2	Watsonville Slough Connector Trail	0.25	Little opportunity exists for enhancement of natural resources.		1		N
8.2	Lower Watsonville Slough Loop Trail	2.5	Opportunity for enhancement of native upland habitat along upper Watsonville Slough.	L	3	1	N
8.4	Ford Street Street-base Trail	0.5	Little opportunity exists for enhancement of natural resources.		1		N
8.5	Las Brisas Connector Trail	0.3	Opportunity for nature pocket park with natural resource benefit and benefit to surrounding wetland habitats. Adjacent to opportunities for significant upland restoration.	M	5	1	N
8.7	Manabe-Ow Connector Trail	0.7	No opportunity for enhancement of native habitat.		1		N
9.1	Upper Struve Slough Trail	0.6	Opportunity to enhance upper Struve Slough channel, remove invasive plant species, and install nature pocket park.	M	3	2	N
9.2	Loma Prieta Ave. Street based Trail	0.6	No opportunity for enhancement of native habitat.		1		N
9.3	Rolling Hills Connector Trail	0.6	Limited opportunity for enhancement of upper Struve Slough resources and connection to Nature Pocket park	L	3	1	N
9.4	Upper Watsonville Slough Trail	1.2	Opportunity to clean portions of Watsonville Slough of significant litter and garbage, as well as an opportunity to remove invasive plants of regional importance include one of the two populations of cape ivy within the Watsonville Sloughs.	M	4	1	N

10.1	Martinelli Stree/East Lake Aventue Street-based Trail	1.8	No opportunity for enhancement of native habitat.		1		N
10.2	Brewington Avenue/Atkinson Trail	0.8	Opportunity to enhance Atkinson pond complex to benefit the Western Pond Turtle and other special status bird species as well as enhance the habitats surrounding Corralitos Creek.		4	3	Y
11.1	Shell Road Trail	6	Opportunities to enhance native habitat occur throughout this trail segment, including large scale improvements to the estuarine habitats and adjacent habitats along Watsonville Slough as it enters the Pajaro River mouth estuary. Significant upland habitat opportunities exist within the context of the development of the surrounding properties.	H	5	5	Y
11.2	Santa Cruz Branch Line Rail Trail	32	Many opportunities exist to enhance and restore native habitat throughout the length of this trail throughout the Pajaro Valley and in particular where the trail passes through the Watsonville Sloughs, including improvements to the culverts through which Watsonville Slough passes west of Lee road.	H	4	3	N

*Resource Enhancement Rank is on a 1-5 scale with a score of 5 with the highest degree of resource enhancement opportunity
**Ease of Implementation Rank is on a 1-5 scale with a score of 5 being the most difficult degree of project implementation

An osprey catches its prey in Harkins Slough, Denise Murphy

Habitat Restoration Plans for Priority Trail Segments

Upper Watsonville Slough Trail, Segment 9.4

Trail Segment 9.4 incorporates much of upper Watsonville Slough and its associated habitats. From its intersection with Freedom Blvd. and Alta Vista Avenue to its intersection with Main Street and Rodriguez Street, it is surrounded primarily by residential development.

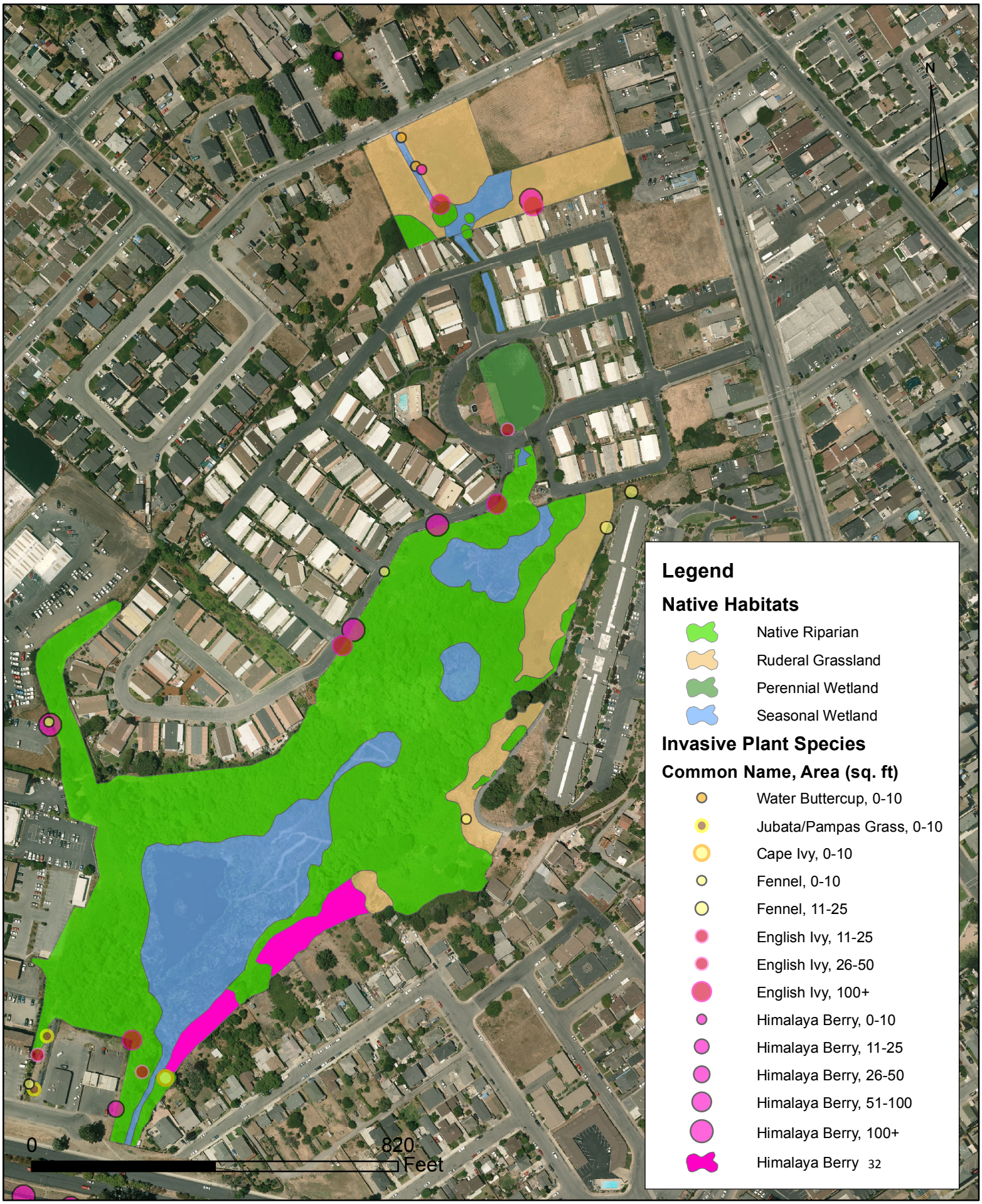
Existing Conditions: Watsonville Slough emerges as spring near its intersection with Freedom Blvd. and Alta Vista Avenue. In most years, the spring is perennial, providing a year-round source of freshwater to its downstream riparian habitats. Historically, the headwaters of this slough were connected to a greater extent to a complex of freshwater wetlands and associated marsh and grassland habitats. This area included the Atkinson Lane pond, and Corralitos Creek and its associated riparian and floodplain habitats. Downstream from the spring, the slough travels through a series of culverts as it passes underneath several street crossings, including Miles Lane and Crespi Circle, before it opens up to a wider ponded area within the Portola Heights mobile home park. The level of this ponded area is controlled by a gate valve. Within the boundaries of the mobile home park, and downstream towards the sloughs' intersection with Main street, the slough forms a seasonal marsh with a wide floodplain, surrounded by willow riparian scrub and ruderal grassland before it flows through a culvert underneath Main Street.

The following is the composition of current habitat conditions:

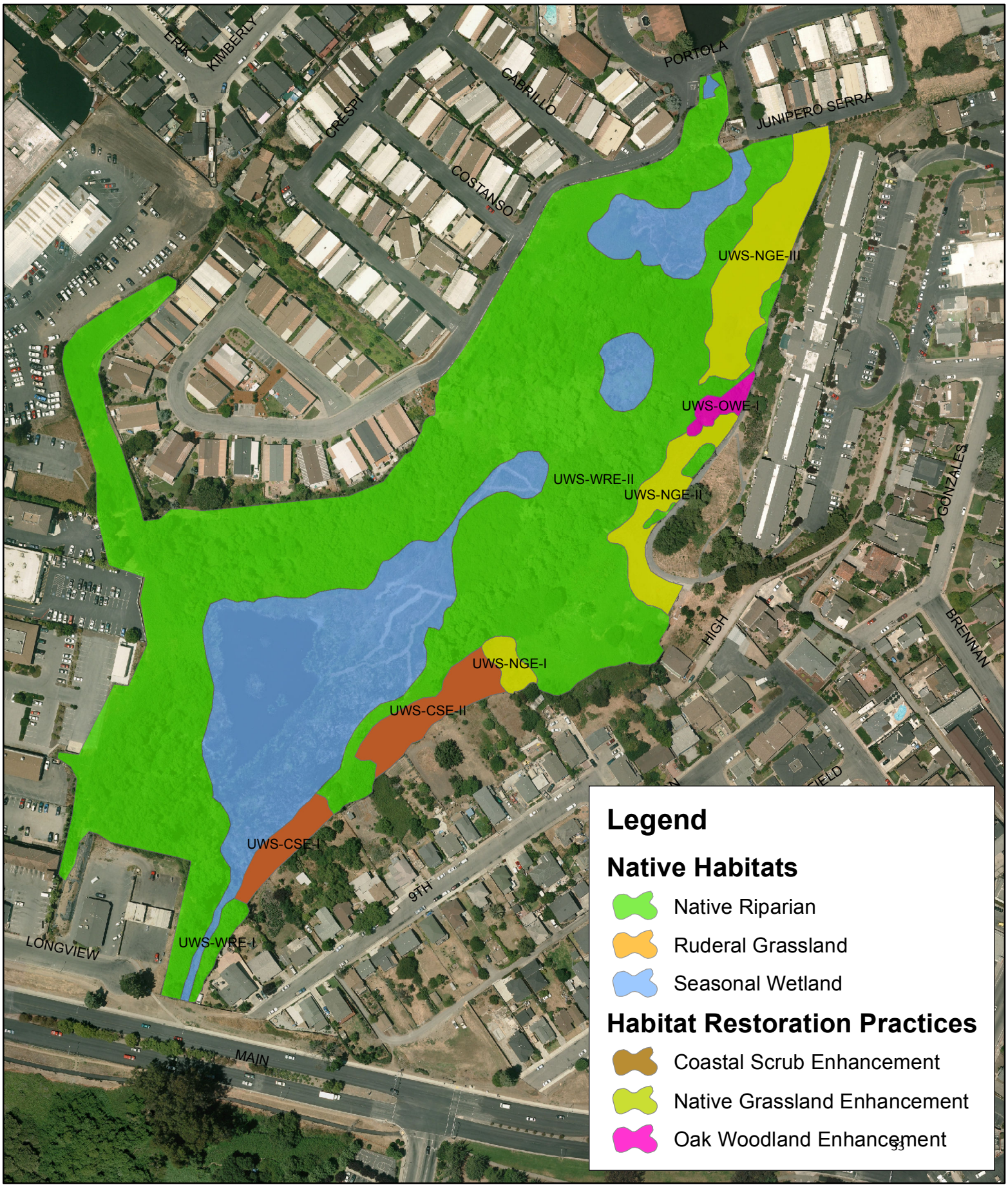
Existing Vegetation Community	Acres
Perennial wetland	0.5
Seasonal wetland	4.3
Ruderal grassland	3.1
Willow riparian scrub	15.3
Coast Live Oak woodland	0.1

While there are substantial blocks of native habitat within this trailsegment, the riparian and ruderal grassland habitats are impacted by a wide range of invasive plant species, degrading the quality of the habitats. In the upper most portion of the slough, residential development directly surrounds the slough, limiting habitat availability. The existing habitat is largely degraded by invasive plant species and

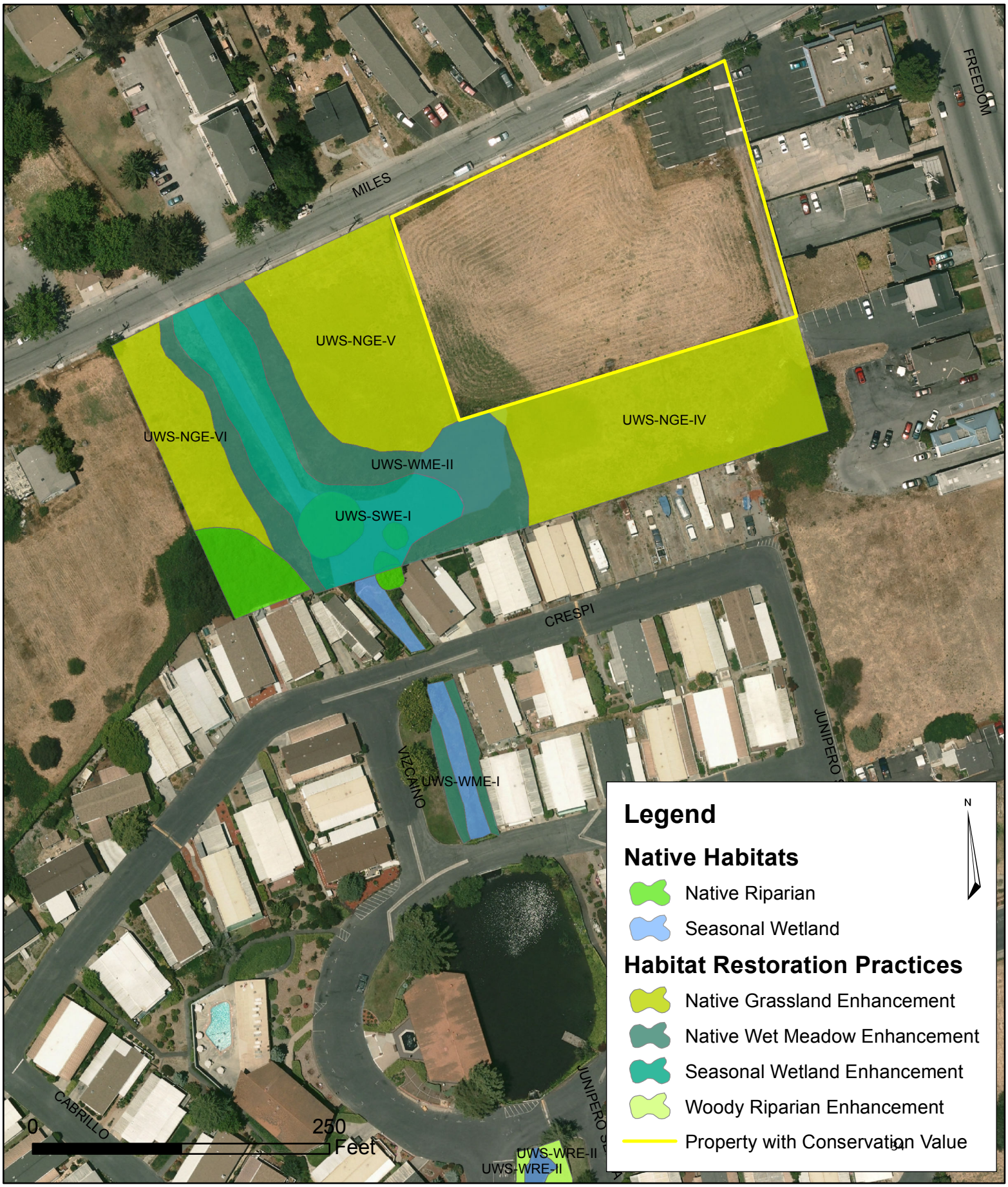
Upper Watsonville Slough, Trail Segement 9.4
Figure 3. Existing Conditions



Upper Watsonville Slough
Trail Segment 9.4
Figure 4. Habitat Restoration Practices



Upper Watsonville Slough
Trail Segement 9.4
Figure 5. Habitat Restoration Practices, North



historic channelization of the slough. In some areas this channelization is causing down cutting of the channel and sediment deposition within the waterway. Garbage, litter, and human impacts near the slough's intersection with Main Street cause significant effects on water quality and wetland and riparian habitat.

Recommendations for the Enhancement of the Trail Corridor and Habitats in the Surrounding Open Space: *Practice codes on the following maps are written in parenthesis in practice descriptions below and are referenced on accompanying maps and practice cost sheets.*

Task 1, Enhance Woody Riparian Habitat: The woody riparian areas within this trail segment are heavily impacted by invasive plant species, limiting their habitat values to wildlife. Invasive plant species include cape ivy *(Delairea odorata*), english ivy (*Hedera helix*), fennel (*Foeniculum vulgare*), jubata grass (*Cortaderia draba*) and Himalayan blackberry (*Rubis discolor*). Both cape ivy and english ivy have a large area of distribution within the watershed, though cape ivy is the more invasive of the two within the watershed. The single cape ivy population within this trail segment is one of a small number of outlier populations known within the slough system, and should be removed immediately. An in-depth discussion of cape ivy removal is found within the Vegetation Maintenance and Stewardship section of this document. The english ivy populations within this trail segment, are similarly relatively small, but are located throughout the habitat areas of this trail. It is recommended that an english ivy control program be initiated. Fennel and jubata grass should be removed throughout the willow riparian areas, as should Himalayan blackberry. No installation of native plants is required for the enhancement of the willow riparian habitat areas. (UWS-WRE-I, II)

Task 2, Enhance Coastal Scrub Habitat: Himalayan blackberry forms two dense stands (0.6 acres) on the southern side of Watsonville Slough. Himalayan blackberry should be removed and the area should be replanted with native plants to form a coastal scrub habitat, such as coffee berry (*Frangula californica*), elderberry (*Sambucus mexicana*), wild rose (*Rosa californica*), California bee plant (*Scophularia californica*), Santa barbara sedge (*Carex barbarae*), hedge nettle (*Stachys adjigoides*), and others. The area where the blackberry is growing should be mowed with either a tractor mounted mower or hand removed with a brush cutter and then mulched with at least four inches of a biodegradable wood chip mulch. Re-sprouting blackberry should be treated with an herbicide approved for use near a wetland, prior to the installation of native plants in winter months. (UWS-CSE-I, II)

Task 3, Enhance Ruderal Grasslands: 1.3 acres of ruderal grasslands occur between Main Street and Portola Circle on the southern side of Watsonville Slough. These ruderal grasslands are lacking in any native plant community. Bristly ox-tongue (*Picris echoides*), Italian thistle (*Carduus pynochephala*), and Italian rye (*Lolium multiflorum*) are the most common plants found in these areas. Due to the lack of native plant species, and lower habitat value associated with these species, the grasslands should be re-seeded in several areas in order to establish diverse native plant communities. Prior to seeding, the grasslands should be mowed to clear any standing vegetation and either disced or roto-tilled to prepare a seed-bed. Just before the onset of rains, native grass and forb species should be incorporated into the

soil with a drill seeder or broadcast seeder and then provided sufficient seed to soil contact, as with a ring-roller. Seeded grasslands should be maintain with regular mowing and hand removal of target non-native plant species during the first three years after seeding. (UWS-NGE-I – III)

The ruderal grasslands (1.3 acres) between Miles Lane and Portola Circle found on both the east and west side of Watsonville Slough should be enhanced in the same manner during the process of construction of the trail and other natural resource enhancement projects, such as the seasonal wetland enhancement. (UWS-NGE IV-VI)

The improvement of ruderal grasslands and seeding with native grassland species is designed to improve the habitat values of these areas. Wildlife associated with native grasslands adjacent to freshwater marshes, such as northern harrier, song sparrows, red-winged blackbird, white-tailed kites, grey fox, and many others are expected to benefit.

Task 4, Enhance Seasonal Wetlands: The portion of Watsonville Slough, which occurs between Crespi Circle and Portola Circle, was channelized during previous agricultural operations prior to the residential development in the area. The narrow slough channel should be widened to support a more complex seasonal wetland with varying elevations and water depths. Improving the slough channel will serve to increase the wetland's ability to filter water as it passes through this stretch of Watsonville Slough as well as increase habitat complexity. (UWS-SWE-I)

Task 5, Enhance Native Wet Meadows: Native wet meadows are areas, which flood seasonally or occasionally, in which native plants that are adapted for seasonal flooding and a high water table grow including grass, sedge, rush, and other associated herbaceous species. Native wet meadows are recommended to be planted around seasonal wetlands between Portola Circle and Miles Lane. The existing, non-native plants in these areas should be removed by mowing, discing, or scraping these sites, prior to applying a minimum of 4" of biodegradable wood chip mulch, and re-planting these areas with a diversity of appropriate native plant species. Enhancement of the native wet meadow plant community is expected to benefit a diversity of wildlife species, aid in the functional capacity of the seasonal wetland to improve water quality in high water months, as well as create a more dynamic and aesthetically pleasing landscape. (UWS-NWE-I, II)

Task 6, Trail Edge Habitat Installation: In conjunction with the construction of the graveled greenway trail, planting of native grass and forb species in a four foot band directly adjacent to each side of the trail should occur. The edges of the trails are places in which non-native invasive plant species, in particular thistle species, often grow well, as the seeds of these plants settle in the cracks in the soil or edge of graveled trail. Repeated mowing, as is necessary for seasonal trail maintenance, can promote the spread of these forb species, which are favored with an early season mowing regime. A trail edge in which there is a high percent cover of native plant species will be resistant to the spread of invasive plant species and reduce the number of times that trail edge mowing will be needed in summer months, reducing annual maintenance costs. Just after construction of the trail and prior to fall rains dense, native trail edges should be established by seeding native plant species with a native seed range drill in a four foot band on each side of the trail.. If the drill seeder used does not perform this action, the native

seed should be incorporated well into the soil by a cultipacker or ring-roller in order to ensure good seed to soil contact. The following spring, the seeded trail edge should be mowed repeatedly to promote the growth of seeded native plant species. Species recommended for use include California oat grass (*Danthonia californica*), purple needle grass (*Nassella pulchra*), slender needle grass (*Nassella lepida*), California poppies (*Eschscholzia californica*), California buttercup (*Ranunculus californica*), wavy leafed horkelia (*Horkelia cuneata*), Yarrow (*Achillea mellifolia*), and other low growing native plant species.

Monitoring and Adaptive Management

Monitoring of habitat installation should be conducted to assess the effectiveness of habitat enhancement measures. Habitat enhancement practices should be measured against the following success criteria after a three year establishment period and five year maintenance period.

Task	**Habitat Restoration or Enhancement Practice**	**Success Criteria**
Task 2	Enhance Coastal Scrub Habitat	Percent cover of Himalayan blackberry should be less than 10%; Coverage of native plant species should be greater than 60%, Native species present should be greater than 15 individual species
Task 3	Enhance Ruderal Grasslands	Coverage of native plant species should be greater than 20%; Native species present should be greater than 10 individual species
Task 5	Enhance Wet Meadow Habitat	Coverage of native plant species should be greater than 60%; Native species present should be greater than 12 species

An adaptive management framework should be utilized that treats management actions as experimental and assess installation success and failures in order to guide future habitat management in meeting success criteria, project goals and objectives over time. Assessing implementation successes through annual monitoring is critical to ensuring that the project is developing on a track to meet or exceed the success criteria.

Trail Construction and Easement Acquisition

In order to complete this trail segment an easement or fee title acquisition will be required with the willing landowner(s). This acquisition offers the potential to increase the open space and habitat values surrounding Watsonville Slough and add to the protected natural lands system developing in the slough system. At least one currently undeveloped property has been identified as holding conservation value

and it is recommended that the preservation of the open space values of this site be explored in consideration of the property owner's interest.

Throughout this trail alignment, the habitats of Watsonville slough abut neighboring residential properties. As is common throughout the slough system, this presents an important opportunity to work with neighbors of the slough and improve the habitat characteristics of these neighboring properties. Installing native plants and habitat gardens on adjacent residential properties would provide a substantial opportunity to enhance wildlife use of the Watsonville Slough. As the habitat restoration work associated with this trail segment is within several residential neighborhoods, the work also presents a valuable opportunity to support neighborhood work parties and beatification projects that support the on-going improvement of the natural habitats. These might involve weekend volunteer days, but also may spur other neighborhood projects such as evening or weekend guided nature walks or neighborhood art projects.

Pajaro Valley High School Trail, Segment 5.1

Trail Segment 5.1 incorporates portions of habitat areas of West Branch Struve Slough and includes several open space and agricultural parcels, the most prominent of which are the City owned Environmentally Sensitive Habitat Areas (ESHAs) adjacent to Pajaro Valley High School.

Site Background: After an extensive planning process, Pajaro Valley High School opened in 2005. As a condition of opening the school within an area rich in sensitive natural resources along California's coastal zone, such as wetlands and grasslands, the Pajaro Valley Unified School District was required to purchase and permanently retire 80 acres of former agricultural lands surrounding the school and restore them to natural habitats under the guidance of a biological restoration plan. The lands were permanently retired in 2005 and designated as an ESHA. Restoration and enhancement of the site began in 2003 and has included seeding of 30 acres of native grasslands, installation of an oak tree buffer, which surrounds the school footprint, and the installation of a variety of native riparian and woodland plant species to augment the diversity of the existing habitat. The 80 acre ESHA includes a significant portion of West Branch of Struve Slough as well as the headwaters of Hanson Slough, which flow as a seasonal seep in winter months. While the newly restored property provide critical habitats for many wildlife species, the restoration work also serves to provide an outdoor laboratory for students at the high school to learn about the value and ecological benefits of the wetlands and open space in the Pajaro Valley.

Existing Conditions: The combination of seasonal marsh, grasslands, and riparian woodlands found within this area makes for a rich habitat area that supports a diversity of wildlife species. A variety of grassland dependent bird species such as white-tailed kite, burrowing owl, savannah sparrow, and loggerhead shrike, which are all listed as California species of special concern, depend on this habitat. This ecosystem also supports a diversity of mammals, including coyote, fox, deer, and a small long-tailed weasel population. The seasonal wetland provides an important dispersal corridor for a population of

California red-legged frog (Federally listed threatened), and may have once supported important breeding habitat for this species. The property contains seasonal springs which feed West Struve Slough and Hanson Slough respectively, a slope wetland within the grassland adjacent to West Struve Slough, and a seasonal pond directly north of Hanson Slough. The seasonal marsh of West Branch of Struve Slough supports several locally rare native plant species, such as slough sedge (*Carex obnuta*), and wooly sedge (*Carex pallida*). While the grasslands have been degraded from a history of strawberry production and dairy operations, there are several small stands of native coastal prairie on the west side of the property, which support California oat grass (*Danthonia caliornica*), meadow barley (*Hordeum bracyantherum*), blue-eyed grass (*Sysrinchium bellum*), and hayfield tarweed (*Hemizonia congesta ssp. luzilifolia*).

The following is the composition of current habitat conditions and reflect post-restoration activities:

Existing Vegetation Community	Acres
Native grassland*	31.6
Seasonal wetland	24.7
Ruderal grassland	39.0
Native riparian	9.3
Coast Live Oak Woodland	0.2
Tree and Shrub Buffer	5.8

*The native grasslands on the western portion of the property (Hanson Slough ESHA) were seeded with native grassland species. Native percent cover within these areas is currently (2012) approximately 3.5 %.

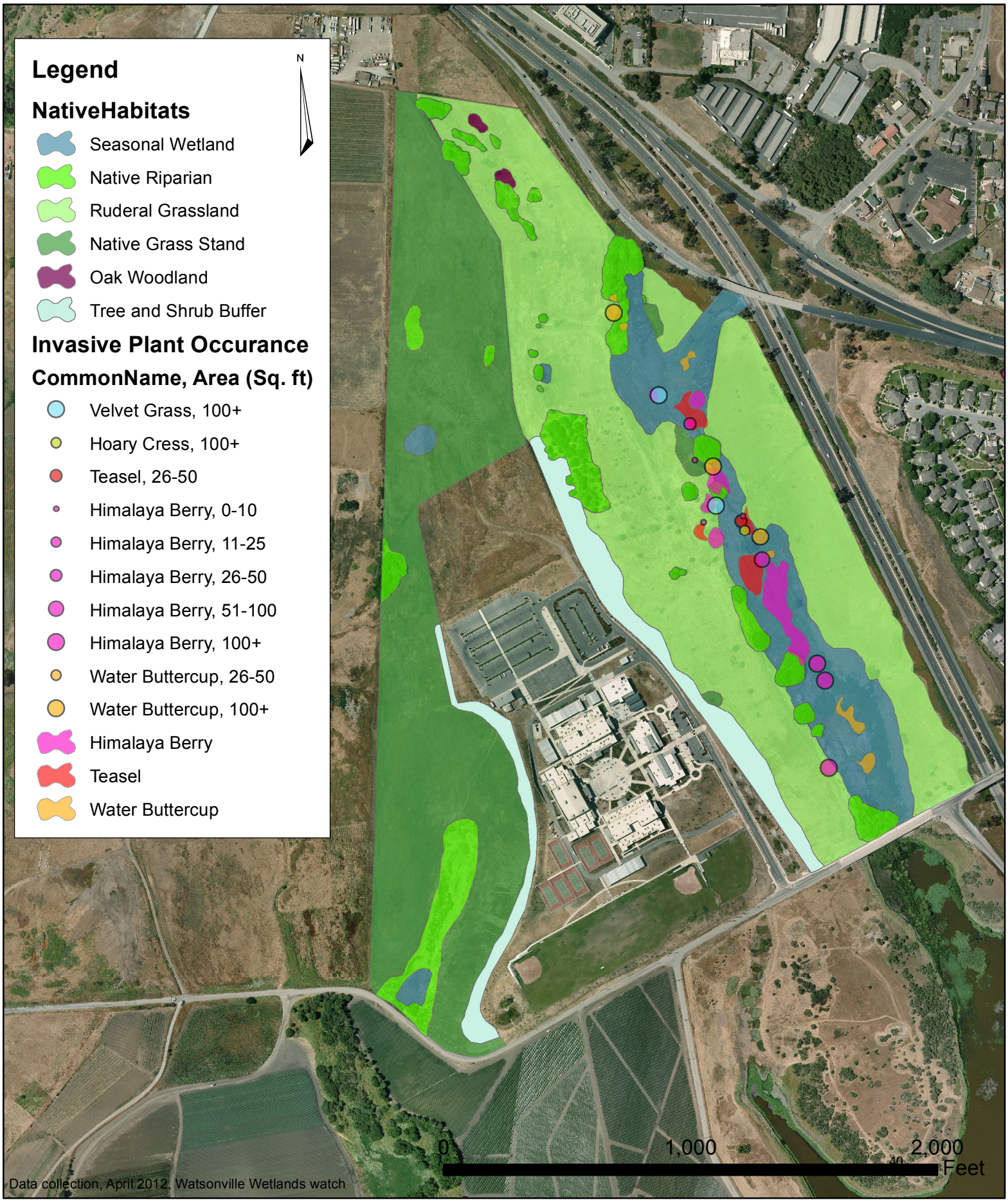
Recommendations for the Enhancement of the Trail Corridor and habitats in the surrounding open space:

Practice codes on the following maps are written in parenthesis after practice recommendations and are referenced on the above maps and practice cost sheets.

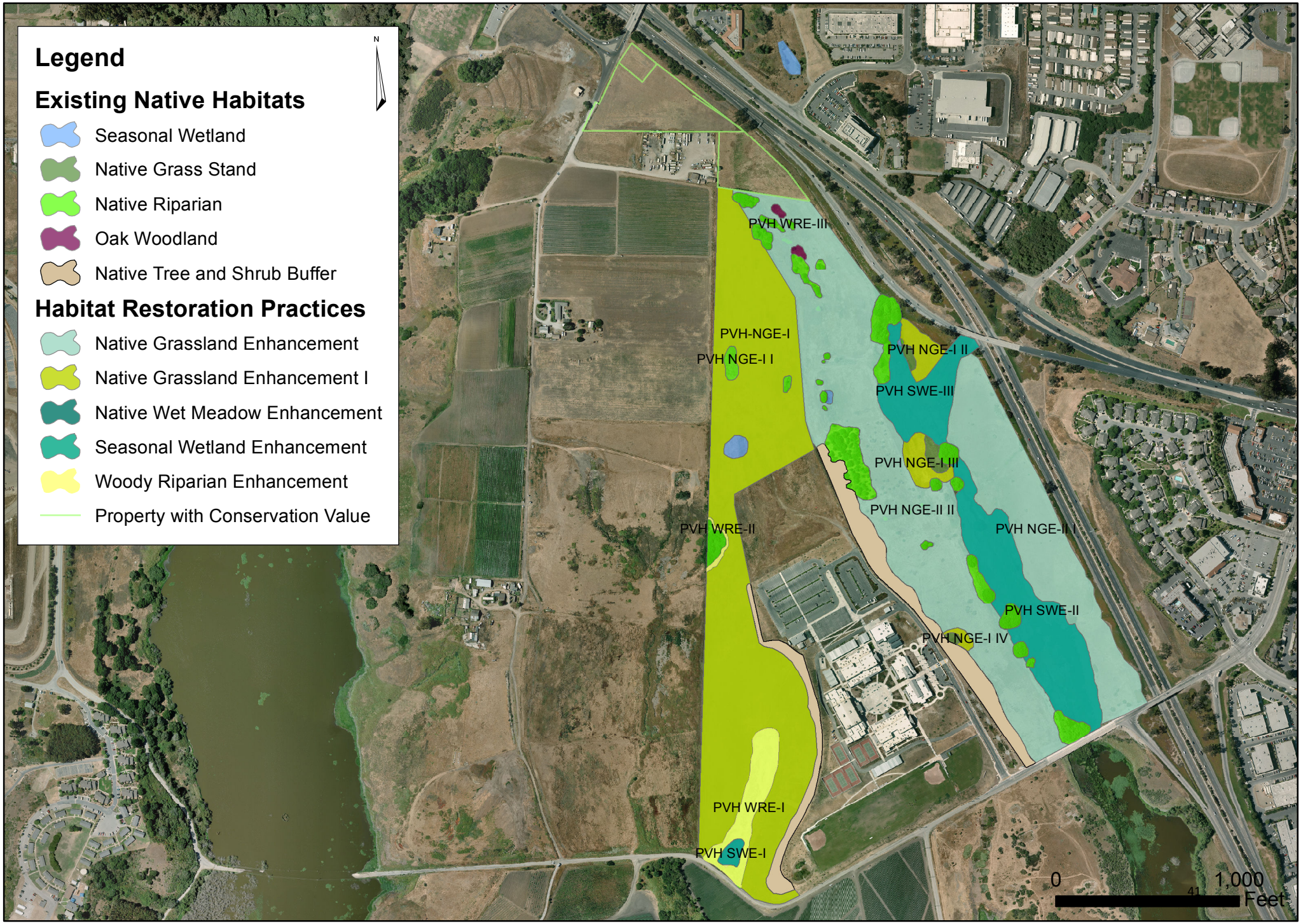
Practice Recommendations

Task 1, Trail Edge Habitat Installation: In conjunction with the construction of the graveled greenway trail, planting of native grass and forb species in a four foot band directly adjacent to each side of the trail should occur. The edges of the trails are places in which non-native invasive plant species, in particular thistle species, often grow well, as the seeds of these plants settle in the cracks in the soil or edge of graveled trail. Repeated mowing, as is necessary for seasonal trail maintenance, can promote the spread of these forb species, which are favored with an early season mowing regime. A trail edge in which there is a high percent cover of native plant species will be resistant to the spread of invasive

Pajaro Valley High School
Environmentally Sensitive Habitat Area
Figure 6. Existing Conditions



Pajaro Valley High School ESHA, Segment 5.1
Figure 7. Restoration Practice Map



plant species and reduce the number of times that trail edge mowing will be needed in summer months, reducing annual maintenance costs. Just after construction of the trail and prior to fall rains dense, native trail edges should be established by seeding native plant species with a native seed range drill in a four foot band on each side of the trail. If the drill seeder used does not perform this action, the native seed should be incorporated well into the soil by a cultipacker or ring-roller in order to ensure good seed to soil contact. The following spring, the seeded trail edge should be mowed repeatedly to promote the growth of seeded native plant species. Species recommended for use include California oat grass (*Danthonia californica*), purple needle grass (*Nassella pulchra*), slender needle grass (*Nassella lepida*), California poppies (*Eschscholzia californica*), California buttercup (*Ranunculus californica*), wavy leafed horkelia (*Horkelia cuneata*), Yarrow (*Achillea mellifolia*), and other low growing native plant species. *Task 2, Enhance Priority 1 Native Grasslands:* Priority 1 native grasslands contain a relatively significant percentage of native grass or forb cover. Coverage of native species likely represents a range of 1 – 15%. The grassland on the western side of the property on the Hansen Slough ESHA was seeded with a native plant seed mix that includes, purple needle grass (*Stipa pulchra*), meadow barley (*Hordeum bracyantherum*), blue eyed grass (*Sisyrinchium bellum*), and California poppy, (*Eschscholzia californica*). Average percent cover of native species was monitored along transect lines in this grassland and was measured at 3.5% as of 2011. The priority 1 grasslands on the West Branch Struve Slough ESHA are small remnant stands of coastal prairie or wet meadows with high grass composition that remain despite previous clearing and land disturbance from agricultural activity. Native plant species include California oat grass (*Danthonia californica*), Hayfield tarweed (*Hemizonnia congesta ssp. luzilifolia*), meadow barley (*Hordeum bracyantherum*), and blue-eyed grass (*Sisyrinchium bellum*).

The presence of native plant species and the ability of these grasslands to support watershed-wide goals for wildlife habitat and native plant preservation and restoration, make these grasslands a high priority for enhancement and they should therefore be enhanced using a variety of strategies.

The grassland on the Hanson Slough ESHA has a low presence of seeded native plant species and requires re-seeding in several areas. This will allow diverse native plant communities to establish, spread, and provide a seed source to other portions of the grasslands. Of the 31 acres of grassland, approximately 6-10 acres should be re-seeded for this purpose. The 31 acres should be mowed two to three times annually to promote growth of native plant species and prevent thatch from accumulating, which can limit the spread and establishment of native plant species. The first mowing should occur in the spring, (if soil moisture levels permit) prior to the bird nesting period. Mowing during the nesting period should target non-native plant species, such as Italian thistle (*Carduus pycnocephala*) and wild radish (*Raphnus sativa*). The entire grassland should be mowed after the nesting period, but before the first rains in order to reduce the accumulation of thatch.

Since the native grasslands on the West Branch of Struve Slough side of the property are remnant native stands they need to be managed differently. Invasive plants should be removed or managed within the grassland and the existing native plant species should be managed with annual mowing or other disturbance activities that will favor their growth. These grasslands should also be monitored annually in April or May for priority invasive plant establishment. Scrapping the top two inches of the soil in

order to stimulate native plant to establish from the seed bank may prove to be a valuable management strategy. (PVH NGE I I-IV,)

Task 3, Seasonal Wetlands: Seasonal wetlands serve critical functions for wildlife on this property, in particular the seasonal wetland and marsh habitat of the upper portion of West Branch of Struve Slough. There are significant issues of impairment including the persistence of non-native invasive plant species, such as bristly ox-tongue (*Picris echoides*), rabbits foot grass (*Polypogon monspeliensis*), and creeping buttercup (*Ranunculus repens*), as well as unstable portions of the West Branch of Struve Slough channel created as a result of past land disturbance activities, where soil is depositing into this slough annually. However, it is recommended that a passive approach to habitat improvement be undertaken due to the presence of sensitive wildlife species, such as California red-legged frog, gray fox, coyote, and a diversity of bird species,. Creeping buttercup (*Ranunculus repens*) should be removed with either hand pulling by volunteers or with an approved herbicide applied by a licensed applicator. Mowing of poison hemlock (*Conium maculatum*) should occur in areas where native plants, such as (*Elymus triticoides*), exist in order to help to establish a native plant community understory along the outer edges of the seasonal wetland and marsh habitat. The gullies at the northern most portion of the West Branch of Struve Slough should be monitored annually. If soil loss and deposition occurs at a rate found to impair the habitat or function of the ecosystem, corrective action should be taken. In this case, additional wetland features and invasive plant removal efforts should be planned. This would be an opportunity to create enhanced habitat such as for California red-legged frogs, or other enhanced wetland features that may benefit a wide variety of species.

The seasonal wetland in the Hanson Slough ESHA is similarly degraded by the presence of invasive plant species. This wetland was excavated in 2004 so that it would hold water for a longer duration into winter months. While seeding with native plant seed and some planting of native plants has occurred, this work should be continued. Replanting of this seasonal wetland will lower maintenance cost in the long term, as less invasive plant removal will be required on an annual basis. In order to do so, all non-native invasive plant species should be removed and the bare ground covered with biodegradable mulch. Native plants should be planted within the mulched areas in the basin in late spring, once the water has receded from the ponded area. (PVH SWE I – III)

Stewardship and Habitat Management

Task 4, Enhance Priority 2 Native Grasslands:

Priority 2 native grasslands are characterized as priority 2 due to the lack of native plant species present within their boundaries. As open range habitat, they serve important functions for a diversity of ground nesting and grassland dependent or associated bird species. These grassland areas have also been planted in some locations with oak woodland associated tree and shrub species such as coffee berry (*Frangula californica*), coast live oak (*Quercus agrifolia*), and toyon (*Heteromeles californica*). Due to the heavy clay soils and presence of invasive weed species, such as bristly ox-tongue (*Picris echoides*) and Harding grass (*Phalaris acquatica*), it is not expected that significant oak woodland habitat will establish

in the near term. However, oak woodland habitat will likely become a more significant feature within these areas over the next 15 to 20 years.

Priority 2 grasslands should be mowed annually or bi-annually to both maintain open range habitat for wildlife species and reduce thatch accumulation that inhibit the establishment of native coastal prairie species. High priority invasive plants should be monitored and removed, such as jubata grass (*Cortaderia jubata*), eucalyptus (*Eucalyptus ssp.).* Harding grass (*Phalaris aquatica*) should be monitored and a control project should be considered if the spread of this species is impacting this property or surrounding properties. (NGE II, I-III)

Task 5, Enhance Woody Riparian Habitats: By in large, the woody riparian habitats on the West Branch of Struve Slough ESHA are in good condition. While some invasive plant species grow in their understory, native plant species, such dense sedge (*Carex densa*) and marsh baccharis (*Baccharis douglausii*). are found there as well. No enhancement is recommended for these areas at this time. However, the riparian areas on the Hanson Slough ESHA should continue to be enhanced.

The northern riparian area contains a seep in winter months, which provides much of the source water for Hanson Slough. Invasive plants, such as Italian thistle (*Carduus pycnocephala*) and bristly ox-tongue (*Picris echoides*), grow thickly throughout this area. The outer edge of the riparian area should be mulched with biodegradable wood chip mulch and replanted with native plant species, in order to diversify this habitat area.

The southern riparian habitat area within the Hanson Slough ESHA has received a significant amount of restoration and enhancement work. In 2005, this area was replanted with a mixture of coast live oak (*Quercus agrifolia),* wild rose (*Rosa californica*), California blackberry (*Rubis ursinus*) mugwort (*Artemesia douglausii*), coffee berry (*Frangula californica*), sycamore (*Platanus racemosa*), box elder (*Acer negundo*), willow (*Salix lasiolepis*), and elderberry (*Sambucus mexicana*). The understory was seeded with a seed mixture including meadow barley (*Hordeum brachyantherum*), red fescue *(Festuca rubra*), blue eyed grass (*Sisyrinchium bellum*), and several other species. While invasive plant species, such as bristly ox-tongue (*Picris echoides*), are still prevalent, thousands of hours of resource specialist, volunteer, and student labor have made a significant impact. And while many of the native plant species installed have survived, only certain species have successfully established and thrived on this site, including wild rose (*Rosa californica*) and California blackberry (*Rubis ursinus*). In order to provide beneficial riparian habitat in this area, the native understory should be diversified with additional plantings of native plant species, such as California bee plant (*Scrophularia californica*), California aster (*Aster chilensis*) and other flowering species.

In the northern end of the West Branch of Struve Slough ESHA a small oak woodland habitat area was planted in 2004. Oak trees (*Quercus agrifolia*), toyon (*Heteromeles arbutifolia*), and coffee berry (*Frangula californica*) were planted in 7 distinct clusters. Some of the oak trees and coffeeberry have done well in this location. The understory, however, is by in large composed of mostly non-native plants typical of the ruderal grasslands that surround the oak plantings. A long-term strategy to restore a

diverse native understory should be put into practice. There are several nearby reference sites for this work on east-facing slopes along Harkins Slough. (PVH – WRE – I – III)

Long-term Management Recommendations

Long-term stewardship on this site should aim to maintain beneficial habitat for a diversity of wildlife species, including ground nesting bird species such as mallard, teal, and burrowing owl as well as other open range associated species such as white-tailed kite, red-tailed hawk, and coopers hawk. The seasonal wetlands support California red-legged frog and other seasonal wetland associated species, and should be managed to promote their lifecycles. As the property supports a population of coyote, an important native predator for the Watsonville Sloughs, habitat for this species should be enhanced and maintained and managed so as not to overly impact this species.

Maintaining a property of this size in a manner consistent with meeting the long term goal of increasing native plant cover and maintaining beneficial wildlife habitat can present a financial challenge, due to the necessary personnel, equipment, and hand labor needs. It is therefore recommended that a rotational grazing program designed and managed to enhance habitat values and native plant communities, be evaluated for this site (task 7). A grazing program may also be a good fit for student learning opportunities at the high school, such as 4H programs. When managed correctly, rotational grazing has been seen to improve disturbed soils, promote native plant growth and recruitment through reduced end of year RDM and maintenance of a low vegetation canopy height during the growing season, and reduce seed-set and spread of invasive plant species. This type of activity may provide a long-term low cost management approach that serves to meet the habitat goals for the property. Consideration would need to be made for managing the livestock in sensitive habitat areas, such as the seasonal wetlands, tree and shrub buffers, and riparian areas. Consideration would also need to be made for the type of livestock used, fencing, and livestock interface with the trail as well as surrounding agricultural operations.

If a rotational grazing program is not utilized, an annual mowing regime will need to be in place, as well as annual removal of high priority invasive plant species throughout the habitat areas (task 8). This long-term stewardship should be done in conjunction with a scholastic program at Pajaro Valley High, such as a vocational training program or academic programs in resource conservation or ecology studies. The nursery at the Fitz Wetlands Educational Resource Center should continue to grow native plants for use in the long-term stewardship and enhancement of the native plant communities and habitats on the property.

Monitoring and Adaptive Management

Long-term monitoring of restoration practices and site conditions is important to understand the impact of efforts designed to enhance habitat and natural resource values. There currently exist short-term data sets for bird and plant populations that were required per the biological restoration plan developed for the property. Monitoring of these parameters should continue annually and be utilized to guide an

adaptive management process for habitat enhancement and management on the property. In order to do so, objectives must be established for monitoring parameters and consequential actions must be developed for resource allocation to respond to monitoring data. Students at the high school can play an important role in this process as a part of their study program. To begin, a survey of the stratified plant populations and habitat types should be conducted to determine the existing percent of native plant coverage. Once this study is completed, an adaptive management process can be developed to set objectives and corresponding actions for the establishment of percent of native plant species coverage for corresponding habitat units.

Project Implementation

Implementing all of the native habitat restoration and enhancement recommendations for this site, in conjunction with the trail construction may appear to be a daunting task for any public agency with little or no restricted or dedicated funds for this purpose. It is highly recommended that the natural lands stewardship program currently operating out of the Fitz Wetlands Educational Resource Center be continued and utilized to provide concurrent natural lands stewardship, job training, and scholastic educational opportunities for Pajaro Valley High School students and throughout the greater Monterey Bay region. It promises the opportunity to be the country's premier program of ecological restoration and resource conservation for high school students at a public institution. While many of the resource restoration and enhancement practice recommendations should be conducted in conjunction with soil disturbance activities associated with the trail construction, others can be conducted over time through a long term stewardship approach. This could effectively amortize costs over decades and maintain relatively low annual costs. Practices that should be conducted in conjunction with the trail construction are labeled as such on the budget spreadsheet for this project. These include the seeding of the trail edges with native grass and forb species as well as directly adjacent native grassland restoration practices.

Trail Construction and Easement Acquisition

In order to complete this trail segment, an easement or fee title acquisition will be required with a willing landowner. This acquisition offers the potential to increase the open space and habitat values surrounding the Pajaro Valley high property and add to the protected natural lands system developing in the Watsonville Slough Complex. The property directly to the north of the Pajaro Valley High property contains a slope wetland on the eastern side of the property. While there is no standing water, emergent wetland plants indicate a freshwater seep as is found on nearby slopes within the West Branch of Struve Slough watershed area. This wetland is a valuable component of the wetlands and associated uplands within the slough complex. If possible, through the process for acquiring the necessary land for the trail easement this wetland and the surrounding upland should be preserved and enhanced.

The property, adjacent to the previously mentioned property and also adjacent to Airport Blvd. is also a property of conservation value, given its proximity to both West Struve Slough and Harkins Slough. It is primarily composed of ruderal grassland habitat, which has value as open range habitat for associated

wildlife species. It is recommended that the preservation of the open space values of this site be explored in consideration of the property owner's interest. As there are significant habitat values within this region as well as significant blocks of preserved habitat, it is recommended that the City work with conservation organizations to continue to support the development of a protected open space reserve system on near-by properties in order to augment the existing natural lands and open space reserve system.

Restoration Plans for Existing Trail Segments

There are a number of important opportunities to enhance and restore native habitats throughout the existing trails network that should be initiated when they fit within the overall prioritization for trails vegetation maintenance and habitat stewardship or if supplemental funding becomes available. High priority projects include the extension of the wetlands habitat restoration work at the Ramsey park Nature Center downstream along Watsonville Slough, enhancement of the seasonal wetlands and associated riparian habitats north of Main Street within the Struve Slough area, the wet meadows and ruderal grasslands south of Main Street along Struve Slough, as well as the riparian habitats surrounding Tarplant Hill.

Watsonville Slough Habitat Enhancement Extension

The City has initiated a number of habitat restoration and enhancement projects along Watsonville Slough between where the slough crosses Main Street and where it flows underneath Highway 1. In light of this, a significant opportunity exists to extend previous work along Watsonville Slough at the Nature Center at Ramsey park and connect this habitat enhancement and wetland restoration effort with the work completed to date along Watsonville Slough adjacent to Highway 1. Several noteworthy projects should be completed within this reach, including enhancement of ruderal riparian habitats, enhancement of existing open range and grassland habitats, and removal of high priority invasive plant species, such as acacia and eucalyptus trees in conjunction with willow scrub or oak woodland habitat enhancement and restoration. There are a several parcels within this section of the slough currently in private ownership. Conservation easements on these parcels, used to facilitate habitat enhancement measures and preservation of open space, should be considered in order to expand the open space network around the trail system, multiply benefits for wildlife species, and improve hiking and other recreational activities.

Struve Slough Grassland, Wet Meadow, and Seasonal Wetland Enhancement

There are several ruderal grassland, wet meadow, and riparian habitats within the existing Struve Slough trails that would greatly benefit from enhancement measures. Most notably, the seasonal wetland just north of Main Street provides an opportunity to restore important riparian and wet meadow habitats while enhancing a seasonal wetland with the potential to support breeding of the California red-legged frog. Further north, toward Pennsylvania Avenue and across from Hope Park, there is a large seasonal wetland and grassland area that has been invaded by Himalayan blackberry, poison hemlock, and other non-native invasive plants that have reduced the diversity of plant species and degraded the habitat values in this area. Invasive plants should be removed from this area and native seasonal wetland, wet meadow, and grassland plant communities should be established. South of Main Street, there are ruderal wet meadow and riparian habitats that have been to a large extent invaded by invasive plant

species such as Himalayan blackberry and fennel. These plant species should be removed as a part of a greater habitat enhancement effort along Struve Slough. Wet meadow habitats should be enhanced through the removal of invasive plant species and the installation of native plants.

Pajaro Valley High Trail Restoration Project
Budget and Cost Worksheet

Restoration and Enhancement Practice Installation					Expense Projection Detail		
Task	Description	Estimated Practice Installation and Establishment Cost	Practice ID		One-time Implementation Expense (3 yr establishment period)	Ongoing Annual Expense (based on 10 yr projection)	Priority Rating
Task 1	**Trail Edge Habitat Installation ****	$7,500.00			$7,500.00		High
Task 2	**Enhance Priority I Native Grasslands**						
2.1	Enhance Priority I Native Grasslands		PVH NGE-I I				
2.1.1	Re-seed native grassland species (6 acres)	$42,000.00				$4,200.00	High
2.2	Enhance Priority I Native Grasslands	$5,000.00	PVH NGE-I II			$500.00	High
2.3	Enhance Priority I Native Grasslands	$5,000.00	PVH NGE -I III			$500.00	High
2.4	Enhance Priority I Native Grasslands	$5,000.00	PVH NGE-I IV			$500.00	High
Task 3	**Enhance Seasonal Wetland Habitat**						
3.1	Enhance Seasonal Wetland Habitat	$4,800.00	PVH SWE-I		$4,800.00		Medium
3.1.1	Hand-weed priority invasive plant species	$1,600.00			$1,600.00		High
3.1.2	Suppress re-sprout of invasive plant species with wood chip mulch	$2,200.00			$2,200.00		High
3.1.3	Install native plants to diversify habitat and reduce recurrence of non-native invasive plant species	$1,600.00			$1,600.00		Medium
3.1.3	Maintain native habitat plantings	$1,600.00			$1,600.00		Low
3.2	Enhance Seasonal Wetland Habitat		PVH SWE-II				
3.2.1	Remove Ranunculus repens (creeping buttercup)	$5,440.00				$544.00	High
3.2.2	Remove Rubis discolor (Himalayan blackberry)	$4,760.00			$4,760.00		Low
3.3.4	Remove Dipsacus fullonum (Fullers teasel)	$10,080.00				$1,008.00	Medium
3.3	Enhance Seasonal Wetland Habitat		PVH SWE-III				
3.3.1	Remove Ranunculus repens (creeping buttercup)	$2,720.00				$272.00	High
	Subtotal	**$99,300.00**			**$24,060.00**	**$7,524.00**	

Site Stewardship and Long Term Habitat Management					Expense Projection Detail		
Task	Description	Estimated Practice Installation and Establishment Cost	Practice ID		One time Implementation Expense (3 yr establishment period)	Ongoing Annual Expense (based on 10 yr projection)	
Task 5	**Enhance Priority II Grasslands**						
5.1	Enhance Priority II Grasslands	$1,440.00	PVH NGE-II I			$1,440.00	
5.2	Enhance Priority II Grasslands	$1,440.00	PVH NGE-II II			$1,440.00	
Task 6	**Enhance Woody Riparian Habitat**						
6.1	Enhance Woody Riparian Habitat	$27,600.00	PVH WRH-I			$2,760.00	
6.2	Enhance oak woodland understory and willow understory	$9,000.00	PVH WRH-II			$900.00	
Task 7	**Establish a Rotational Grazing Program**						
7.1	Install perimeter fencing	$12,000.00			$12,000.00		
7.2	Install internal fencing	$4,500.00			$4,500.00		
7.3	Manage native plant populations	$3,200.00				$3,200.00	
Task 8	**Manage and enhance grasslands to suppress growth of priority invasive plant species and provide beneficial wildlife habitat**						
8.1	Mow grassland annually	$3,840.00				$3,840.00	
8.2	Hand weed grasslands annually for priority invasive plant species, such as Eucalyptos, Acacia, Jubata grass	$1,280.00				$1,280.00	
Task 9	**Restoration Project Maintenance**						
9.1	Provide long term maintenance and stewardship on previously installed restoration and enhancement projects	$4,000.00				$4,000.00	
Task 10	**Monitor ecosystem health and success of practice implementation**						

10.1	Continue plant population monitoring along permanent transect lines to understand the change in native plant cover over time in relation to management activities	$1,500.00				$1,500.00	
10.2	Establish a monitoring program for gullies within West Branch Struve Slough to understand sediment deposition and its impact on aquatic species health and water quality	$1,000.00				$1,000.00	
10.3	Continue bird species population monitoring to understand impact of restoration activities on bird species populations and guide on-going ecological restoration	$1,000.00				$1,000.00	
Task 11	Invasive weed prevention program and eradication of newly established high priority invasive plant species						
	Subtotal	**$71,800.00**			**$16,500.00**	**$22,360.00**	

** Should be undertaken in conjunction with trail contrustion activity

Looking east over Harkins Slough

Section 5. Vegetation Maintenance, Management and Habitat Stewardship

In 2009, a vegetation and maintenance manual was completed for the existing wetland trails system for the City of Watsonville by the Biotic Resources Group. The existing maintenance manual provides the foundation for vegetation maintenance activities for theWatsonville Scenic Trails Network, however, there are several important additions to this plan that need to be made as the Watsonville Scenic Trails plan incorporates many habitat areas which are not currently a part of the wetland trail system. Notably, the habitat areas adjacent to the Pajaro River and Corralitos Creek, as well as several new larger open space properties, such as the Pajaro Valley High School ESHAs, present new habitat types, requiring new approaches to vegetation maintenance and management.

The existing, wetland trail maintenance manual provides many, still current, recommendations for management of invasive plant species, work scheduling and maintenance activity timing, as well as a program for varying management approaches. Detailed maps of existing plant populations are presented for the existing trail segments and adjacent habitat areas. These maps need to be amended and updated through the operations of a habitat stewardship program that is adaptive to current and future conditions.

In order to plan and implement a comprehensive strategy for vegetation maintenance and management, the geographic database for native and non-native plants and habitats should be updated annually. The 2009 maps of plant populations within the current trail system should be treated as a baseline inventory, but must be simplified and adapted to reflect habitat types which mirror varying habitat management approaches, as described in subsequent sections of this plan. It is also critical to establish a prioritization of invasive plant removal to guide resource allocation for management activities, as is described in the invasive plant section, which appears further in this document. It is critical, that mapping and monitoring be utilized to guide management, yet in order to do so, a mapping and monitoring approach must be developed that can be conducted within the regular work responsibilities for trails maintenance restoration specialists.

In order to develop recommendations for vegetation management and habitat stewardship for the Watsonville Scenic Trails Network, data was collected with a Trimble gps recorder on all trail segments

throughout the planning area between October 2011 and April 2012. A geographic database was developed for priority invasive plants through this process. Native plant species of special importance were also noted during field surveys, as were significant habitats and habitat impairment issues.

This section of the plan is divided into several sub-sections:

Section 5.1. Existing Habitats and Important Native Plant Populations

Section 5.2. Trail-Edge Management and Mowing

Section 5.3. Grassland and Open Range Habitat Management

Section 5.4. Habitat Restoration, Monitoring and Adaptive Management

Section 5.5. Invasive Plant Management

Section 5.6. Trail Vegetation Management and Trail User Safety

Section 5.7. Geographic Database Updates for Trails Vegetation Management

Section 5.1. Existing Habitats and Important Native Plant Populations

A key strategy for management of habitat adjacent to the Watsonville Scenic Trails Network is to preserve, support, and provide management actions which benefit existing native plant populations and significant native habitats within or adjacent to future trails. Through its regional approach, trails are planned to be constructed within and adjacent to a diversity of habitat types, including the riparian habitat corridors along Corralitos Creek, Salsipuedes Creek, the Pajaro River, the wetland and associated upland habitats of Watsonville Slough, Struve Slough, West Struve Slough, Harkins Slough, and Hanson Slough, as well as significant areas of coastal prairie habitat. The location of future trails should continue to be planned to preserve significant blocks of native habitat, while not overly impacting the values of these habitats to support native plant and wildlife species. Where easements or acquisition of land are needed for trails construction, larger conservation easements or fee title acquisitions should be pursued in concert with, efforts led by, local, State, and Federal conservation organizations that can support the development of a broader natural reserve system within the Pajaro Valley. The overall goal being to sustain and restore wildlife habitats, open spaces and environmental values and services found within the Pajaro Valley in a way which is supportive and complimentary to the working landscape in which they are found.

Resource allocation for habitat management and vegetation maintenance should give priority to sustaining and enhancing existing native habitats and plant populations throughout the trails system. The following provides an over-view of the existing native plant communities and management approaches which should be utilized to support these populations. A comprehensive habitat map of the Pajaro Valley can be found in the Watsonville Sloughs Conservation and Enhancement Plan, 2002, completed by Swanson Hydrology and the Biotic Resource Group for Santa Cruz County.

Coastal Prairie Habitat

The native grassland community in the Watsonville Sloughs system is defined as Coastal Terrace Prairie, and is characterized as a short grass prairie in which perennial bunchgrasses, such as California oat grass (*Danthonia californica*), Purple Needlegrass (*Stipa pulchra*), and Blue wilidrye (*Elymus glaucu*s), are often dominant species. Annual and perennial forb diversity is exceptionally high in this community, with over 200 different forb species, though this is not typically seen in the remnant coastal prairies of the Watsonville Slough System. The coastal prairie plant community typically grows on clay soils formed on coastal marine terraces that have moved inland and been uplifted over time. Coastal prairie habitat provides important habitat features for ground nesting and grassland dependent bird species, which is critically important in light of the loss of rangelands in the Watsonville Slough System over the past few decades, resulting in a loss of upland habitat for grassland dependent species. Many bird species have experienced declines over the last three decades of changes in land use patterns, and include burrowing owl, short-eared owl, northern harrier, horned lark, savannah sparrow, grasshopper sparrow and loggerhead shrike. Coastal prairie habitat and open range habitats also support a diversity of other grassland associated and dependent species such as white-tailed kite, golden eagle, red-shouldered hawk, red-tailed hawk, merlin, and sharp-shinned hawk. A description of management guidelines for coastal prairie species is found in section 5.4, which follows.

Coastal Prairie habitat supports the Federally listed threatened and State listed endangered Santa Cruz tarplant (Holocarpha macradenia), which occurs in several locations throughout the proposed Watsonville Scenic Trails Network. No trails are proposed through known existing or historic population locations. Populations of Santa Cruz tarplant occur at the Watsonville Airport, with a population of approximately 500,000 individuals recorded in 2012, and on open space parcels within a close proximity to a few of the proposed the trails., , These populations includ the Apple Hill population (351 individuals, 2003), the Tarplant Hill population (684 individuals, 2011), and an unconfirmed population near the future Buena Vista Park, off of Larkin Valley Road. Further information on this species, can be found within the City of Watsonville Scenic Trails Network Master Plan, 2012. Guidelines for management of this species are further described in the section 5.4, which follows.

Native Wet Meadow Habitat

Native wet meadows are a habitat type characterized by native plants which can grow in highly saturated soils and can sustain seasonal inundation during winter months. Typical plant species include sedge (Carex ssp.), rush (Juncus ssp.), and a variety of grass and herbaceous forb species. Native wet meadows provide critical habitat functions as transitional habitat between wetlands and uplands, and support a complex food chain. Within the trails planning area, the most significant wet meadow habitats include the habitats adjacent to the seasonal wetlands on the future Buena Vista park site, the wet meadows adjacent to West Branch Struve Slough on the Pajaro Valley High School property, and the Atkinson Lane pond.

Wet meadow habitats within the planning area are by-in-large impacted by invasive plant species. Invasive plant species management, such as hand removal and seasonal mowing within priority wet

meadow habitats should be emphasized in the habitat management program. Management actions to enhance wet meadow habitats also include additional plantings of native wet meadow species in conjunction with management of invasive plant populations.

Coast Live Oak Woodland Habitats

Coast live oak woodland habitats occur throughout the Watsonville Slough System, predominately on east facing slopes and in areas with sandier soil composition. Less common on the coastal terraces surrounding the sloughs, oak woodlands are more common in the foothills of the Pajaro Valley and the northern and western portions of the planning area. Known for high ecological diversity and valuable wildlife habitat, woodlands are characterized by the presence of coast live oak (*Quercus agrifolia*), coffee berry (*Frangula californica*), elderberry (*Sambucus mexicana*), and a diversity of understory species, such as hedge nettle (*Stachys adjugoides*), yerba buena (*Satureja douglasii*), and wake robin (*Trillion ssp*.). These diverse habitats are supportive of a number of important wildlife species, including nesting raptors such as white tailed kite, amphibians such as long-toed salamander (*Ambystoma macrodactylum),* and mammal species including gray fox (*Urocyon cinereoargenteus*).

Throughout the planning area, oak woodland habitat is impacted by the presence of invasive plant species, the most common of which are french broom (*Genista monspessulana*) and Eucalyptus (*Eucalyptus ssp.).* Enhancement opportunities for these habitats should focus on control of invasive plant species and limiting of other invasive plants which do not presently occur but could have a major impact, such as vinca (*Vinca major*), and others.

Seasonal Wetlands

A variety of seasonal wetlands occur throughout the planning area, including freshwater open water habitat, freshwater marsh habitat, seeps, springs, slope wetlands, vernal pools, and salt marsh habitat. As a center of biological diversity and a critical habitat within the Pajaro Valley, seasonal wetlands should be preserved, enhanced, and restored where possible. Seasonal wetlands provide important habitat for a wide range of wildlife species, including several State and Federally listed threatened and endangered species as well as State listed species of special concern. These species include, the California red-legged frog (*Rana aurora draytonii*), Western pond turtle (*Actinemys marmora),* and a variety of marsh and wetland associated bird species, such as the tri-colored blackbird (*Agelaius tricolor*).

Vegetation and habitat maintenance and stewardship should be conducted with sensitivity to wildlife species associated with seasonal wetlands and their lifecycle needs. By in large, a qualified biologist, or knowledgeable trails restoration specialist, should assess maintenance and restoration work within seasonal wetland habitat prior to and during the course of practice implementation. When working in these areas, use of equipment should be planned so as to not impact these species Guidelines for work in within these habitats include conducting surveys for sensitive species prior to beginning work, setting mower heights at minimum 6” inches above the ground, operating machinery at a slow pace in order to give wildlife an opportunity to move out of the way of equipment, and proper staging of equipment.

Woody Riparian Habitat

Important woody riparian habitat can be found in the drainages of upper Harkins Slough and adjacent to Corralitos and Salsipuedes Creeks, as well as along the length of most of the Pajaro River. While much of the woody riparian habitat has been impacted by adjacent land use activities, such as encroachment and clearing of vegetation for flood-control purpose, as well as invasive plant species, significant woody riparian habitat exists within the planning area for the Watsonville Scenic Trails Network supporting a wide range of wildlife species, including California red-legged frog, and a diversity of riparian associated bird species including the yellow warbler (California bird species of special concern).

Enhancement within the existing riparian corridors should focus primarily on invasive plant removal, as a means to enhance the understories and structures of these habitats. The riparian corridors along the Pajaro River and Corralitos and Salsipuedes Creeks are greatly impacted by invasive tree and herbaceous species, such as Eucalyptus (*Eucalyptus ssp*.), Acacia (*Acacia ssp*.), and Giant Reed (*Arundo donax*). The greatest impact however, is most likely from Cape Ivy (*Delaiera odorata*), which grows throughout these waterways, greatly impacting its habitat values. Throughout the slough system, woody riparian habitats are dominated by arroyo willow (*Salix laesolepis*), and are also impacted by invasive plant species, such as Himalayan blackberry (*Rubis discolor*), poison hemlock (*Conium maculatum*) and english ivy (*Hedera helix*). Control strategies for these species are listed in section 5.3 below.

Restoration of riparian habitat along Corralitos Creek, Salsipuedes Creek, and the Pajaro River has the potential to greatly improve the riparian corridors for both terrestrial and aquatic species, as well as water quality within the planning area and should be explored in conjunction with trails easement acquisition and other complimentary planning efforts.

Prioritizing existing habitats for management actions

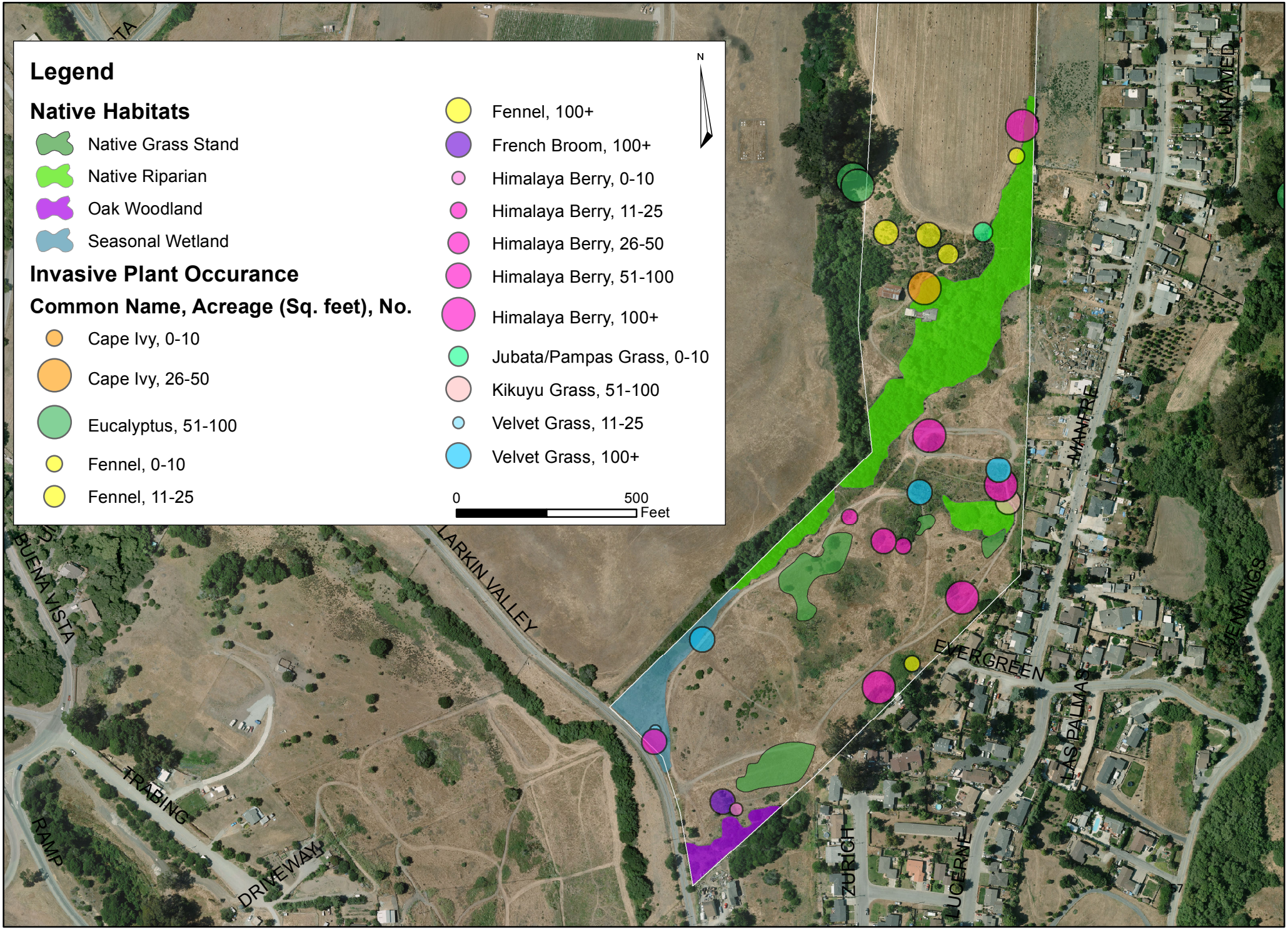
As trail segments are constructed, habitat units should be mapped in order to develop an understanding of the existing habitat resources, the invasive plant species present, and the opportunities to enhance and restore habitat. Understanding these elements will lead to a more effective conservation approach with greater species benefit.

For example, an assessment of the habitat resources of the future Buena Vista park identified stands of coastal prairie habitat, which were previously unknown. Management strategies for this property should be developed which prioritize the enhancement of these populations, as well as the riparian and freshwater marsh habitats. Secondary actions should include enhancement and restoration of a native under-story within the oak woodland community which occurs on the south western portion of the property. A map of this property is found on the following page.

Section 5.2. Trail-Edge Management and Mowing

Managing the trail system for recreational walkers, hikers, and bicyclists requires regular mowing of a 2 foot minimum width on each side of the trail, in order to keep vegetation from encroaching on to the

Future Park, Trail Segment 4.2
Figure 8. Existing Conditions



trail, reducing the width of the trail and impacting the trail user experience. Trail edges should be mowed 2 – 4 times during the growing season, depending on the type of vegetation growing along the trail, as well as seasonal weather conditions. Occasionally plant seedlings will develop within the edge of a trail as the edge of the trail degrades over time. Seedlings should be flamed with a flame torch during rain events or when there is sufficient moisture on the soil and in the air to support this activity.

Defining the trail edge mowing as distinct from grassland and open spaces is critical to the success of the habitat management program. For each trail that is constructed, a mowing plan should be developed which clearly defines trail edge mowing and grasslands and meadows which should be mowed seasonally. While trail edges should be mowed throughout the season, grasslands, meadows, and woodland understories should be mowed in only a limited way during the bird nesting season in order to promote nesting .

The height of the trail edge mowing will likely be determined by the type of equipment in use. However, to the extent practical, the mower blade should be set at least three to four inches above the soil surface in order to avoid wildlife impacts. Mowing trail edges slowly, while important for effective equipment operation and safety of trail users, will also allow for reptiles, amphibians, and other wildlife to avoid the mower. A flail mower is preferable to a brush cutter or rotary mower, as a flail mower will leave the plant material in smaller pieces that will breakdown more readily and are less likely to lead to the buildup of thatch.

As trails are built, particular concern should be given to the establishment of low growing native plants that respond well to repeated mowing. Native plants such as purple needle grass (*Nassella pulchra*), slender needle grass (*Nassella lepida*), California oat grass (*Danthonia californica*), Hill-dweller sedge (*Carex tumilacola*), California poppy (*Escscholzia californica*), Yarrow (*Achillea millefolia*), California buttercup (*Ranculus californica*), wavy-leafed horkelia (*Horkelia cuneata*), and many others would perform well for this use. Native plants should be established with a drill seeder, broadcast seeder, or hydro seeder, and careful attention should be made to ensure sufficient seed to soil contact for proper germination. Maintenance during the establishment period for this trail edges is of particular importance and will result in an annual cost savings for trail edge mowing, due to savings in one to two cuttings per year, while also creating established trail corridors that can enhance surrounding habitat areas with well-formed bands of native grassland habitat providing a seed source for other habitat areas.

Section 5.3. Grassland and Open Range Habitat Management

Grasslands and open range habitat within the planning area can be divided into relatively intact coastal prairies, defined by at minimum 5% cover of native plant species, and ruderal grasslands, which lack native plant species cover. Because management of each type of grassland differs, management must be defined first through a survey of the specific grassland in order to determine plant species composition and identify any native plant populations. It is important to note that both invaded ruderal grasslands and native coastal prairies serve critical functions and value to wildlife populations.

Ruderal Grassland Management

Ruderal grasslands are characterized by non-native grassland species, typically found on the site as a result of past disturbance such as prior agricultural use, prior planting of pasture mixes, or over-grazing. Typical species found in ruderal grasslands include, wild radish (*Raphnus sativa*), mustard (*Brassica ssp*.), bristly ox-tongue (*Picris echoides*), Italian thistle (*Carduus pycnocephala*), bull thistle (*Cirsium vulgare*), and Italian rye (*Lollium multiflorum*).

Management of ruderal grasslands should be driven by goals and objectives for each type of grassland. When restoration of coastal prairie is planned for a future date, management of thistle and other broadleaf weeds should be a primary goal, as these will make future seedling establishment of native grasslands more difficult. If no restoration will occur, the primary management consideration should be wildlife use of that site, in particular bird use and nesting. A secondary goal would be management of invasive plants of regional importance to reduce their presence and spread to near-by grasslands or habitat areas.

In cases where reducing large stands of ruderal species such as poison hemlock (*Conium maculatum*), wild radish (*Raphnus sativa*), and Italian thistle (*Carduus pycnocephala*) is desired, sites should be managed to reduce the target non-native plant seed bank. This is best accomplished by repeated mowing of these species just prior to seed set, when the plant has maximized its resource expenditure for seed production, but the seed is not yet viable. Some species that are perennial or biennial, such as bristly ox-tounge, (*Picris echoides*) or Harding grass (*Phalaris aquatica*) will not respond as favorably to an intensive mowing regime. Alternative practices, such as hand removal of small stands or rototilling in the fall have shown to be successful.

Coastal Prairie Management

Though rare, native coastal prairie habitat does exist within the Watsonville Scenic Trails Network. Management of coastal prairie habitats should utilize intensive mowing or grazing in order to ensure low residual dry matter at the end of the growing season, while providing the conditions necessary for re-seeding of native grass and forb species. Mower height and frequency of mowing should be determined depending on the particular native and non-native plant species within the coastal prairie habitat area.

In both ruderal and native grasslands, perennial invasive plant species are particularly important to keep from establishing. Harding grass (*Phalaris aquatica*), tall fescue (*Festuca arrundinacea*), Jubata grass (*Cortaderia jubata*), sweet fennel (*Foeniculum vulgarae*), perennial pepperweed (*Lepidium latifolium*), and French broom (*Genesta monspesulan*a) are examples of high priority invasive plant species that should be the focus of long-term management efforts. Invasive tree and shrub species such as species of eucalyptus and acacia are also of high concern, as these can dramatically alter the habitat quality and type of a grassland community.

Management for the Santa Cruz tarplant (Holocarpha macradenia), if found to be present, or re-introduced, should be done in a targeted way, in consultation with the California Department of Fish and Game and the U.S. Fish and Wildlife Service, as this species requires a specific management

approach both for maintaining and increasing above ground expression and for stimulating soil seed bank recruitment. It is recommended that the City, in collaboration with conservation agencies such as the Watsonville Wetlands Watch , work with the above listed agencies to develop both a long term strategy for management of Santa Cruz tarplant as well as a research program for success monitoring and adaptive management. This type of program would have local and regional benefit, in particular if conducted in coordination with other agencies managing this species within the Watsonville Slough System watershed and the Elkhorn Slough System watershed.

General Guidelines for Grassland Management

When managing grasslands, there are instances in which competing interests of providing ground nesting and wildlife habitat varies from the needs of native grassland establishment, such as keeping low grass height in order to allow sufficient sun-light penetration to establishing native grasses or forbs. Any management actions focused on increasing cover of desired species and decreasing cover of undesirable species should be developed with consideration of the phenology of the target plant species, as well as the life history of the target wildlife species. Grasslands with high percentages of non-native grasses or herbaceous plants such as wild radish (*Raphnus sativa*), poison hemlock (*Conium maculatum*), or various thistle species, must often be mowed repeatedly and selectively in order to shift them to a more native plant community. When possible, mowing should be accomplished prior to the nesting period. As this is often not possible, due to weather or management needs during the nesting season, early mowing will give a greater opportunity for repeated nesting in the case of nest disturbance. In all cases, for mowing during the nesting season, a nesting survey should be conducted prior to mowing, and mowing should be more selective than before and after the nesting period. It is also recommended to select several areas, regionally, on an annual basis to not mow, as undisturbed tall herbaceous cover can still provide valuable nesting habitat for certain bird species, such as mallard, teal, red-winged blackbird, and song sparrows.

In order to implement an effective grassland management program, it is important to define specific goals for habitat areas, allowing for cost effective and focused management. For example, enhancement of native grasslands should strive for high percent cover of a diversity of native grass and forb species. Targeted percent cover for native grassland habitat of significant value should be set on a case by case basis once a baseline inventory of species present and percent cover of native species present is established. An excellent target for success would be a watershed-wide goal of maintaining a minimum of 15% - 2% cover of native plants within the grassland over time for any stratified coastal prairie habitat that has not been seeded.

Section 5.5 Habitat Restoration, Stewardship, Monitoring and Adaptive Management

Restoration of native habitats through the planting of native plants in discrete habitat units is an important strategy to improving the over-all habitat conditions of the trails master planning area. As a result of a long history of farming in the Pajaro Valley, much of the original riparian, grassland, and woodland habitats have been disturbed and in many areas, significant native habitat resources have been lost. Establishing highly diverse native habitat areas can provide an important seed source that,

when coupled, with other management strategies, such as invasive plant management, can aid in the spread and recruitment of native plant species to new habitat areas. Native plant recruitment into areas where invasive plant populations are removed is a critical component of the habitat restoration strategy. If no native plant populations exist to replace invasive plant populations, an invasive plant treadmill is created, where one invasive plant replaces another. In these instances, establishing blocks or sections of diverse native habitats enables management to focus on managing for the lifecycle and habitat needs of the native plant and native habitat community, rather than a sustained approach against a long list of invasive plant species.

Locations and zones for habitat restoration should be developed as trail segments are built, with consideration for life-cycle needs of the native plant species, as well as dispersal means for each species. Wind and water dispersal are both common dispersal method and generally suggest placing habitat planting areas upstream and upwind of a desired habitat establishment location.

Methods for installation of native plants will vary widely for each habitat type. Riparian habitats, oak woodland habitats, and native grassland habitats will all require different installation strategies. Prior to the initiation of any habitat restoration project, a restoration plan with goals and objectives should be established in order to guide implementation and provide a basis for a monitoring and adaptive management process. A critical factor in determining whether to begin a habitat restoration project is the assessment of nearby invasive plant populations and the likelihood that an invasive plant population will move into the restored native habitat.

Guidelines for Establishing Native Grasslands:

Native grassland restoration sites should be selected based on their likelihood of success, which takes in to account two key factors: existing plant community supportive of conversion to native grassland (lack of highly aggressive invasive plants – in particular perennial native plants), and proximity to invasive plant populations that can move into the restored grassland. Appropriate soil composition and moisture levels are primary factors as well.

There are several ways in which ruderal grasslands can be managed prior to seeding with native grass and wildflower seed. Non-native plants, particularly broad-leaf invasive plant species, should be mowed repeatedly to reduce the presence of their seed in the soil seed bank. A native seed mix should also be developed with an understanding of the soil type in which it will be utilized.

Prior to seeding, the site should be disced or roto-tilled to prepare a weed-free seed bank. The native grass and forb should then be either drill seeded or broadcast seeded and then incorporated into the top inch of the soil profile with a culti-packer or ring roller in order to ensure sufficient seed to soil contact prior to the onset of rains or just after the first rains. If the seed is sufficiently incorporated into the soil, no mulch will be required. If seed cannot be incorporated into the soil a straw mulch should be utilized to protect seed from predation by birds as well as to sustain soil moisture in between rain events. Maintenance of the restoration practice for at least the first three years is critical and will require a combination of mowing and hand weeding to ensure good establishment of the seeded native species.

Use of Native Seed and Plant Material

Locally-sourced native seed and plant material, specific to the watersheds of the Pajaro Valley should be utilized whenever possible, as the local genetic material is most adapted to the unique coastal environment. Use of plant material from other watersheds can serve to dilute the local genetic pool, reducing the long term likelihood of success for any native plant installation project. The use of local genetic material is also an important means to both conserve and enhance the local genetic resources of native grassland species in the Pajaro Valley and greater Monterey Bay.

Monitoring and Adaptive Management

An important component of any habitat restoration program is the evaluation of program effectiveness and allocation of resources. Monitoring should be accomplished in the following ways:

1) A daily log of vegetation maintenance and habitat restoration activities for trails restoration specialist and field staff should be kept so that a clear understanding of resources allocated for maintenance activities can be established. Annually, the work log should be analyzed to determine resources spent on various activities.

2) Permanent transect lines for plant population monitoring should be established prior to any restoration activities or enhancement activities, and be maintained during and after construction in order to evaluate the projects effectiveness.

3) Permanent photo monitoring stations should be utilized prior to, during, and after construction and maintenance in order to document and record existing conditions and progress towards meeting a projects' goals.

4) Wildlife monitoring, such as with a baseline survey by a qualified biologist, wildlife cameras, or the establishment of point count or transect monitoring for bird populations should be established in order to document project impact, as well as to aid in determining the impact of restoration activities on wildlife species prior to construction. Long-term monitoring and project specific monitoring can utilize the Project Tierra database, a citizen science database established by Watsonville Wetlands Watch, to facilitate environmental monitoring in the Pajaro Valley.

For the purpose of the trails master planning area, both monitoring and adaptive management need to be scaled to a level reasonable with project staffing availability. While a full-scale adaptive management plan may not be utilized for all actions, the following areas warrant the development of an adaptive management framework that is location and project specific:

1) Management of habitats for threatened, endangered, or listed species of concern, such as in stream woody debris and sufficient water levels for steelhead trout or expression of Santa Cruz tarplant and a corresponding need for seed bank recruitment efforts vs. above ground habitat manipulation.

2) Effectiveness of invasive plant removal strategies.

3) Effectiveness of habitat restoration processes and methods.

Utilizing an adaptive management and monitoring approach is critical to effective resource allocation for the trails habitat maintenance and stewardship program.

Section 5.5. Invasive Plant Management

Invasive plant management is a high priority component of habitat management within theWatsonville Scenic Trails Network. Successful implementation of an invasive plant management program should build off of the existing invasive plant management programs within the Watsonville Slough System and should leverage partnerships with landowners, agricultural operators, local, State, and Federal agencies whose jurisdictions or operations are impacted by the presence of invasive plant species and whose operations may impact the spread and distribution of these species.

The most critical component of an invasive plant management program is prevention of the spread and establishment of invasive plant species. For operators of the trails habitat vegetation management program, it is critical that the spread of terrestrial and aquatic invasive plant species is prevented by fully and properly cleaning equipment, such as mowers and tractors, after use within areas where invasive plant species are growing. Workers should be trained on the identification of priority invasive plant species, so that they can be sure not to spread these species, or so that they can respond to an early infestation of these species. It is critical that other agencies working within the region operate with similar concern for this issue, such as Santa Cruz County Public Works, Santa Cruz County Mosquito Abatement Authority, Pajaro Valley Water Management Agency, and others. Education to the public about this issue is important as well, as the general public can inadvertently spread these species.

Possible vectors for the spread of invasive plants include: vehicles, equipment such as mowers, straw mulch, wood chip mulch, soil, gravel, boots, clothing, horticultural plants that spread to nearby habitat areas, boats, kayaks, waders, fishing equipment, and the dumping of aquariums into local waterways.

No program aimed at preventing the introduction of invasive species can ever be 100% effective, so it is important to detect any introduction while it is still relatively small and manageable. Because many invasive plants can spread substantially in a single year it is best if surveys for detecting newly introduced invasive be conducted annually. Surveys are typically best conducted in spring and early summer for terrestrial plants, and mid-summer for aquatic plants. Surveyors should be familiar with all the plants both native and non-native that currently occur in the survey area. In addition, surveyors should be aware of some of the invasive plants that occur in similar situations and nearby areas of California. Any plants found that cannot be identified in the field should be collected and analyzed to determine the species. Careful records, using a gps recorder, should be kept to document the location of any weeds that are determined to be new introductions to the area surveyed.

It is particularly important to catch aquatic weeds as early as possible. Aquatic weeds are much more difficult to control than terrestrial weeds and they can grow at an incredibly rapid rate in warm weather. Aquatic weeds that are mostly submerged, such as Hydrilla (*Hydrilla verticillata*), can be very difficult to

spot, Additionally, some areas of the sloughs have limited access and can only be monitored or observed by boat. In 2010, a small population of water hyacinth was identified in Struve Slough and removed by a Santa Cruz County Mosquito Abatement Control officer. Had this gone unnoticed, it would have created a far more substantial and costly problem. Similarly, in Freedom Lake, a small population of water hyacinth was noticed but not removed. Within four years, hyacinth had covered the entire lake, with little opportunity to address the problem as the cost of treatment and removal grew to exceed one million dollars. The result of an analysis of invasive plants that do not currently occur within the Pajaro Valley but are most likely to appear is found in Appendix A.

Once invasive plant populations have become established, as they have throughout the Watsonville Scenic Trails Network, on-going consideration should be given to the prioritization of removal of these particular invasive species . Each weed species must be evaluated for impact on the environment, potential to spread to new areas, and feasibility of eradication. Often it is most effective to attempt to contain the spread of a weed species by giving a priority to smaller outlying populations rather than large central populations, as well as focusing on removing invasives from areas that have a relatively high percentage of native plant cover. The surrounding native plants may be able to colonize the areas of invasive removal making them more resistant to reinfestation. Higher priority should be considered for invasive plants in areas that threaten rare native species such as Santa Cruz tarplant (*Holocarpha macradenia*) or red-legged frog (*Rana aurora draytonii*). Native plant communities that are considered relatively rare and to have high conservation value should also be considered as high priority for protection from invasive plants.

Utilizing these factors for consideration of resource allocation to an invasive plant management program, the following are recommended actions for the trails master plan segments. While these recommendations will need to be considered alongside the over-arching trails construction process and timeline, they provide a framework or assessing the current state of invasive plant species and prioritization of management actions.

Invasive Plant Management Strategies within the extent of the Watsonmville Scenic Trails Network:

Establish a control strategy for Cape Ivy (Delearia odorata):

Cape ivy is a highly invasive weed species that is found growing densely throughout much of Corralitos Creek and the Pajaro River trail segments. Cape ivy is also found in limited distribution within the slough system. Due its ability to climb aggressively and severely degrade riparian habitat and biological diversity, it is recommended that a control strategy be employed, which prioritizes opportunities to impact the extent of this species in consideration of resource allocation and availability.

A control strategy should be employed that: 1)Eliminates outlying populations within the Watsonville Slough System; 2)Continues the removal of this species and works to keep it from re-establishing at the Pajaro River Park behind the Water Resources Center; 3)Initiates removal of outlying populations along the Pajaro River and Corralitos Creek as well as removal of top growth and canopy growth of low and

moderate infestations in order to benefit habitat resources in a manner consistent with available funding.

Priority 1: Eliminate outlying populations in the Watsonville Slough System, before these populations increase. Four outlying populations of cape ivy exist within the slough system, including two on Harkins Slough, one population on Watsonville Slough, and a fourth population on upper Struve Slough. These populations should be first removed by hand, with all above ground material bagged. A follow up treatment of herbicide, sprayed by a licensed applicator with a chemical approved for use within wetlands should be utilized as a follow-up treatment. These populations should be monitored annually once treated.

A map of cape ivy distribution within the planning area is found on the following page. A full set of maps of cape ivy occurrence within the Pajaro River and Corralitos Creek riparian corridors is provided in Appendix A.

Priority 2: Maintain the efforts to remove the population of cape ivy along the Pajaro River adjacent to the City WaterResources Center, initiated in 2009

An ambitious program of control of cape ivy was initiated as a part of the creation of the new park along the Pajaro River adjacent to the City of Watsonville Water Resources Center. As an important park and kayak launch for the area, the on-going use of this park depends on the successful control of this species and the enhancement of native riparian habitat that is conducive to park visitation. A map of the distribution of cape ivy surrounding the Water Resources Center is found on the following page.

Giant Reed (Arrundo donax)

Giant Reed is a highly invasive plant species, native to east Asia and Africa, introduced to Southern California in the 1800's for erosion control and roofing material, it can severely impact riparian habitats and eliminate native plant communities. Due to the relatively small distribution of this species within the trails planning area, it is recommended than a comprehensive approach be undertaken for the removal of this species which 1) Removes the two known outlying population of Arrundo donax within the Watsonville Slough System 2) Removes occurrences near valuable habitat areas, on the Pajaro River adjacent to the City Water Resources Center3)Removes populations upstream before downstream removal is addressed. *Priority 1: Remove Arrundo donax population within the upper Struve Slough area, as this is the only population of this species within the slough system.*

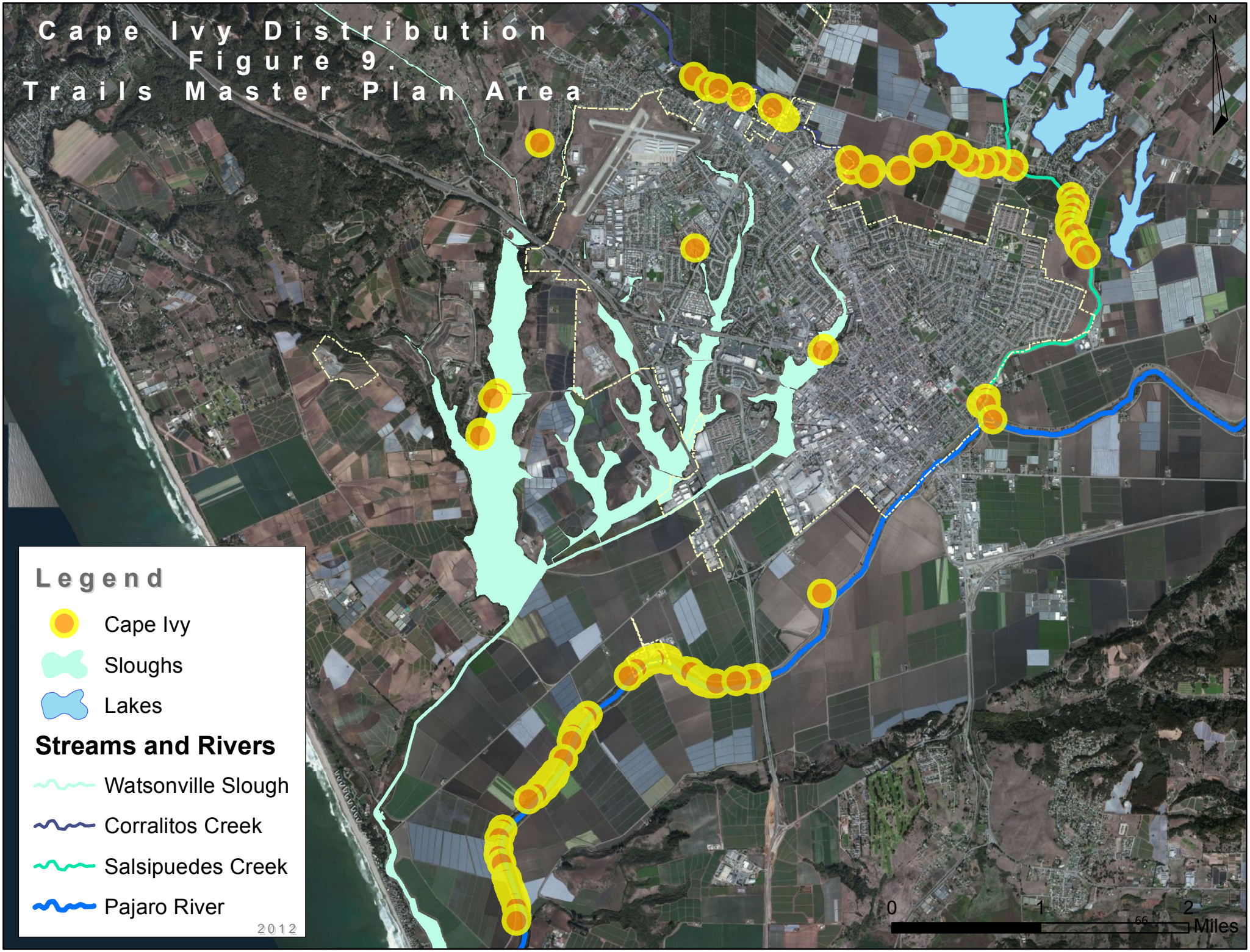
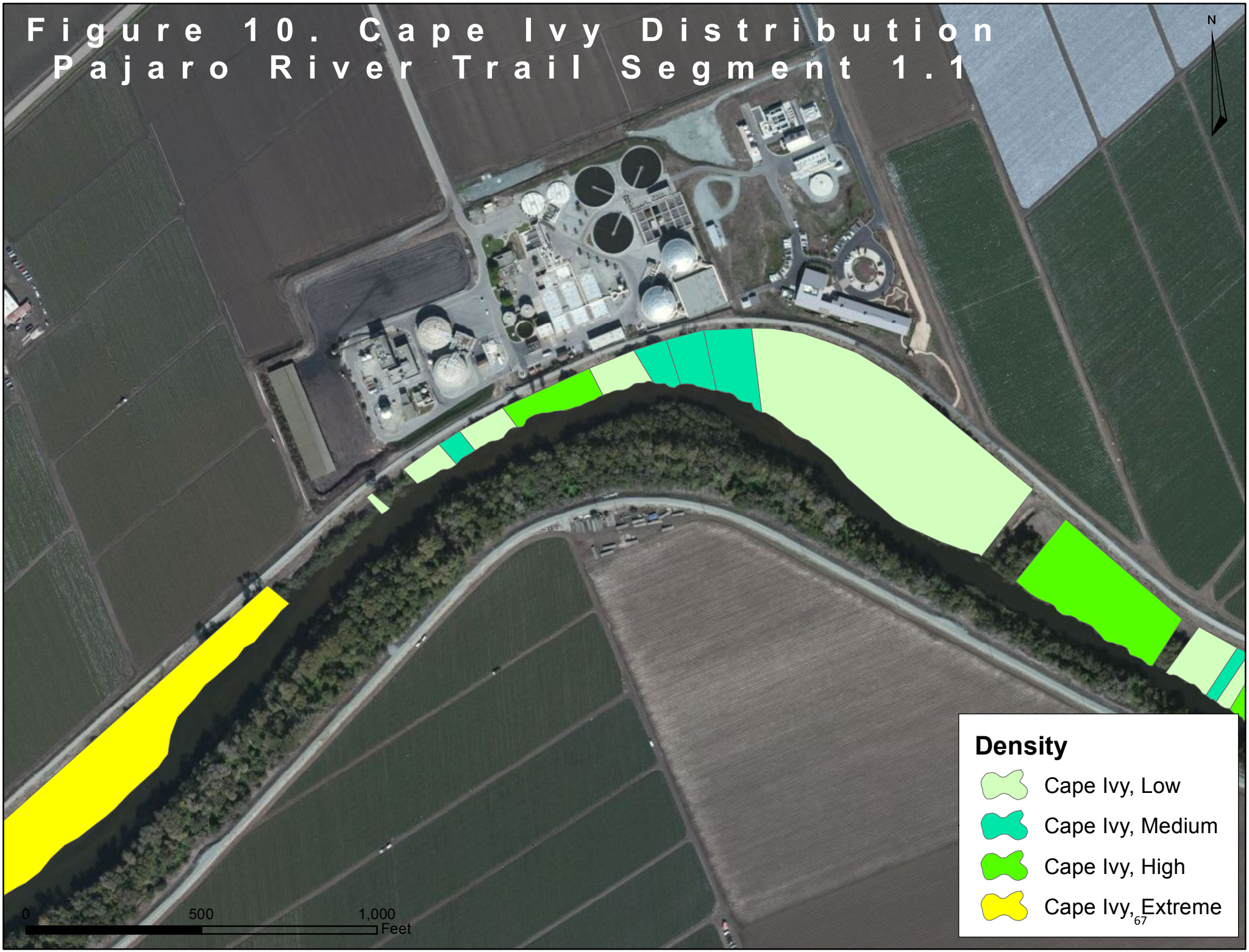

Cape Ivy Distribution
Figure 9.
Trails Master Plan Area
N
Legend
Cape Ivy
Sloughs
Lakes
Streams and Rivers
Watsonville Slough
Corralitos Creek
Salsipuedes Creek
Pajaro River
2012
0
1
2
Miles

Figure 10. Cape Ivy Distribution
Pajaro River Trail Segment 1.1



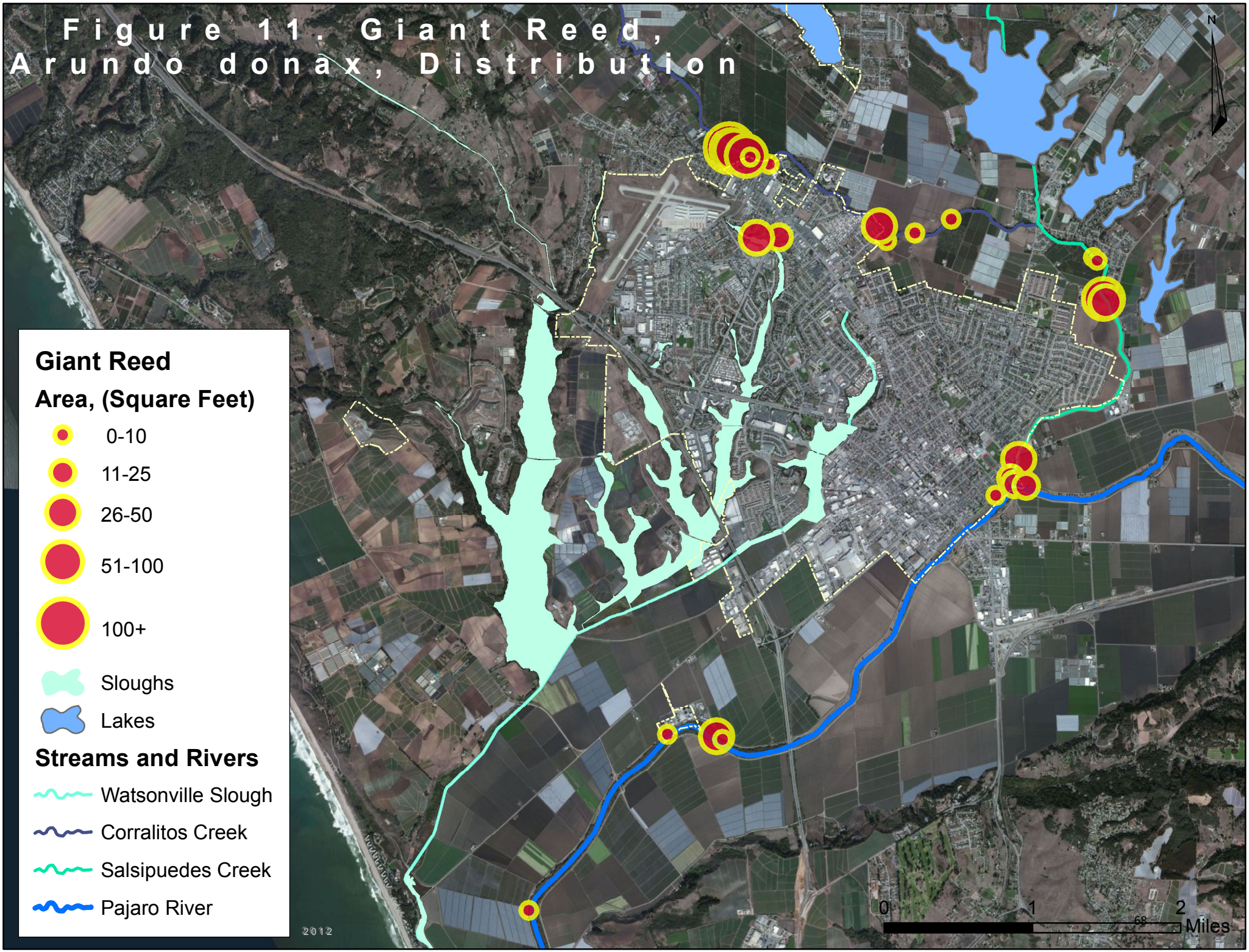


Figure 11. Giant Reed, Arundo donax, Distribution
N
Giant Reed
Area, (Square Feet)
0-10
11-25
26-50
51-100
100+
Sloughs
Lakes
Streams and Rivers
Watsonville Slough
Corralitos Creek
Salsipuedes Creek
Pajaro River
2012
0
1
2
Miles

Priority 2: Remove occurrences of this species adjacent to the City of Watsonville WaterResources Center, where habitat restoration along the Pajaro River is underway.

Priority 3: Remove the population of this species downstream of the City of Watsonville WaterResources Center, as the upstream populations along the Pajaro River, near the confluence with Salsipuedes creek will likely be removed during the Santa Cruz County Pajaro River bench excavation project (planned for 2012 and 2013).

Priority 4: Remove outlying populations of this species along the Corralitos creek corridor

Priority 5: Begin a comprehensive project to remove this species from Salsipuedes and Corralitos Creek beginning near the confluence of Salsipuedes Creek and the Pajaro River and working upstream.

Additional Invasive Plant Species:

Both cape ivy and giant reed are limited in their distribution, by-in-large, to the areas shown in the maps provided in this document. Most other priority invasive species have wide ranging distributions within the watershed, increasing the difficulty of a control strategy and necessitating a program that works with partner agencies to leverage resources. Control strategies should be determined utilizing the principles articulated in this document, as trail construction is phased in over time.

When possible, timing of invasive plant removal activities should coincide withthe times in which equipment is in use and disturbance activities are occurring during trails construction. Conducting invasive plant removal activities at these times in particular in the case ofs larger invasive tree removal projects or large scale habitat understory enhancement projects involving the removal of large growth of invasive plants such as Himalayan blackberry and others will maximize the impact of the work with the resources available

Section 5.6. Trail Vegetation Management and Trail User Safety

It should be noted that there is a direct correlation between certain habitat density and trail user safety, in particular with willow scrub and other dense riparian habitats. Dense trail-side vegetation can provide a place for people to hide and present trail user safety concerns. It is important that trails maintenance activities be conducted on an on-going and as needed basis to support trail user safety by: 1) Maintaining visibility along trail corridors, 2) Opening up visibility into areas which provide a safety concern for trail users. Consideration must, however, be given to the timing of this activity. A survey by a trained biologist should be conducted prior to any clearing of vegetation and brush during the nesting season in order to ensure that no nests are disturbed by trail clearing activities. Habitat for other special status or sensitive wildlife species should be considered and impacts avoided, such as wood rat nests, bat roosting locations, or fox and coyote dens.

In order to keep the trails clear of safety hazards and maintain the trails open for the public, maintenance of trails vegetation should be done in accordance with the following work plan:

Table 1. Trail Maintenance Activities and Frequencies

Item	Estimated Frequency
Inspect trails	1 x per week
Remove fallen trees	As needed
Trail tread filling and maintenance	1 x per year, or as needed
Fence repair, replacement, or removal	As needed
Tree and shrub pruning if encroaching on trail	2 x per year
Bench sitting area maintenance	3 x per year
Trail edging repair or replacement	As needed
Post signs for flooded trail segments	As needed
Maintain and repair drainage structures	1 x per year
Maintain and repair special structures	1 x per year
Trail edge mowing in accordance with annual mowing plan	3 x per year, or as needed
Fuel load reduction of vegetation	1 x per year, or 2x per year if vegetation conditions present hazards
Restoration of native habitats and natural resource management and improvement	On-going
Keep trails maintenance log up to date and current	On-going

Section 5.7. Geographic Database Updates for the Trails Master Plan

It is important to have a geographic database that can be updated annually so that it reflects current conditions and can be utilized to guide annual management activities as well as document changes in plant populations. Trails restoration specialists should be trained in gps monitoring and utilize a regular and annual monitoring program. Because allocating the time for this task can be difficult, it is critical to establish a prioritization for species management, and utilize the GIS database for those species which can be easily recorded and whose presence in maps can be useful to guide management activities. These species include: cape ivy, giant reed, acacia, jubata grass, french broom, and other high priority species. Mapping of ruderal weedy species, can be useful if the goal is to target control of particular species. However, monitoring of these species will likely not result in a change of management approach and therefore the value of species specific monitoring in this instance should be weighed. It is recommended that, as a top priority, resources be allocated to maintaining the GIS database for priority invasive species, as well as for documenting locations of new invasive plant species that the trails restoration specialist needs to return to. As the trail system grows, so will the need to utilize the geographic database for project planning, monitoring, and management.

Extending the Watsonville Scenic Trails Habitat Network: Nature Parks and Native Landscaping

A foot path along Corralitos Creek

Throughout the City, in areas adjacent to the wetlands, natural habitats, greeways, and open spaces, there are a variety of places in which the creation of natural landscapes with a place-based design approach could provide additional benefits to the ecological and urban landscape. One way to achieve this is by utilizing native plants in commercial, industrial, and residential landscapes as a part of a low-impact development strategy and urban beautification projects. There are also opportunities to develop nature parks that offer all of the amenities of the City's current park's system but create dynamic habitats and ecosystems.

Native Landscaping

Throughout the City, residential, commercial, and industrial developments are surrounded by the Watsonville Slough System and natural habitats of the Pajaro Valley. Utilizing native plants in landscaping is an important strategy of low impact development and reducing a building's carbon footprint, while creating a landscape that supports the surrounding natural ecosystems. Native plants, used in green-roofs, bio-swales, and storm-water detention ponds can be valuable ways to clean urban storm water runoff before it enters the slough system, reduce energy-use and cost for landscape maintenance, and create drought-tolerant, and aesthetically-pleasing, wildlife friendly landscapes. All factors that are critical in a valley which is in over-draft of its ground water resources. The landscaping at the City's Water Resources Center and several newer developments provide good examples of how this approach to native landscaping can be utilized. These models should be continued with all of the businesses around the wetlands and trails system in order to maximize their benefit.

Backyard landscaping with native plants is another emerging field with great promise for support of the natural landscape and ecology of the area. Backyard landscapes which utilize native plants and other complimentary plants to create habitat gardens can provide critical support to native insects, birds, bats, and other pollinators. A recent study by professor, Gordon Frankie, at the University of California Berkeley, stated that 81 different species of bees were identified in urban gardens located throughout

Berkeley, California. Backyard habitat landscapes in neighborhoods throughout the City is an important strategy to support the natural ecology of the sloughs ecosystems.

Nature Parks

Many Cities throughout the United States and Canada have adopted an approach to urban parks supportive of the natural landscapes in which their cities were founded. Called conservation parks, or nature parks, these parklands are landscaped with native plants and provide an important greenway within what can be a dense residential or urban landscape. The City of Watsonville has an abundant network of parks, which can benefit from further growth in this area. Under-utilized parkland or currently un-used City owned parcels can become natural ecosystems designed for human use. Play structures can be developed to mimic and interpret natural features, such as giant spider webs or local wetland wildlife, where children can play. Landscaping can be designed for aesthetics while complementing the natural landscape by utilizing the diversity of native plants of the Pajaro Valley and supporting the natural ecological system surrounding the park. These park features offer the potential for recreation, inspiration, and interpretation of the natural and historical landscape and tie into neighborhood beautification projects. They also provide new experiences for family outings in neighborhoods, wildlife viewing and birdwatching, care and stewardship of the parkland and guided walks on natural ecology, and historical ecology..

Nature parks along the Pajaro River, adjacent to the levee trails, would be one strategy for restoring habitat along the river corridor while developing greater hiking, bird watching, and recreational opportunities. With the exception of the new Pajaro River Park at the City's Water Resources Center, the river levee trails lack access points to the river or any surrounding habitat areas,. Larger blocks of restored habitat that are managed for hiking and public access could serve multiple functions, such as recreation and additional flood control capacity. An established network of nature parks in conjunction with habitat restoration projects along the river's waterway might be more easily seen as compatible with surrounding agricultural operations and would provide a positive first step towards restoring larger blocks of habitat within the agricultural landscape west of the city on the river corridor.

The following are existing locations which could provide potential nature parks within the city limits. A process for use of these locations has not yet been identified and no projects have been initiated.

Potential Park location near Struve Slough: Herman Avenue near Rolling Hills Middle School

Potential Park Location: Watsonville Slough near the Harkins Slough Rd. Bridge and Keary Street

Existing Park Enhancement Opportunity: The Uplands within Ramsey Park


Looking downstream along Corralitos Creek

Appendix A

Unlabeled Figures

Existing Trail System, Upper Struve Slough Habitat Enhancement Practice Map

Existing Trail System, Watsonville Slough Habitat Enhancement Extension Practice Map Project 1A

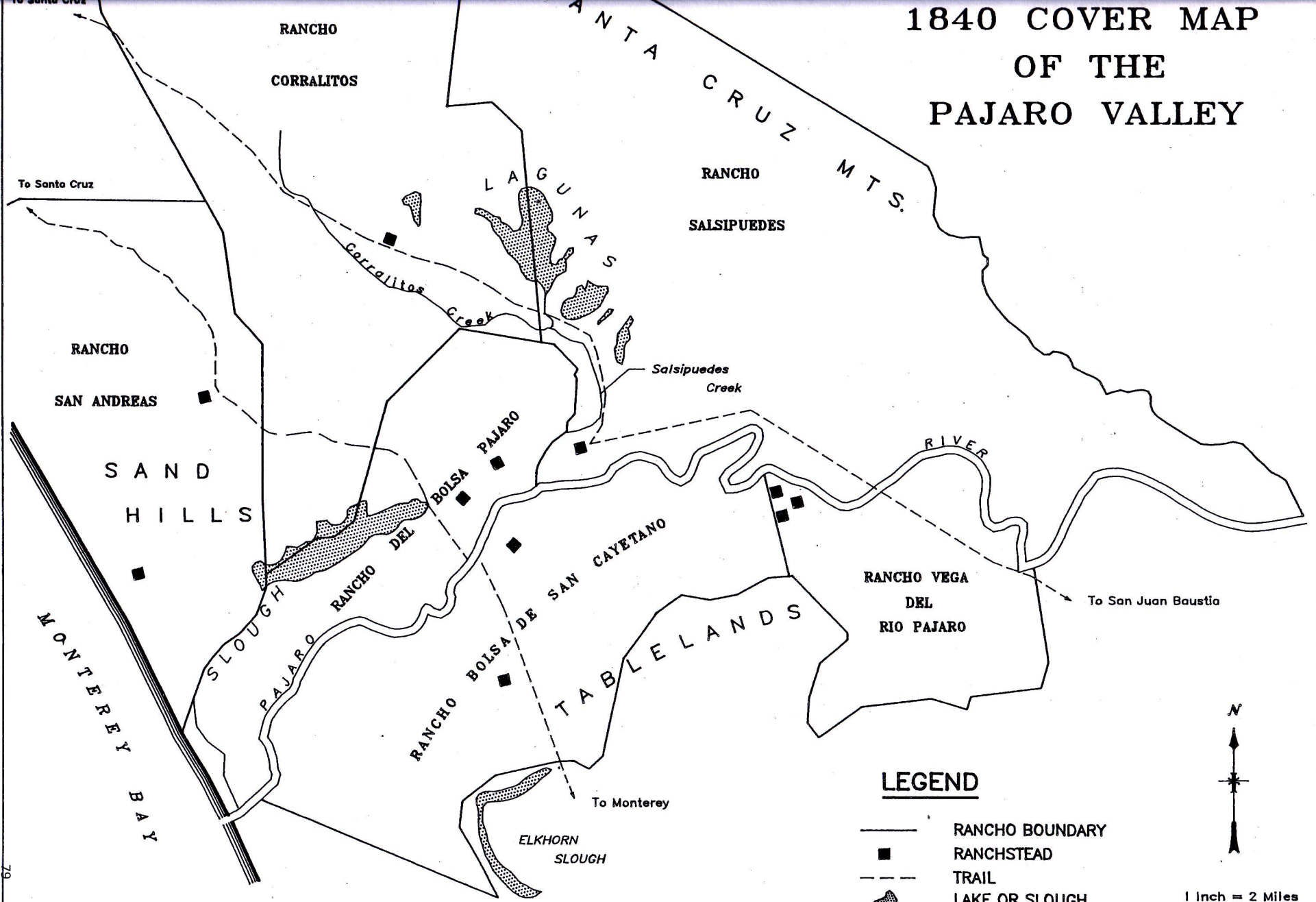


Figure 4: Location of settlements in the Pajaro Vallley in 1840. After Hornbeck 1969.

1889 Map of the Pajaro Valley Overlaid on Top of Current Street, Levee, and Highway Map, 2012

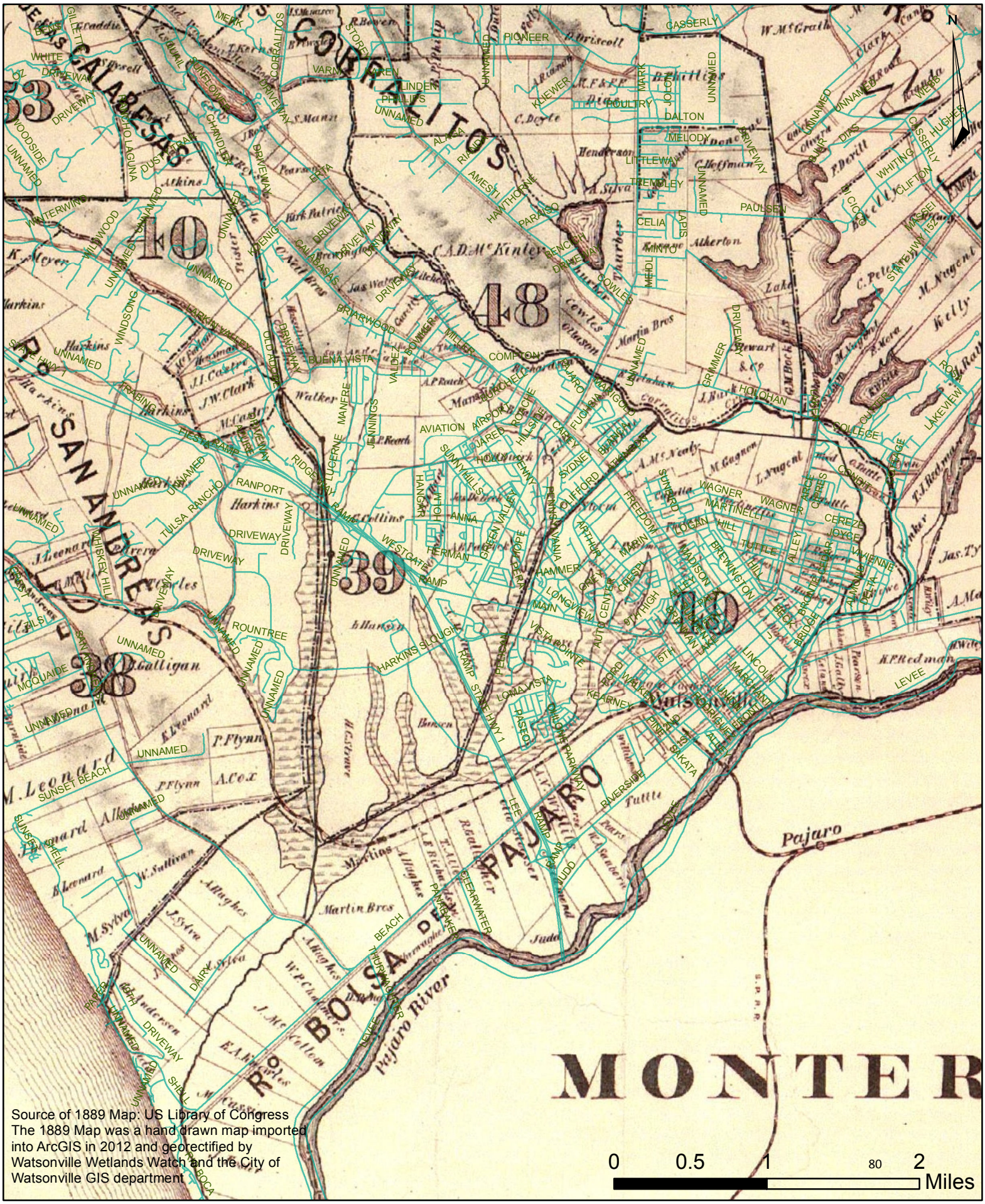
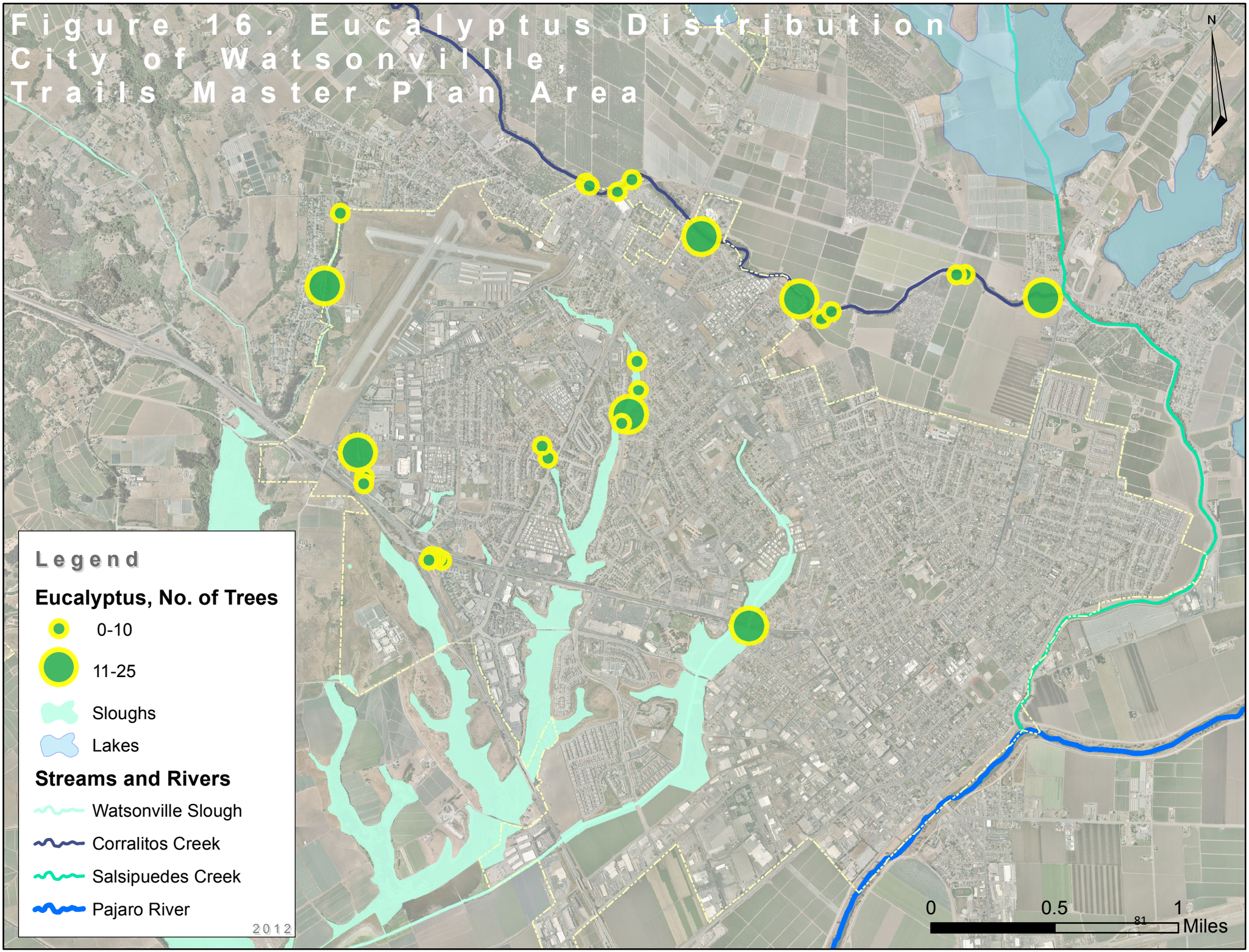


Figure 16. Eucalyptus Distribution City of Watsonvillle, Trails Master Plan Area



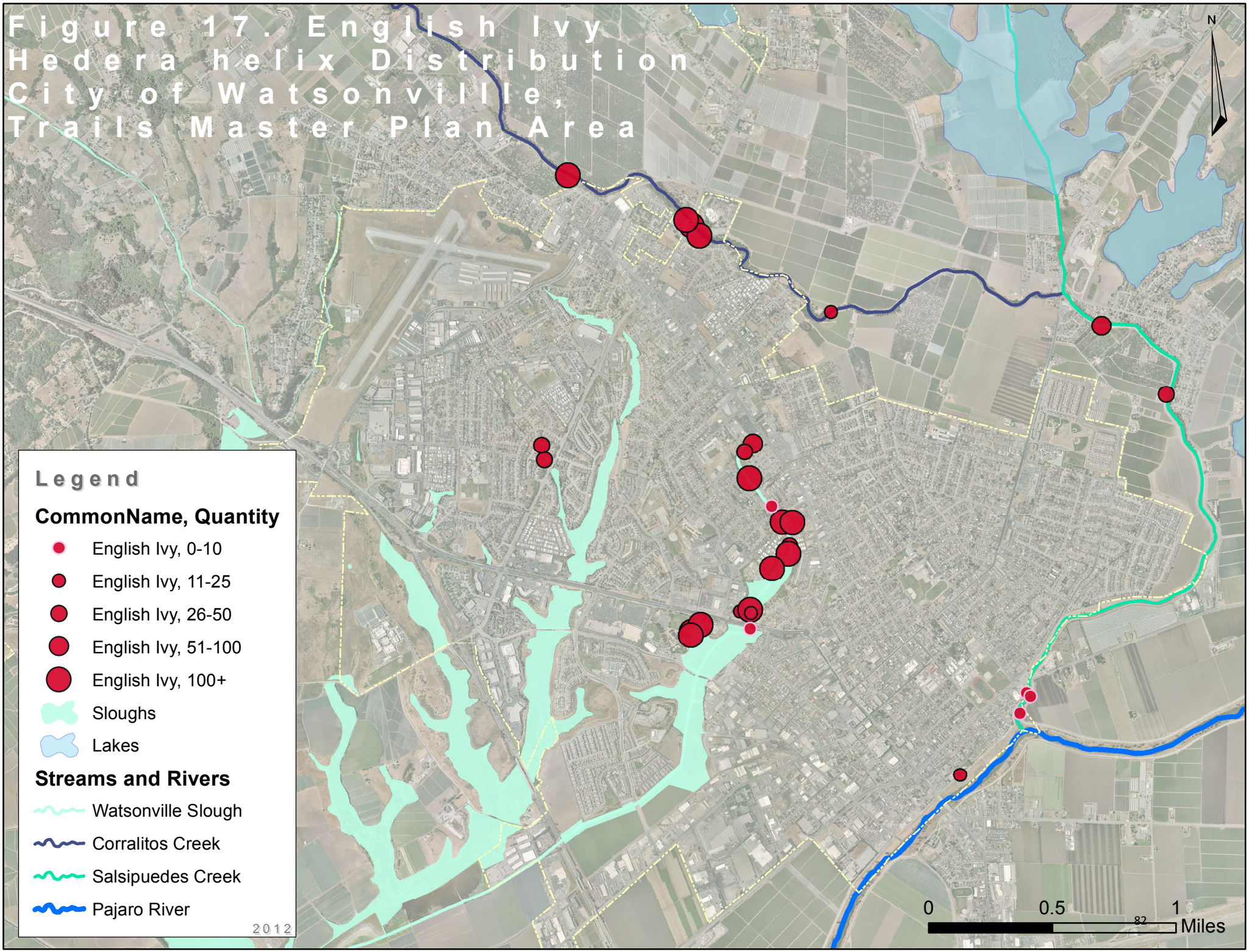


Figure 17. English Ivy
Hedera helix Distribution
City of Watsonville,
Trails Master Plan Area
N
Legend
CommonName, Quantity
English Ivy, 0-10
English Ivy, 11-25
English Ivy, 26-50
English Ivy, 51-100
English Ivy, 100+
Sloughs
Lakes
Streams and Rivers
Watsonville Slough
Corralitos Creek
Salsipuedes Creek
Pajaro River
2012
0
0.5
1
Miles

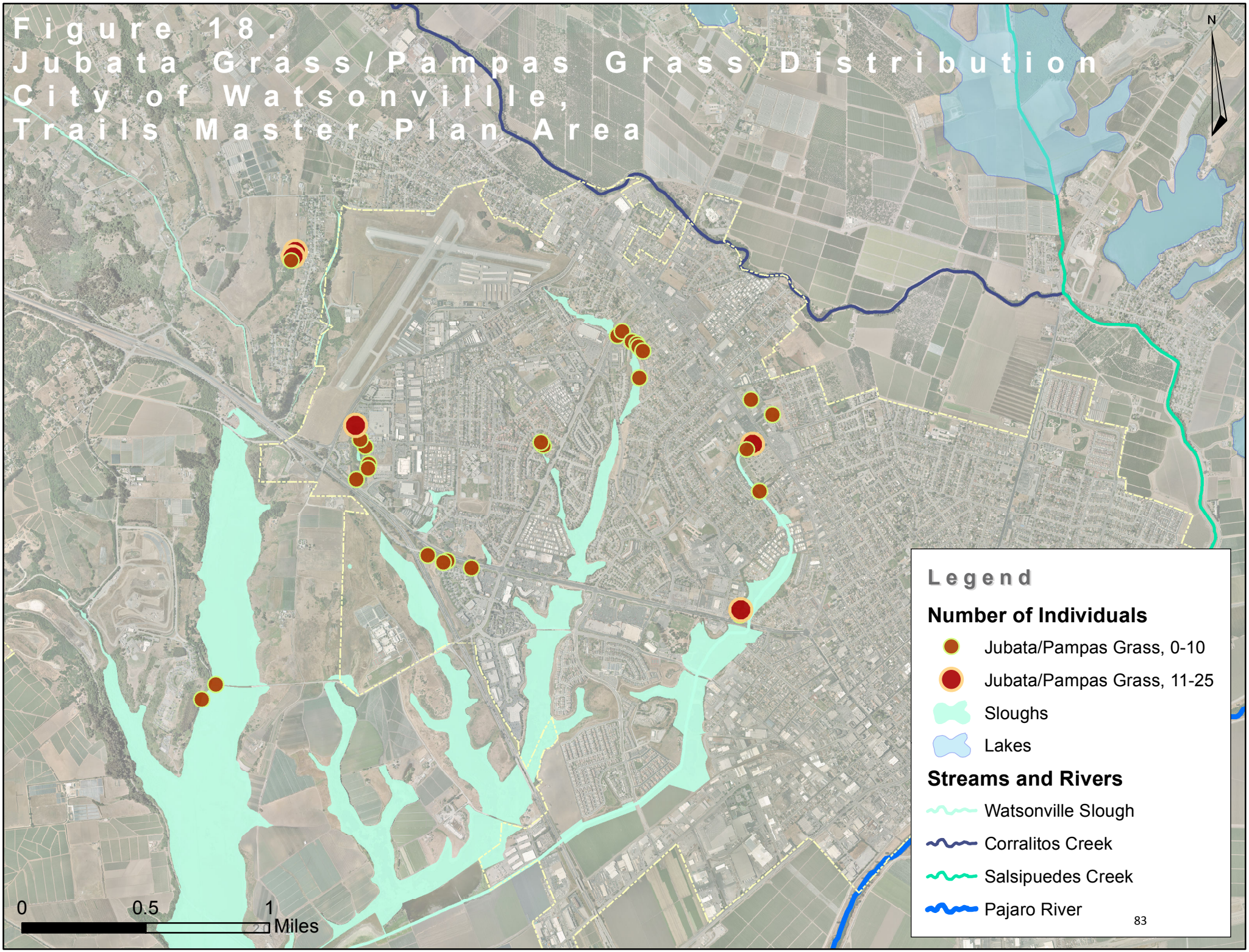


Figure 18.
Jubata Grass/Pampas Grass Distribution
City of Watsonville,
Trails Master Plan Area
N
Legend
Number of Individuals
Jubata/Pampas Grass, 0-10
Jubata/Pampas Grass, 11-25
Sloughs
Lakes
Streams and Rivers
Watsonville Slough
Corralitos Creek
Salsipuedes Creek
Pajaro River
0
0.5
1
Miles

Figure 19. Water Buttercup Ranunculus repens Distribution City of Watsonvillle, Trails Master Plan Area

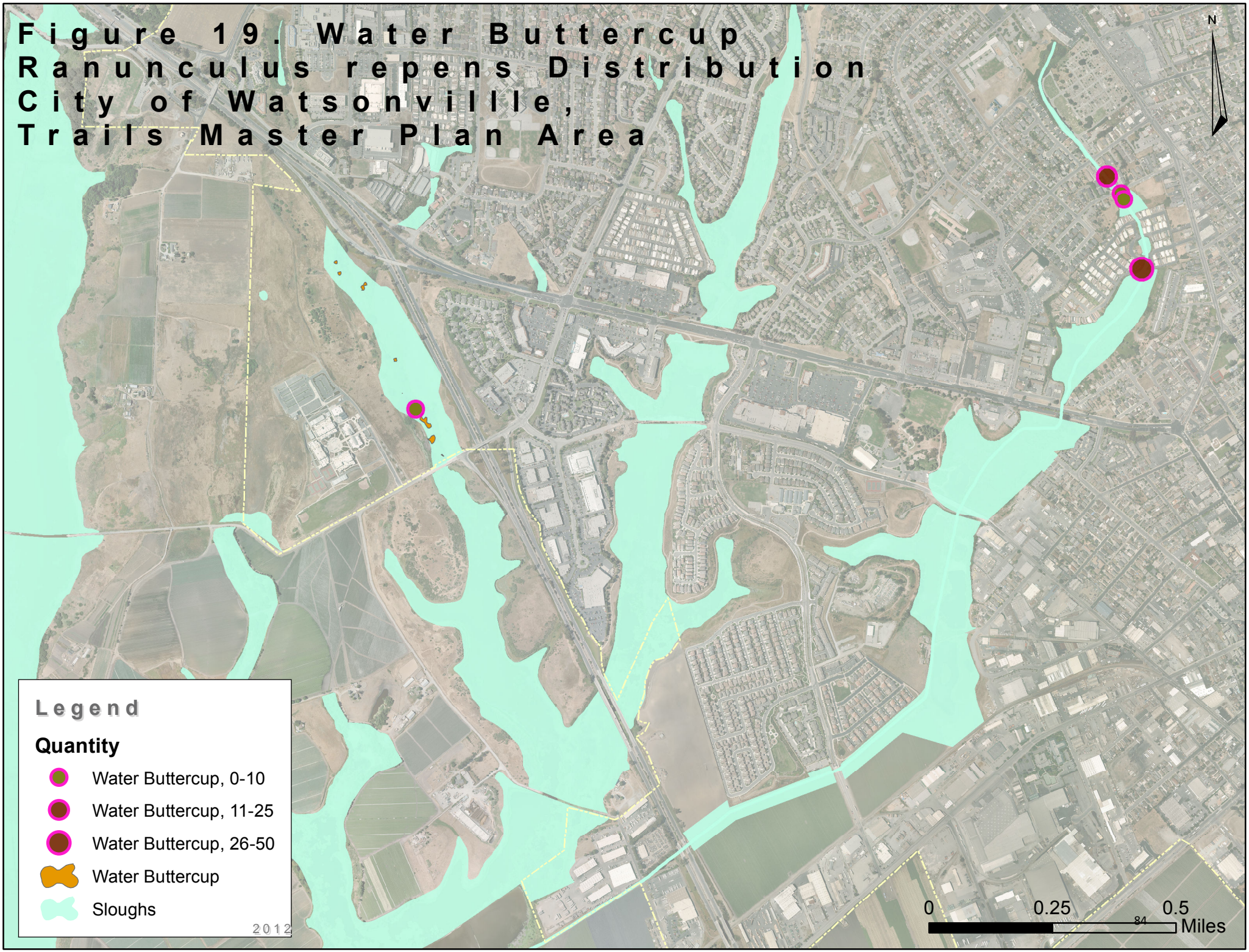


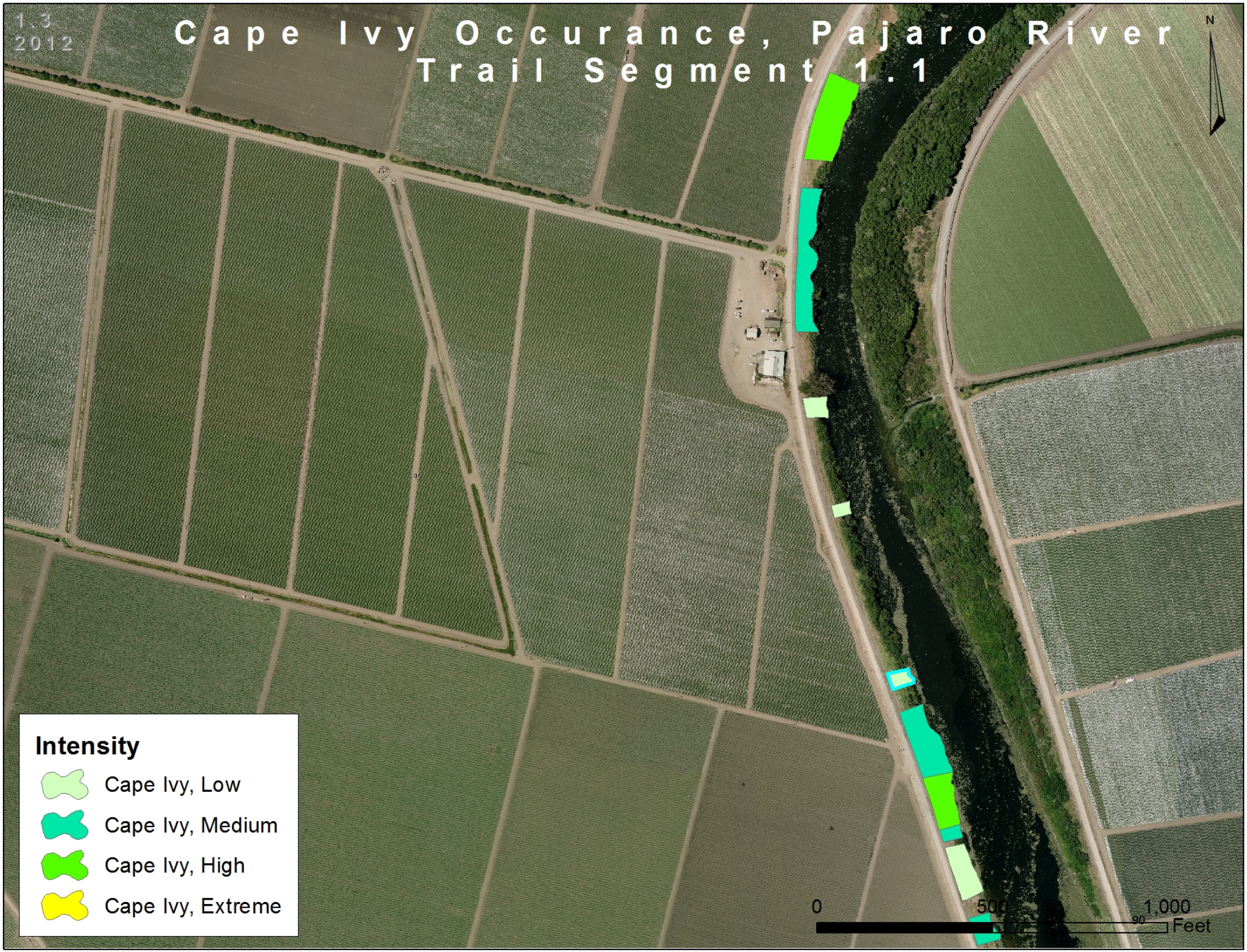
Figure 15. Acacia Distribution City of Watsonvillle, Trails Master Plan Area

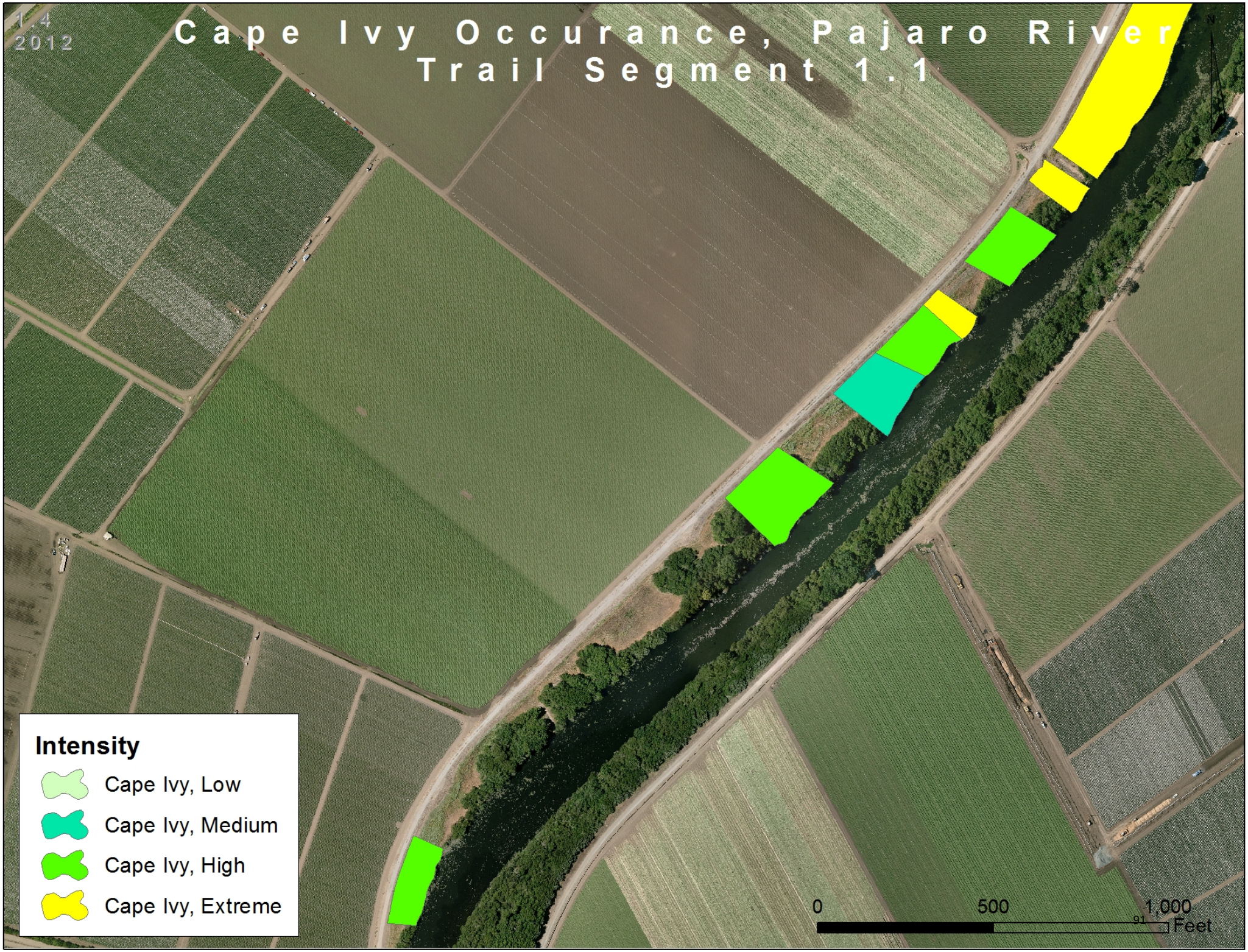

Cape Ivy Distribution
Pajaro River
Trail Segment 1.1, 1.2
Pajaro River
Cape Ivy Density Class
Cape Ivy, Low
Cape Ivy, Medium
Cape Ivy, High
Cape Ivy, Extreme
N
0
0.5
1
Miles

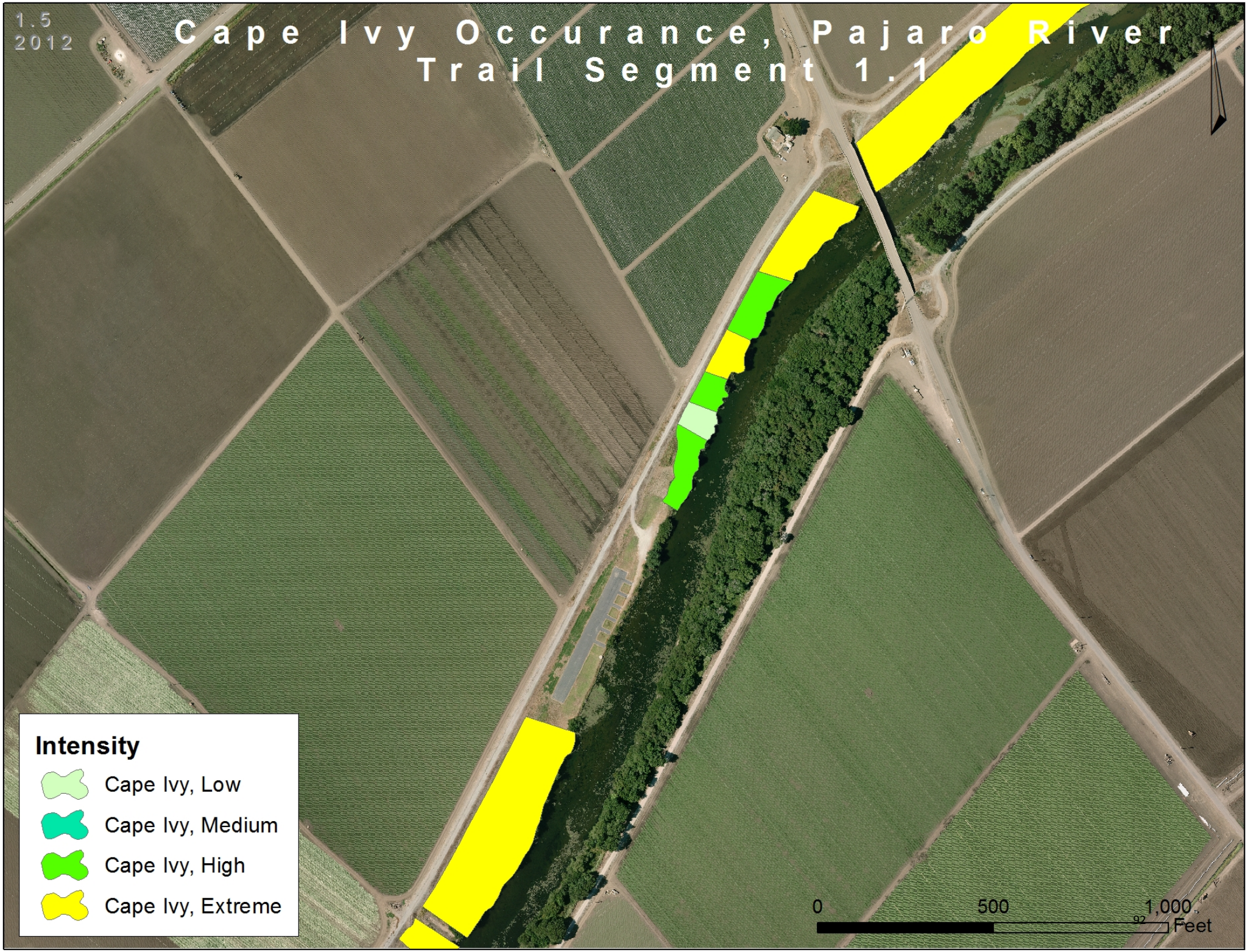

Cape Ivy Distribution
Pajaro River
Trail Segment 1.1, 1.2
Pajaro River
Cape Ivy Density Class
Cape Ivy, Low
Cape Ivy, Medium
Cape Ivy, High
Cape Ivy, Extreme
N
0
0.5
1
Miles


1:1
2012
Cape Ivy Occurance, Pajaro River
Trail Segment 1.1
N
Intensity
Cape Ivy, Low
Cape Ivy, Medium
Cape Ivy, High
Cape Ivy, Extreme
0
500
1,000
Feet

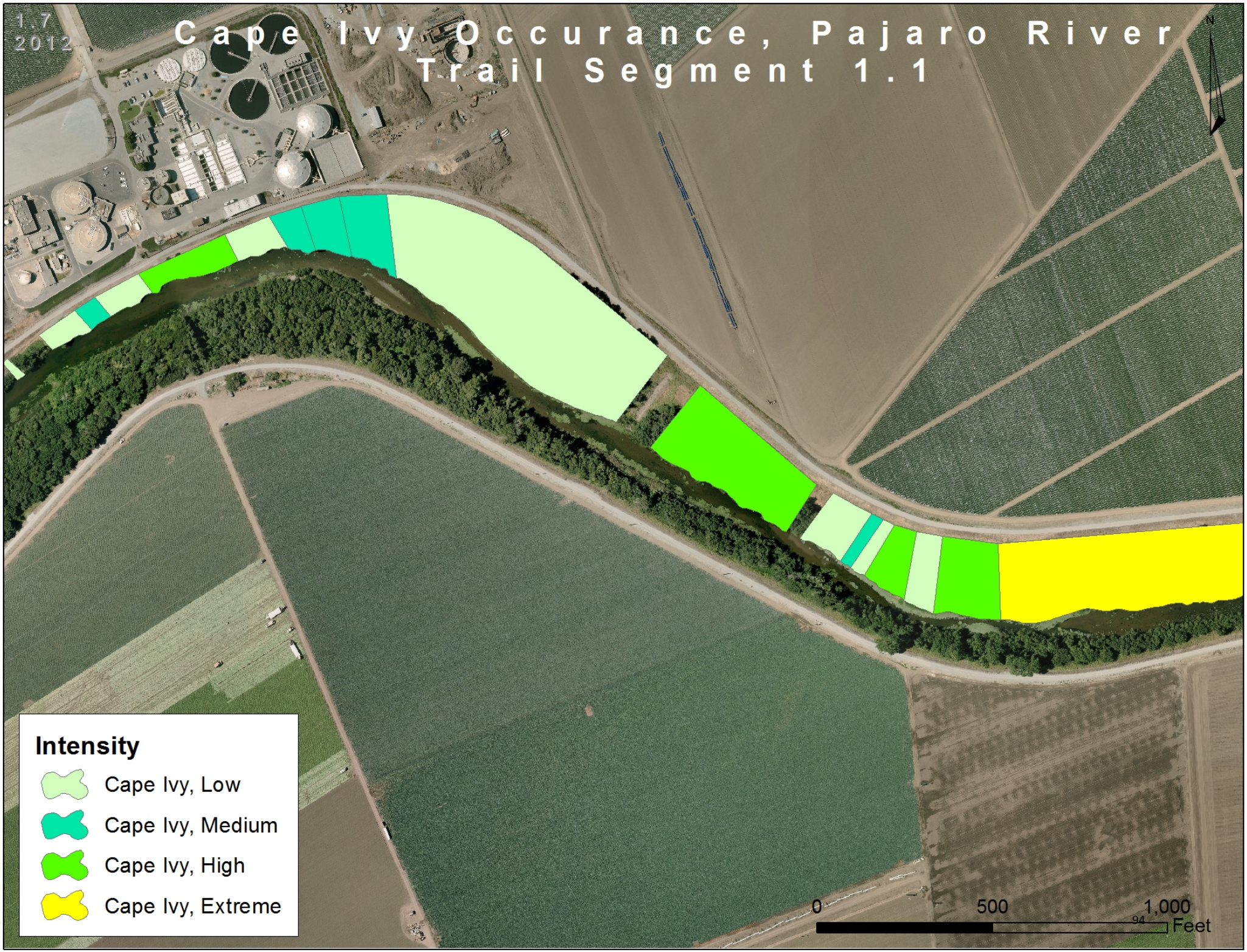

1.2
2012
Cape Ivy Occurance, Pajaro River
Trail Segment 1.1
N
Intensity
Cape Ivy, Low
Cape Ivy, Medium
Cape Ivy, High
Cape Ivy, Extreme
0
500
1,000
Feet

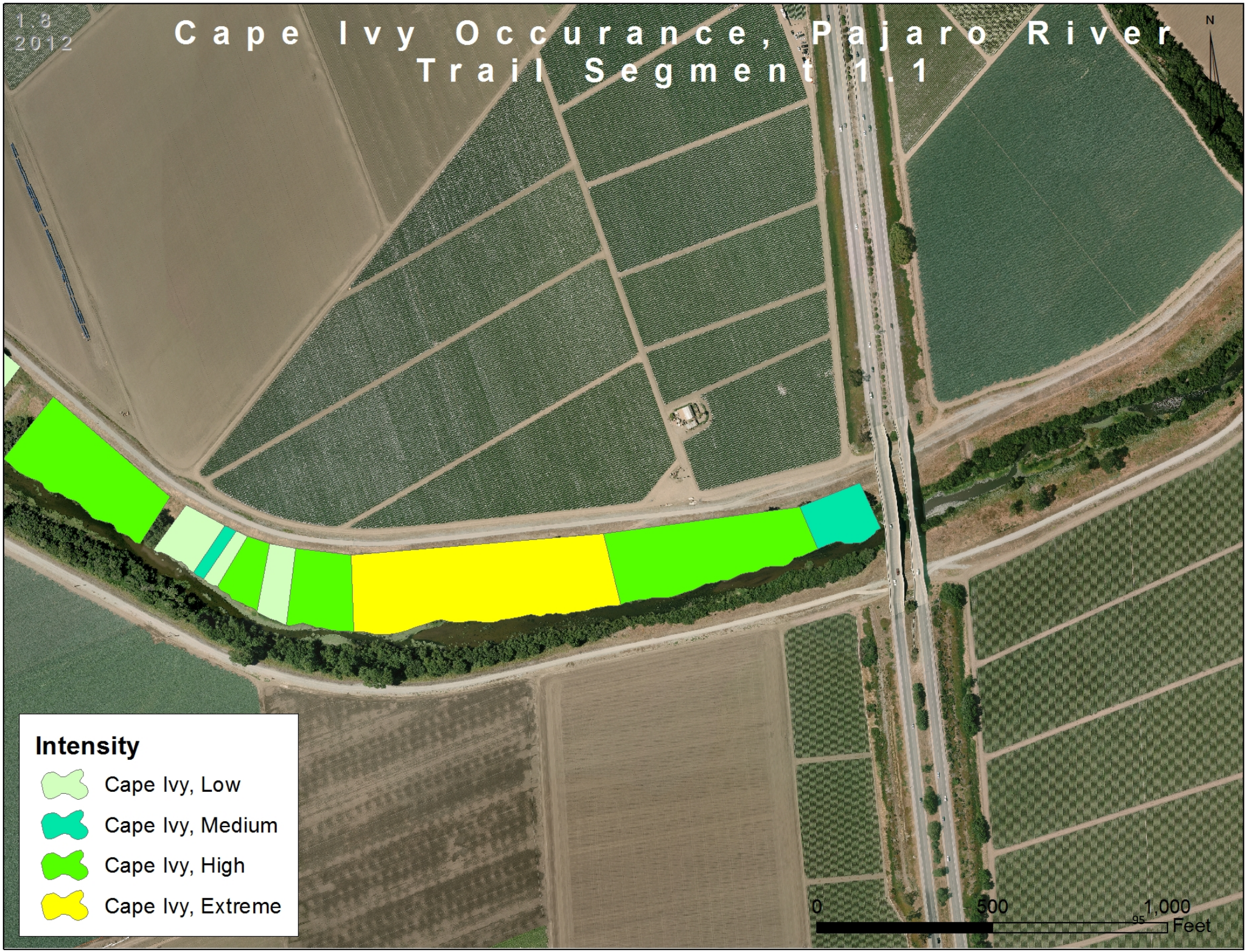

1.3
2012
Cape Ivy Occurance, Pajaro River
Trail Segment 1.1
N
Intensity
Cape Ivy, Low
Cape Ivy, Medium
Cape Ivy, High
Cape Ivy, Extreme
0
500
1,000
Feet

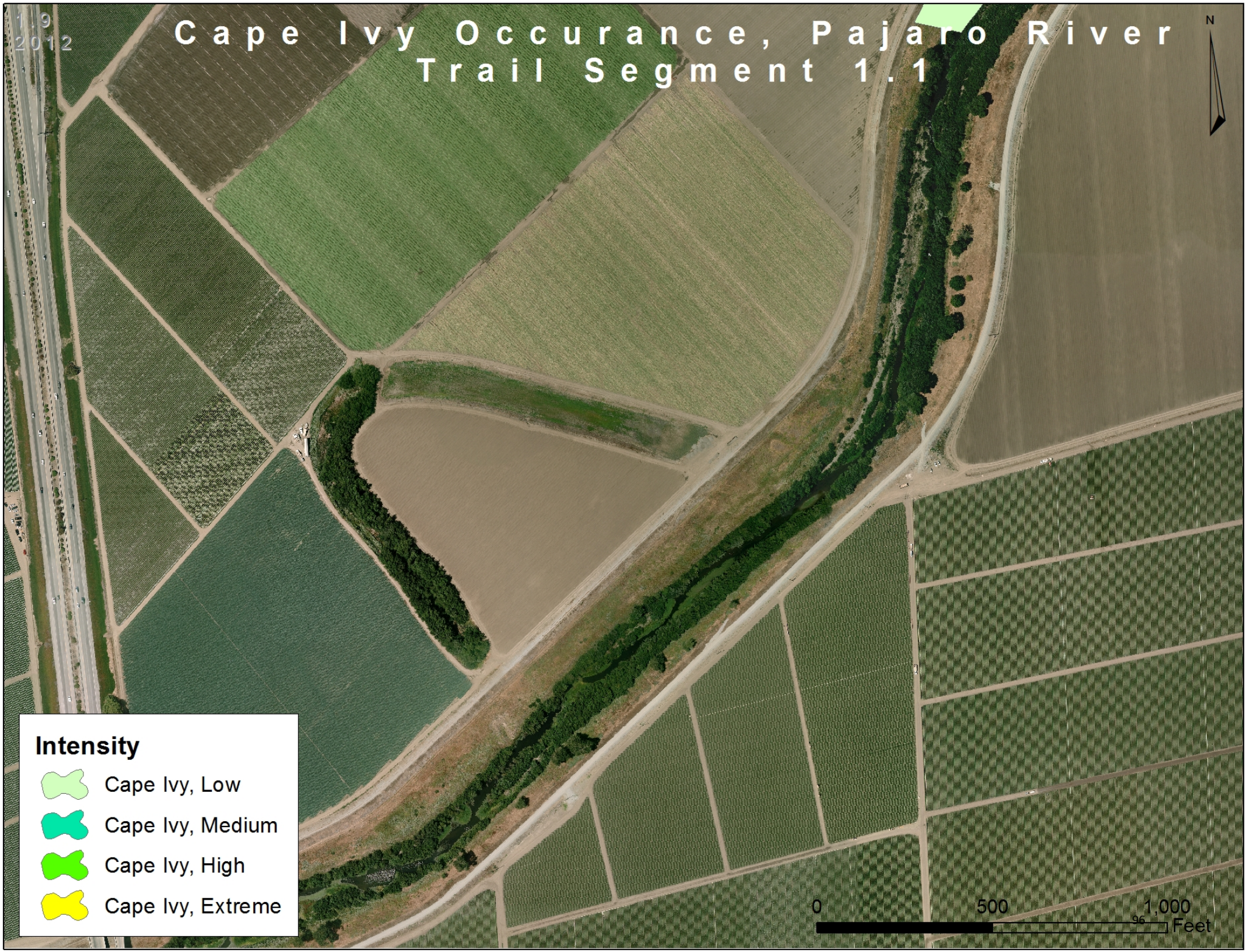

1.4
2012
Cape Ivy Occurance, Pajaro River Trail Segment 1.1
Intensity
Cape Ivy, Low
Cape Ivy, Medium
Cape Ivy, High
Cape Ivy, Extreme
0
500
1,000
Feet

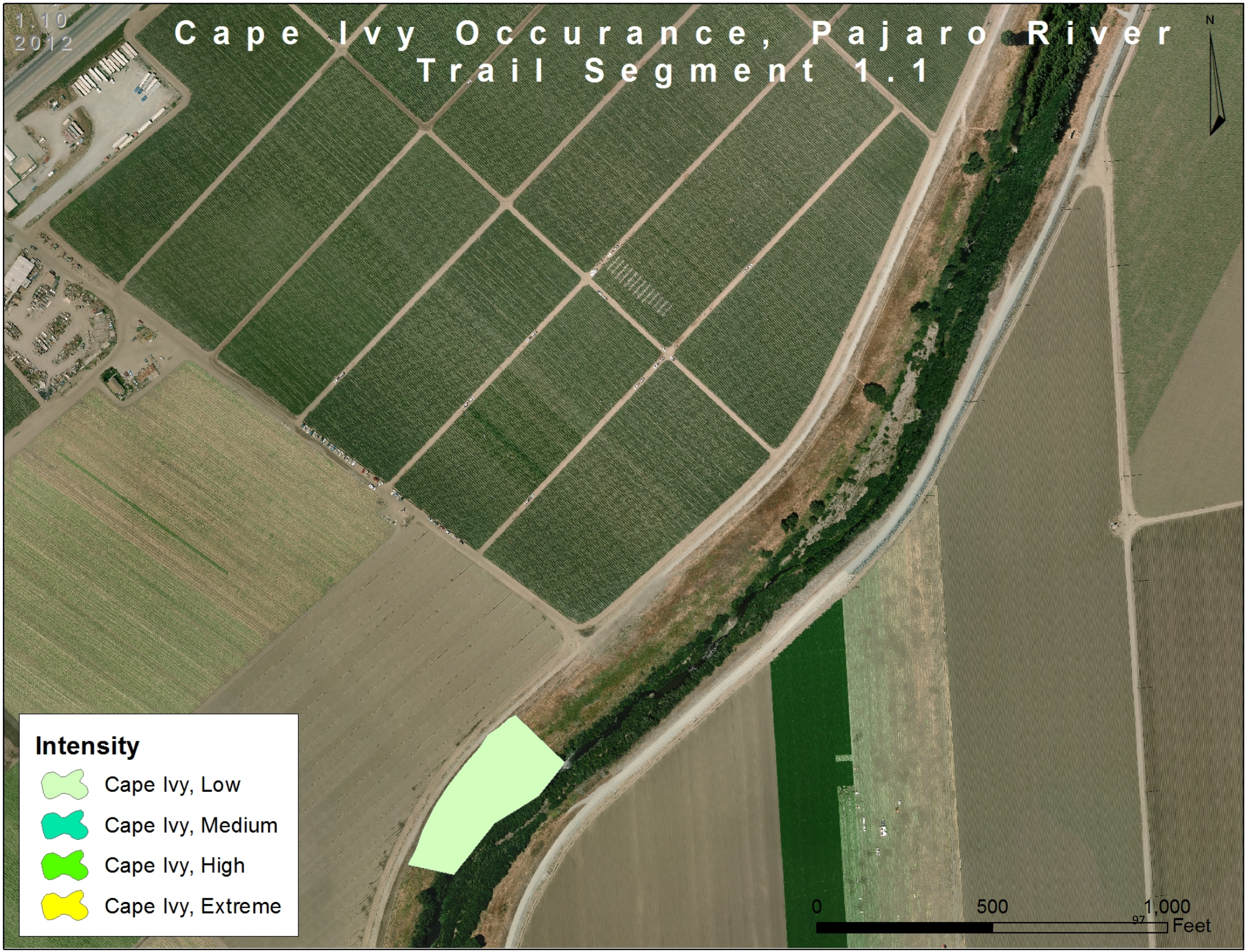

1.5
2012
Cape Ivy Occurance, Pajaro River
Trail Segment 1.1
Intensity
Cape Ivy, Low
Cape Ivy, Medium
Cape Ivy, High
Cape Ivy, Extreme
0
500
1,000
Feet


1.6
2012
Cape Ivy Occurance, Pajaro River
Trail Segment 1.1
Intensity
Cape Ivy, Low
Cape Ivy, Medium
Cape Ivy, High
Cape Ivy, Extreme
0
500
1,000
Feet


1.7
2012
Cape Ivy Occurance, Pajaro River
Trail Segment 1.1
N
Intensity
Cape Ivy, Low
Cape Ivy, Medium
Cape Ivy, High
Cape Ivy, Extreme
0
500
1,000
Feet


1.8
2012
Cape Ivy Occurance, Pajaro River
Trail Segment 1.1
N
Intensity
Cape Ivy, Low
Cape Ivy, Medium
Cape Ivy, High
Cape Ivy, Extreme
0
500
1,000
Feet


1.9
2012
Cape Ivy Occurance, Pajaro River Trail Segment 1.1
N
Intensity
Cape Ivy, Low
Cape Ivy, Medium
Cape Ivy, High
Cape Ivy, Extreme
0
500
1,000
Feet


1.10
2012
Cape Ivy Occurance, Pajaro River
Trail Segment 1.1
N
Intensity
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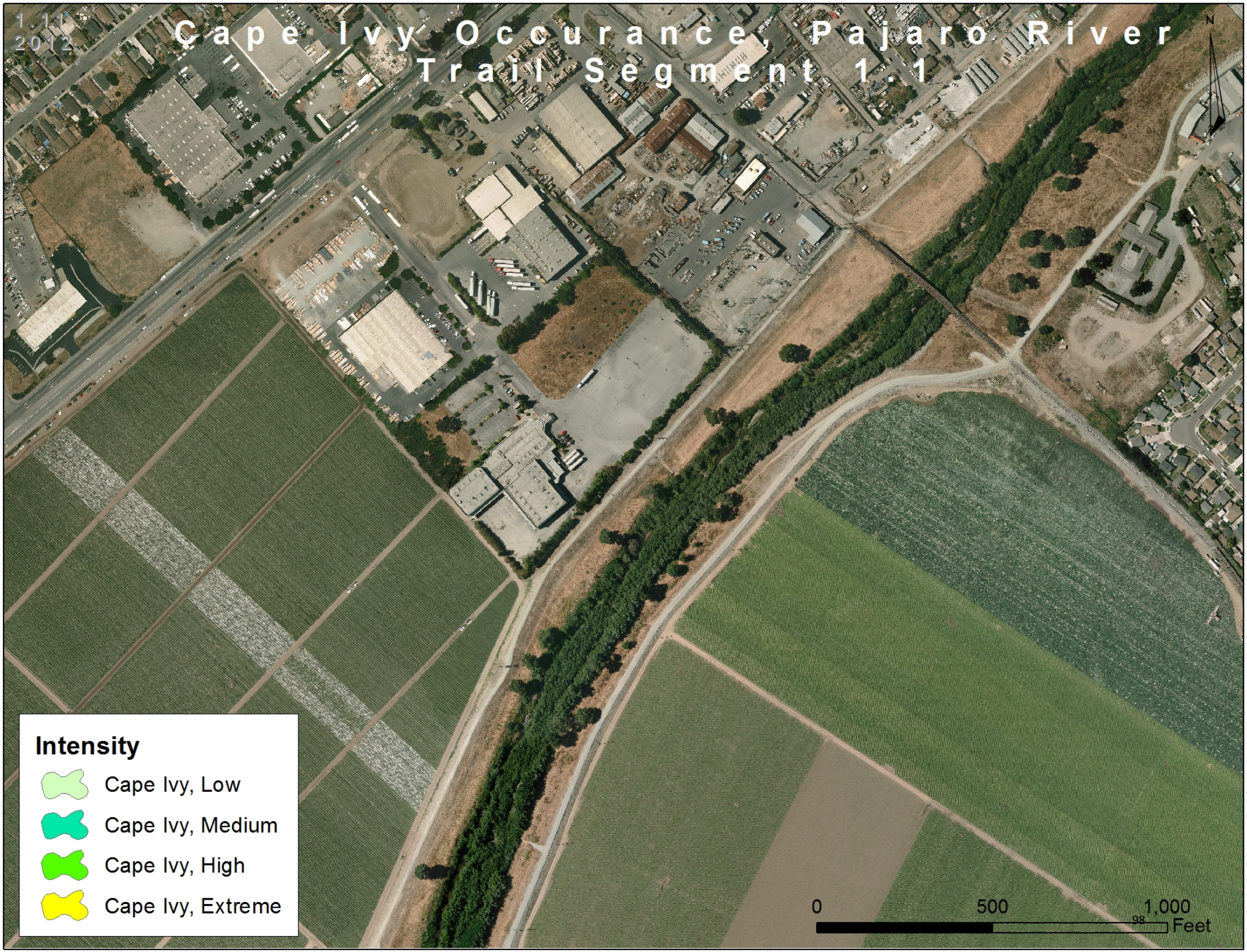
Cape Ivy, Medium
Cape Ivy, High
Cape Ivy, Extreme
0
500
1,000
Feet


1.11.2012
Cape Ivy Occurance, Pajaro River Trail Segment 1.1
N
Intensity
Cape Ivy, Low
Cape Ivy, Medium
Cape Ivy, High
Cape Ivy, Extreme
0
500
1,000
Feet


1.12
2012
Cape Ivy Occurance, Pajaro River
Trail Segment 1.1
N
Intensity
Cape Ivy, Low
Cape Ivy, Medium
Cape Ivy, High
Cape Ivy, Extreme
0
500
1,000
Feet

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C3.

Street Trees Plan

Street Tree Planting Plan

ACKNOWLEDGEMENT:

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Existing Conditions

The City of Watsonville has a great deal to build on in terms of urban form and character. Its scale, street pattern, development density and the influences of the natural and agricultural landscape all combine to create a charming and livable city. Watsonville's citizens show pride in their city, and their neighborhoods are well cared for. Watsonville's climate is ideal for a wide range of plants and street trees and many of the city's streets and landscapes exhibit a unique and rich planting character. Some of the city's historic neighborhoods and its newest developments have a rich urban forest that illustrates Watsonville's potential to be a tree-filled city.

Based on a sample tree inventory performed for this report, some characteristics of Watsonville's urban forest are:

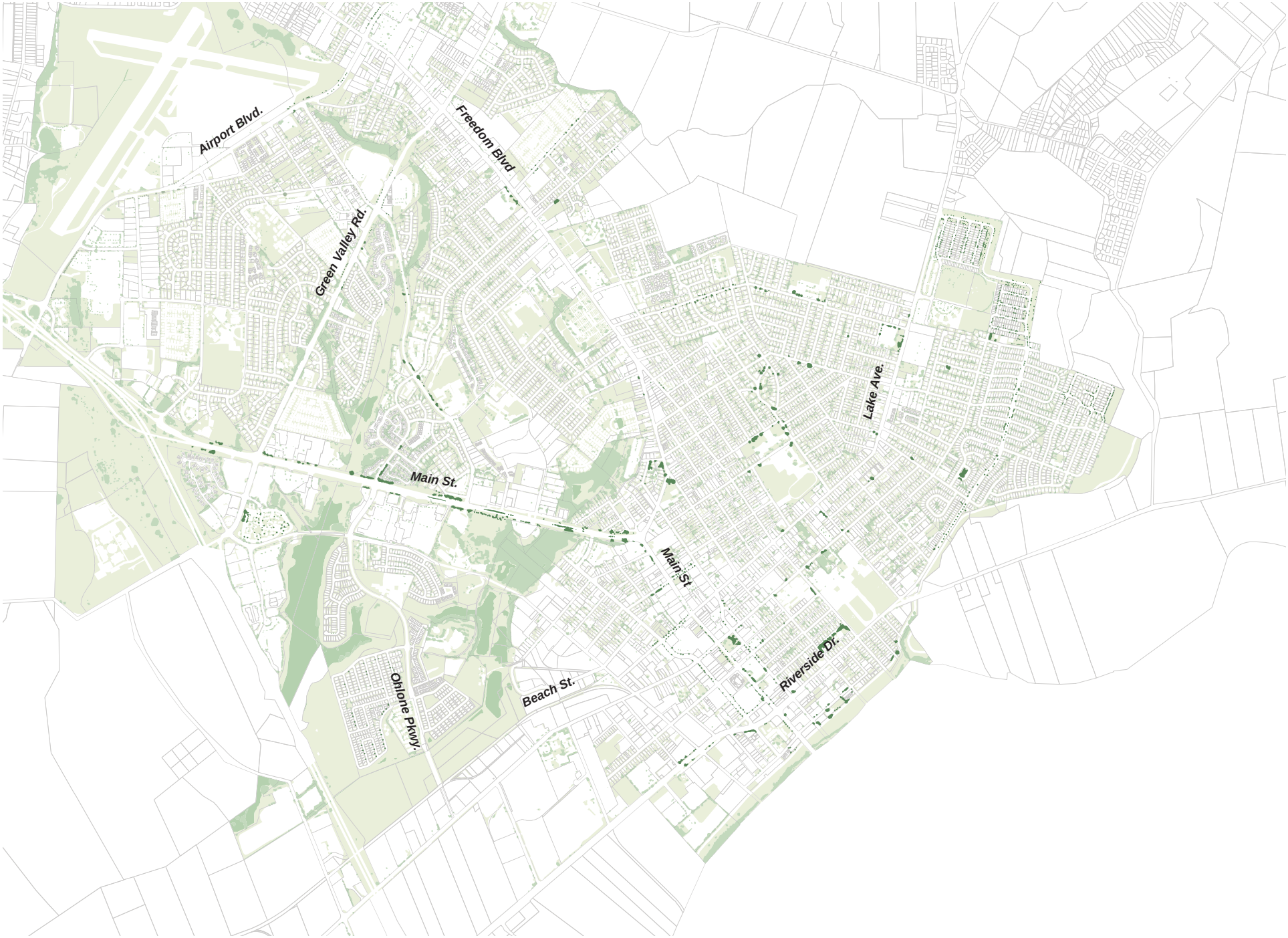
- The sample inventory found a total of 36 distinct tree species.
- The relative age structure of Watsonville's public tree population is intermediate, with less than 1% of trees measuring greater than 24 inches DBH. This means that the age distribution of trees will progress toward a healthy balance as new trees are planted, with few trees currently at the end of their lifespan.
- Watsonville's tree resource is in relatively good condition overall, with 36.5% of trees rated good or better and 60% rated fair.
- Watsonville's public tree population has sequestered 631.1 tons of carbon (CO2) to date, valued at $9,467.

Overall, however, the city has a dearth of street trees. The City's tree canopy coverage, including not only street trees but also trees on private property, is approximately 7.8%. A city with Watsonville's climate can reasonably set a goal of 40% canopy cover. For Watsonville, this would mean planting an additional 1,350 acres of tree canopy, approximately 46,600 additional trees. At an approximate cost of $300 per tree, this would require an investment of $14 million.

Most of any city's trees are on private property or large public open spaces and nature preserves. However, street trees can contribute significantly to the overall canopy coverage. For example, the City of Burbank, CA, which is similar to Watsonville in size and density, has over 20% canopy coverage in its municipal public spaces, including streets. Moreover, street trees contribute most to the quality of the public environment, since streets comprise approximately 90% of the total public open space of a typical city. With approximately 1,500 existing street trees, It is clear that Watsonville's public streetscape realm has a huge potential to incorporate more street trees.

A typical treeless street in Wastonville.

Comparison of typical streets in Burbank, CA (left) and Watsonville (right).

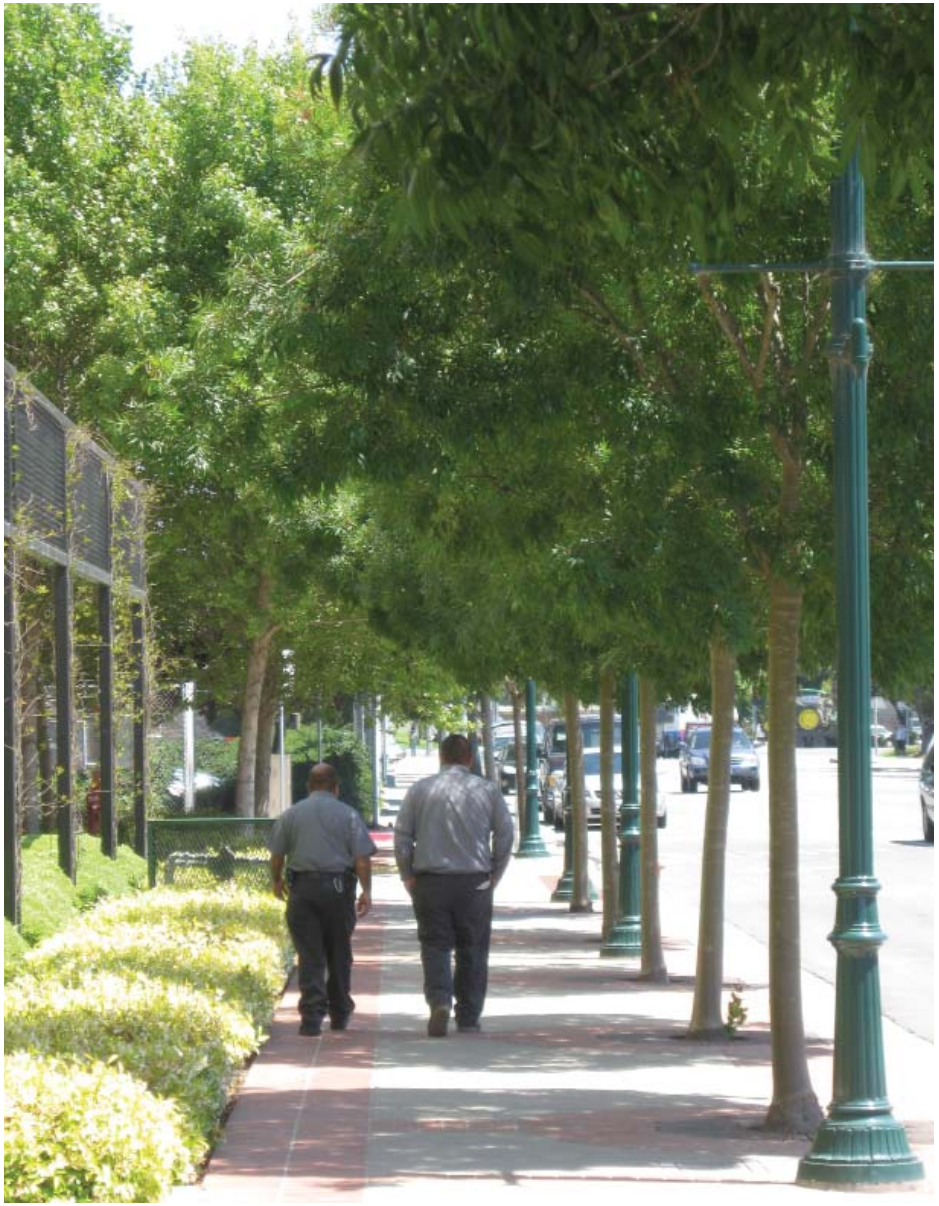


Map showing the existing street trees in the public realm.

The Value of Trees

A healthy urban forest provides a number of benefits to the community. Some of these benefits are:

- **Increased home value**: Landscaping, particularly with trees, adds monetary and aesthetic value to a home. Studies have shown that street trees can increase a home's value by 7 – 20%.
- **Decreased crime:** According to a 2001 University of Illinois study, trees and greenery can cut crime significantly: "Compared with buildings that had little or no vegetation, buildings with high levels of greenery had 48 percent fewer property crimes and 56 percent fewer violent crimes. Greenery lowers crime through several mechanisms. First, greenery helps people to relax and renew, reducing aggression. Second, green spaces bring people together outdoors, increasing surveillance and discouraging criminals. Relatedly, the green and groomed appearance of an apartment building is a cue to criminals that owners and residents care about a property and watch over it and each other." (http://lhhl.illinois.edu/crime.htm)
- **Calmed traffic**: Trees planted along streets create an environment that makes drivers more aware of their surroundings, which includes pedestrians, and drivers will reduce their speed. Studies indicate that street trees can result in automobile speed reductions of 4 – 7 miles per hour, even without any other changes to the roadway.
- **Reduced energy use**: Trees provide natural shade for buildings during hot summer months, and deciduous trees allow in winter sunlight and solar gain.
- **Reduced global warming:** Trees naturally absorb and store atmospheric carbon dioxide, thereby slowing climate change. According to the tree inventory done for this study, the public trees in Watsonville are estimated to currently sequester 54.5 tons of atmospheric CO2 per year. An additional 42.4 tons is avoided through decreased energy use.
- **Improved air quality**: Trees remove carbon dioxide from the atmosphere, while releasing oxygen into it. These two processes are among the most important for human and environmental health. The trees' foliage also traps particulates, essentially filtering the air to a higher level of quality.
- **Absorb storm water**: The network of a tree's roots extends far into soil, stabilizing it, and absorbing more water than soil alone can hold. Stable, permeable soils allow more water to be absorbed and causing less surface runoff into streets and water bodies.
- **Create urban habitat**: Trees, along with understory plants, provide refuge and homes for animals such as songbirds, and other small animals escaping predators. A diversity of urban wildlife is ensured when trees and landscaped areas are present.
- **Psychological benefits**: Living and playing in areas that are green with trees and plants improves general emotional wellbeing for children and adults. Neighborhoods that have trees growing in them have stronger community ties, with residents more likely to feel safe and to socialize.
- **Improved public health**: A city with urban trees is a city that addresses the civic and environmental topics listed above. Healthier, more economically viable cities value the importance of urban trees as an integral part of their society.
- **Encourage economic development:** Street tree planting can be a catalyst for economic development on sites adjacent to improved public streets.
- **Trees are beautiful**: Some qualities of trees can't be easily measured, such as their green leaves, their flowers or fruit, a leaf's color change in autumn, or the winter appearance of branches against the sky. Additionally, trees can be landmarks or reminders, and can define the character of a neighborhood.



This downtown section of Main Street has a well-established street tree canopy.

Understanding Watsonville

This Street Tree Planting Plan endeavors to describe the opportunity for street trees to reinforce and enhance the unique character of Watsonville on a city-wide and neighborhood scale. From the perspective of increasing tree canopy coverage and achieving the ecological and economic value of street trees described above, it may be sufficient to identify trees that are suited to Watsonville's climate, identify the potential locations for street tree planting, prioritize areas for initial implementation, and begin planting trees. A well-thought-out citywide street tree planting plan can add more to the quality of the city by enhancing the city's form and character. This approach combines urban greening with "place-making" to achieve ecological, economic and cultural goals.

Watsonville's form and character has three main influences: The cultural influence, which includes its historic development, architectural character, pattern of land use, and circulation networks; the agricultural influence, which is apparent around the city's perimeter and its overall setting in this rich and productive agricultural region; and the natural influence, which is primarily expressed in the sloughs and the Pajaro River corridor. Each of these influences is described below.

CULTURAL INFLUENCE – NEIGHBORHOOD CHARACTER

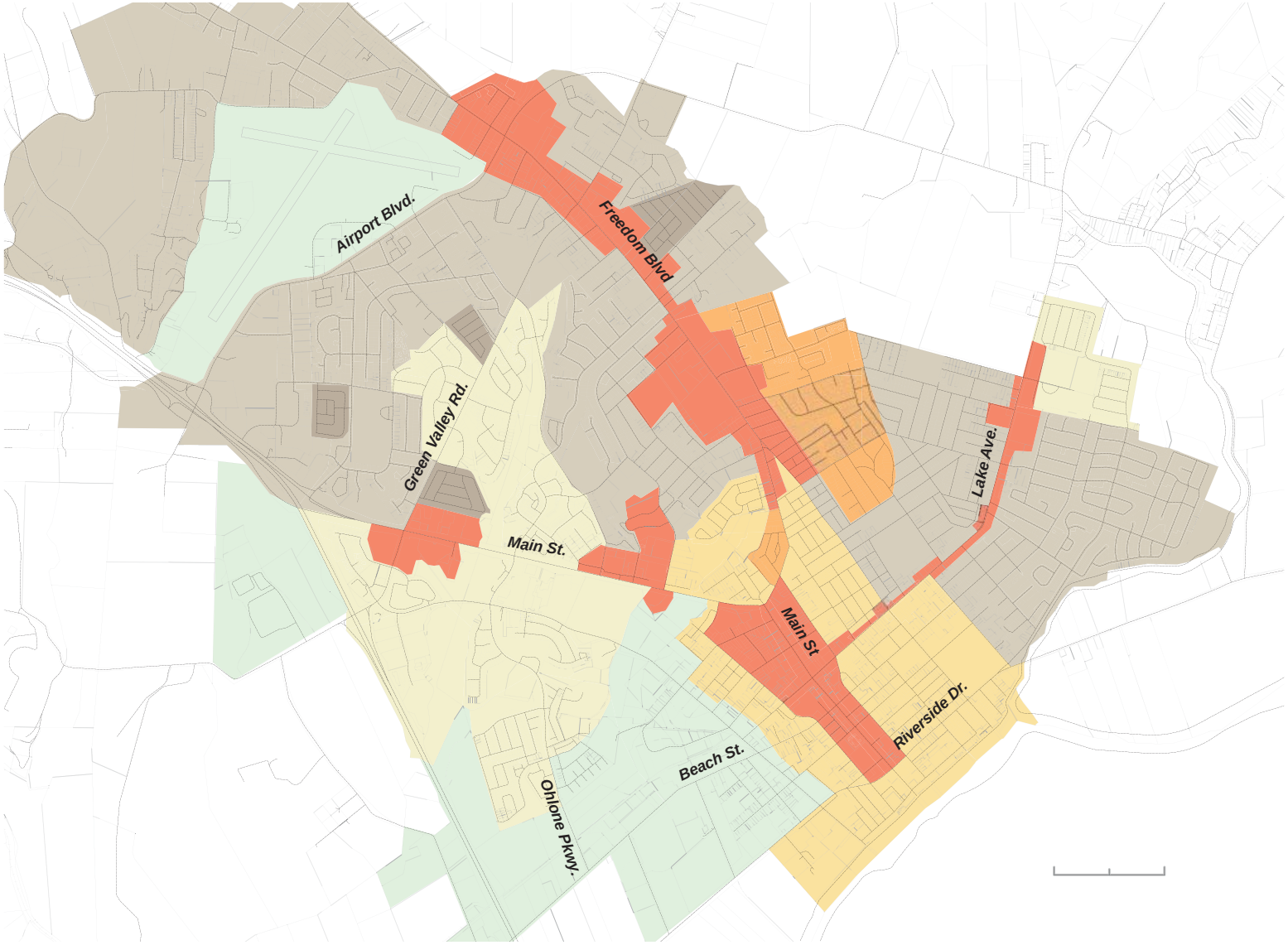
Watsonville consists of 30 neighborhoods, some of which are quite small. These neighborhoods are mapped in Figure 2. These neighborhoods are a result of historic growth patterns, which are simplified here into six general categories:

- Residential Ranch Style
- Residential Two-Story
- Residential Bungalow
- Residential New Development
- Commercial Mixed-Use
- Industrial

The downtown commercial mixed-use area and bungalow-style residential neighborhoods are the earliest historical areas of Watsonville. The next areas to develop historically were the ranch-style and two-story neighborhoods, which were mostly built in the '80s. The most recent residential development areas tend to be located near the sloughs. The main industrial zone of the city is associated with the food processors toward the south. In addition to the downtown

A new development in Watsonville with planted tree strips.

Sections of Tuttle Avenue have large established trees in front yards.



Neighborhood Character

Residential - Ranch Style

Residential - 2 story

Residential - Bungalow

Residential - New Development

Commercial/Mixed Use

Industrial

Neighborhood Character Map

mixed-use commercial zone, there are three main commercial corridors: upper Main Street, East Lake Ave., and Freedom Blvd.

Watsonville's neighborhoods are generally well cared for. People take care of their front yards; there is little blight or litter. Many gardens throughout the city display a sense of pride and creativity.

An eclectic mix of plant species is part of what makes Watsonville unique. The streets that do have street trees show that Watsonville has great potential to be a beautifully tree-filled city. Because of Watsonville's climate, the city can support a wide range of species. Watsonville is at the intersection of the southern California and northern California influences and its climate is very hospitable to trees. The trees that are in Watsonville are generally very healthy. The existing mix of succulents, palm trees, perennials, and evergreen and deciduous trees indicates that a huge range of trees can do well in Watsonville's climate.

While most of the streets in Watsonville do not have street trees, the newest neighborhoods show what is possible with abundant trees, shrubs and perennials planted in tree strips between the curb and sidewalk. Some streets in the newest neighborhoods have implemented innovative ways to maximize planting in the public right of way while balancing the need for on-street parking (see photo on opposite page).

A well planted front yard in Watsonville.

Established yard trees in an older section of Watsonville.

La Hacienda Street has an innovative solution to accommodate street trees and on-street parking.

NATURAL INFLUENCE

Watsonville lies at the upper reaches of two natural sloughs, which are part of a system of six freshwater wetlands that flow to the Monterey Bay. These sloughs extend into the urban fabric of the city, and are one of the city's most striking landscape features (Figure 4). Recently, areas around the sloughs have been developed as amenities with trails and parks that take advantage of this natural resource. The sloughs are a strong visual amenity seen from various vantage points, especially crossings points and where streets dead-end at the sloughs.

The Pajaro River and the Salsipuedes Creek (which is a tributary to the Pajaro) form the eastern boundary of the city. These rivers are largely separated from the city by levees, however the trail on top of the levees are a well-used amenity. The influence of the riparian zone can be felt at certain places along the river and at the river crossings.

The vegetation in the sloughs is characterized by:

Trees:

- Coast Live Oak (*Quercus agrifolia)*
- Cottonwood (*Populus fremontii)*
- Western Sycamore (*Platanus racemosa)*
- Willow (*Salix sp.)*
- California Boxelder (*Acer negundo var. californicum)*

Shrubs:

- Coffeeberry (*Rhamnus californicus)*
- Coyote brush (*Baccharis sp.)*
- Toyon (*Heteromeles arbutifolia)*
- California Dogwood (*Cornus californica)*

Aerial view showing adjacency of the sloughs to the urban fabric.

A view of the sloughs from one of the Watsonville's wetland trails.

Map showing the sloughs and rivers of Watsonville.

AGRICULTURAL INFLUENCE

Equally important as the natural influence is the agricultural influence on the city form. The city is bounded to the north and south by agricultural lands (see map on opposite page). To the south, there is an industrial transition zone between the agricultural lands and the residential and commercial areas of the city. To the north, the sense that the residential neighborhoods abut agricultural lands is felt more strongly, as there is no transitional zone; rather, the line between the two land uses is clear and distinct.

Aerial view of Watsonville farmland

Street at the edge of Watsonville bordering on farmland (Wagner Ave.)

Map showing agricultural lands adjacent to Watsonville streets

STREETS AND GATEWAYS

One of Watsonville's unique characteristics is its non-orthogonal network of streets. Watsonville is a patchwork of street grids with various orientations. The various patches of street grids are linked and bordered by larger neighborhood connectors, commercial corridors and arterials. For the purposes of the Street Tree Planting Plan, six street types are identified: retail boulevards, such as upper Main St.; commercial corridors, such as Freedom Blvd. and East Lake St.; green arterials, such as Airport Blvd.; downtown passages, such as lower Main St.; neighborhood connectors, such as Martinelli St.; agricultural gateways, such as Riverside Blvd.; and local residential neighborhood streets. A map of street types (opposite page) distills the city's form into a clear hierarchy of street networks.

Map showing street hierarchy of Watsonville

Street Character

Agricultural Gateway

Commercial Corridor

Downtown Passage

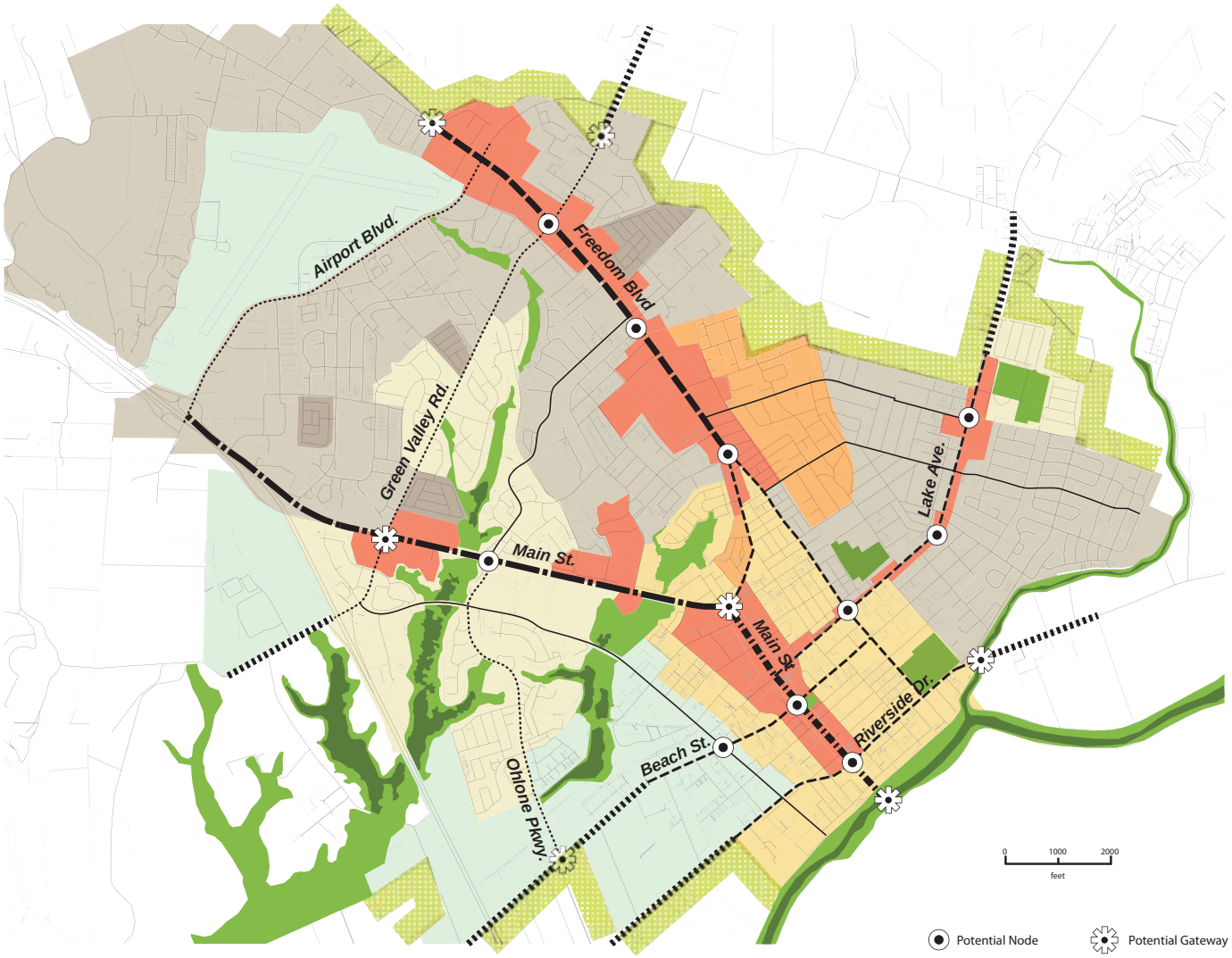
Retail Boulevard

Green Arterial

Neighborhood Connector

URBAN FORM ANALYSIS MAP

The composite Urban Form Analysis Map (opposite page) combines the above components—neighborhood character, natural influence, agricultural influence, and street and gateways network. Here, clear patterns and adjacencies can be seen that give strong cues for street planting strategies that can reinforce the city's unique character as described in the next section.



Street Character

Agricultural Gateway

Commercial Corridor

Downtown Passage

Retail Boulevard

Green Arterial

Neighborhood Connector

Neighborhood Character

Residential - Ranch Style

Residential - 2 story

Residential - Bungalow

Residential - New Development

Commercial/Mixed Use

Industrial

Composite Urban Form Analysis map

Street Tree Program Framework

The Street Tree Program Framework diagram (opposite page) builds on the Urban Form Analysis Map to define a series of zones that a street tree planting program would respond to. Each zone would be expressed by the types of street trees planted there. These zones are as follows:

HISTORIC DOWNTOWN CORE

This zone consists of the mixed-use commercial downtown core and the adjacent bungalow-style residential neighborhoods. These areas are characterized by historic tree plantings, typically of non-native ornamental species and shade trees. The residential neighborhoods in this zone are planted with an eclectic mix of ornamental plants, including flowering perennials, succulents, palm trees, shade trees, needle-leafed evergreens including redwoods, and even monkey-puzzle trees. The downtown commercial core, meanwhile, is planted with consistent street trees on each street, giving a formal character to the commercial streets. This historic downtown core could influence the neighborhood to its north.

AGRICULTURAL INFLUENCE ZONE

The neighborhoods to the northeast of the city are within what could be considered an agricultural influence zone that might reflect its adjacency to the agricultural fields to the north through the types of trees used. These could include fruit trees that reflect the historic orchards or “windrow” trees reflecting agricultural windrows commonly used in the region. Martinelli Street, named for the apple producer, passes through this zone.

SLOUGH CHARACTER ZONE

The neighborhoods that are adjacent to the sloughs might be enhanced by street tree plantings that relate to the slough and riparian ecologies. Slough and riparian species such as Black Walnut, Buckeye and Sycamore would give these neighborhoods a defining character and potentially increase the habitat value of the natural corridors that thread through the city. Notable views of the sloughs from adjacent streets and crossings may be marked by a change in the tree species and tree spacing.

RESIDENTIAL NEIGHBORHOODS

The residential neighborhoods that are outside of the natural and agricultural influence zones are places where Watsonville’s eclectic planting character is expressed and would be enhanced with a diverse tree planting program.

AGRICULTURAL GATEWAYS

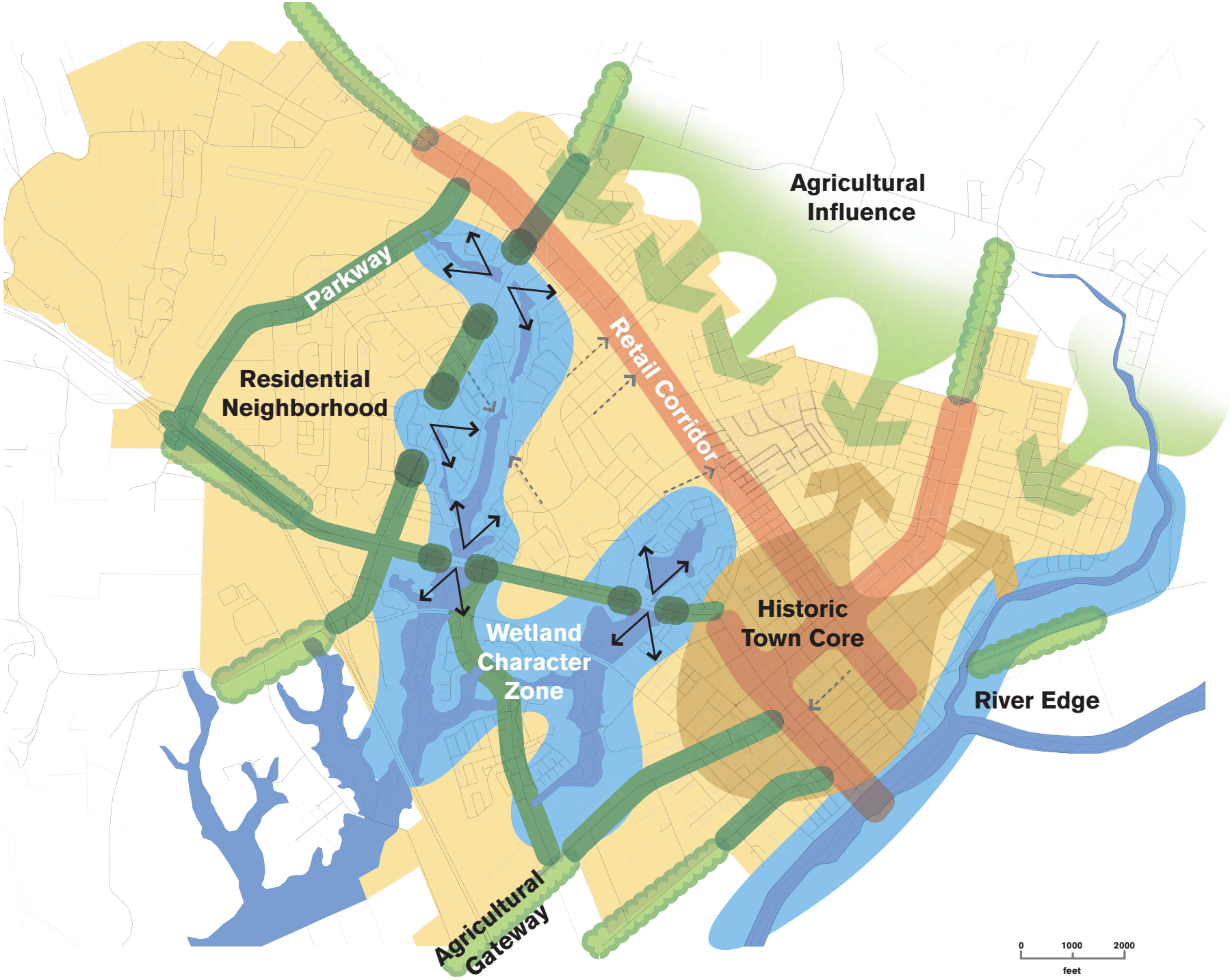
The agricultural gateways might be expressed with tree plantings that reflect the agricultural vernacular, such as windrows and orchard plantings.

PARKWAYS

The parkways are neighborhood collector streets or arterials that have an arboretum-like character which could be enhanced. These corridors generally have significant space within the right-of-way for tree planting, where larger trees or tree clusters might be appropriate.

RETAIL CORRIDORS

The retail corridors could be marked by special street trees. Lower Main St. is already lined with uniform rows of Flowering Pear trees. Freedom Blvd. and East Lake St. could be enhanced with street trees that improve the experience of shopping on these streets. The unique characteristics of each of these streets suggest different street-tree planting solutions, which are described below in the specific implementation plans.



Street Tree Program Framework Diagram

Street Tree Planting Opportunities Overview

Throughout Watsonville, the standard sidewalk width is seven feet. This width is too narrow to plant a viable street tree in a tree well within the existing sidewalk zone. A minimum width of four feet is required for accessibility and a three-foot wide tree well would not give the trees enough soil to be healthy or long-lived. This plan recommends alternative opportunities for planting street trees that will ensure larger, healthier and longer-living trees. The main opportunities examined during the planning process are as follow.

FRONT-YARD PLANTING INCENTIVES

Possibly Watsonville's most important potential for street-tree planting is in the front yards of private residences. In most of Watsonville's residential neighborhoods, the homes have ample front yards that could support wonderful street trees that would significantly enhance the streetscape environment. Incentivizing front-yard tree planting would probably be the most cost-effective way for Watsonville to achieve its tree-canopy goals. Incentive programs could take many forms, but in general they would consist of the city purchasing the trees and helping the residents to plant them by providing tools, materials, and possibly labor. The city may choose to provide periodic pruning services, especially in the first several years of the tree's growth. Residents would commit to maintaining the tree. It should be stressed that tree maintenance generally requires little other than watering during establishment; maintenance costs would be a negligible increase to the resident's water bill – measured in pennies per year.

MIXED-USE STREETS: PLANT WHERE POSSIBLE

Many of Watsonville's mixed-use commercial corridors do not have room for sidewalk widening because of the traffic volumes they handle. Similar to the front-yard tree-planting potential in Watsonville's residential neighborhoods, these mixed-use commercial corridors contain many unpaved areas along the back-of-walk within the private properties where trees could be planted. A similar incentive program geared toward business- and property-owners could add a significant number of trees to these corridors. Individual business- and property-owners could select trees to highlight their businesses, or a merchants association along a street or street segment could select a single species to give a corridor a distinctive identity.

WIDENING SIDEWALKS

Many of Watsonville's streets are wider than necessary to accommodate the necessary traffic volumes. In these cases, sidewalks could be widened to provide room for traditional street-tree planting in tree wells along the back-of-curb. Typically, a sidewalk-widening project would be part of an overall streetscape improvement project, potentially including new streetlights, street furnishings, public art and other amenities. Sidewalks wider than Watsonville's standard seven feet would be most beneficial along commercial or mixed-use corridors. As the city may reconstruct streets in the future—whether to replace or repair damaged pavement or utilities, or as part a development plan—opportunities for sidewalk widening and tree planting should be sought and incorporated into the designs. Innovative technologies such as structural soil and modular underground structural framework systems (e.g., Silva Cell) can be incorporated into street improvement projects in coordination with civil engineering efforts.

PLANTING WITHIN ROADWAY: STORMWATER MANAGEMENT ZONES, TREE-ISLANDS, PLANTING STRIPS

Where streets are wider than necessary in residential neighborhoods, planting areas could be added within the existing roadway area. These planting areas could take the form of traditional planting strips behind the curb and at the level of the sidewalk. Alternatively, the planting areas could be graded to provide drainage swales (known as bioswales, rain-gardens, or bioretention areas) to filter and absorb stormwater, preventing pollution and erosion of the city's wetlands and rivers. Such planting areas would offer multiple benefits: room for street trees and other planting, stormwater management, traffic-calming, and a buffer zone between pedestrians and vehicular traffic. In some cases, where there is an excess of on-street parking supply, these planting areas could be located in place of the existing parking lane on one or both sides of the street. In cases where there is demand for on-street parking, "tree-islands" could be located within the parking lane, displacing some but not all of the existing on-street parking. Tree islands could serve as stormwater-management planting areas, or they could be traditional curbed planting areas.

Street tree in historic downtown

Proposed Priority Implementation Projects

This plan identifies eight proposed priority implementation projects: Freedom Blvd., Martinelli St., East Lake Ave., Clifford Ave., Upper Main St., Bockius St. (and similar residential streets), and Riverside Dr. These streets were selected as priority implementation projects because they:

- Represent typical case studies for each of Watsonville's typical street types (described above under "Street and Gateways");
- Are equitably distributed throughout the city, offering maximum exposure to demonstration projects;
- Represent each of the zones identified in the Street Tree Planting Framework described above;
- Reinforce a contiguous network throughout the city.

The implementation of each of these projects would require further study. In some cases, traffic and parking-demand analyses would be required. In other cases, an incentive program would need to be developed to encourage participation by private land-owners. Each of these projects should emphasize continued public input from the beginning of the process as they are developed further.

These priority implementation projects are shown on the opposite page and described in detail below.

Proposed Priority Implementation Map

FREEDOM BOULEVARD

The proposed area for the Freedom Blvd. street tree planting stretches from the city border at Buena Vista Drive in the north to Lincoln Street to the south. (The segment from Lincoln St. south to Main St. has been improved with new sidewalks which include tree wells, and should be planted with a species consistent with the rest of Freedom Blvd.) There are currently no street trees in the public right-of-way along Freedom Boulevard, with the exception of a paved median with tree wells between Alta Vista Ave. and Crestview Dr. In several isolated locations along Freedom Blvd., trees that are planted on adjacent private property affect the character of the street, but the vast majority of the street is devoid of trees. The street has two lanes of traffic in each direction with a center turn lane and seven-foot-wide sidewalks.

Freedom Boulevard Project Summary

Short-term Project

Number of trees:	130 (approx.)
Tree Spacing:	Where possible on private properties
Tree size:	24” box
R.O.M. cost:	$52,000

Assumes no irrigation and no planting other than trees.

Long-term Project

Number of trees:	680 (with tree grates)
Tree spacing:	30’
Tree size:	24” box
Street reconfiguration:	Sidewalk widening to 10’, lane re-striping
R.O.M. cost:	$24 Million - $30 Million

Includes contractor mobilization, demolition, standard concrete sidewalks, irrigation for trees, minimal utility work. Does not include street furnishings, new lighting, utility undergrounding or major utility work.

Freedom Boulevard priority implementation project 1”= 800’

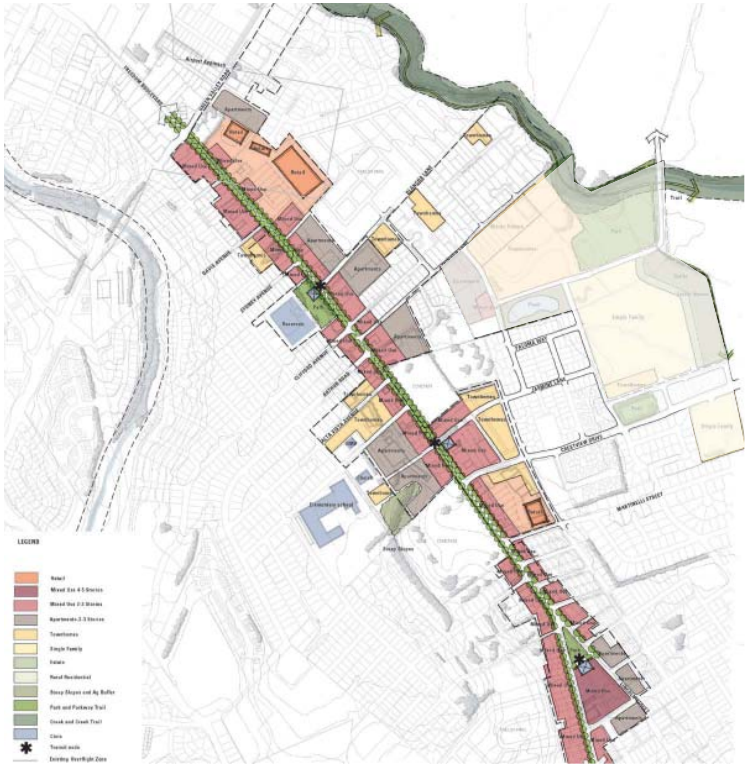

Green Valley Rd
Green Valley Rd
Blanca Ln
Clifford Ave
Clifford Ave
MATCHLINE
MATCHLINE
Madison St
Crestview Dr
Marigold St
Marigold St
Lincoln St
Lincoln St
Alta Vista St
MATCHLINE

This plan proposes two street tree planting concepts: a near-term plan and a long-term vision. The near-term planting plan takes advantage of the significant amount of unpaved planting area that is within the private properties along Freedom Blvd. Planting trees in the existing unpaved planting areas would enhance Freedom Blvd. significantly. The resulting tree pattern would be irregular, since some of the properties do not have planting areas. Planting trees in the unpaved planting areas on private properties could be achieved through tree-planting incentives and with the cooperation of the property owners. Property owners could select trees from a longer list of possible species, which would create an eclectic tree palette in keeping with the eclectic tree palette found in much of Watsonville. Property and business owners could select trees that would highlight entrances to their businesses and which would be compatible with their signage. Large expanses of parking could be screened from view.

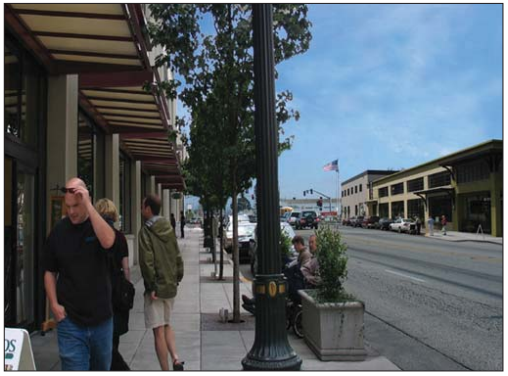
The long-term tree-planting vision for Freedom Blvd. is consistent with the Vista 2030 proposed development plan, which describes Freedom Blvd. as a mixed-use pedestrian-oriented corridor. Freedom Blvd. would become a tree-lined street more like those found in Watsonville's downtown, with a consistent species. To achieve this vision, the sidewalks would have to be widened to a minimum of eight feet, or a preferable width of ten feet. This plan illustrates several possible configurations for the ultimate design of Freedom Blvd., pending traffic analysis, public input, and the further refinement of the long-term development strategy.

Current condition of Freedom boulevard: an auto-oriented corridor

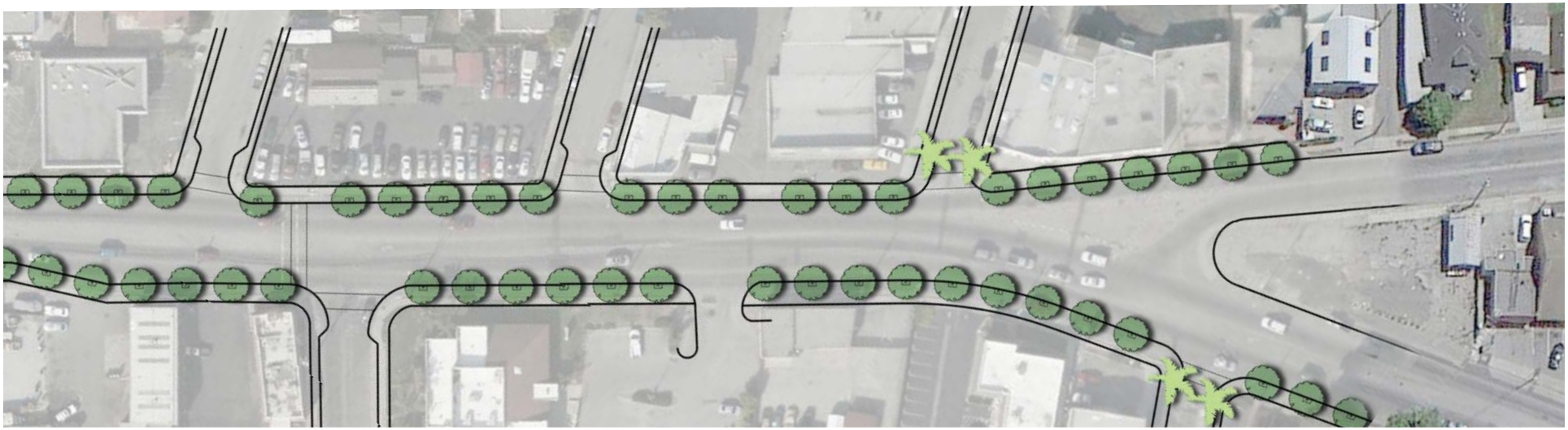
Freedom Boulevard priority implementation project typical area enlargement (1"=100')

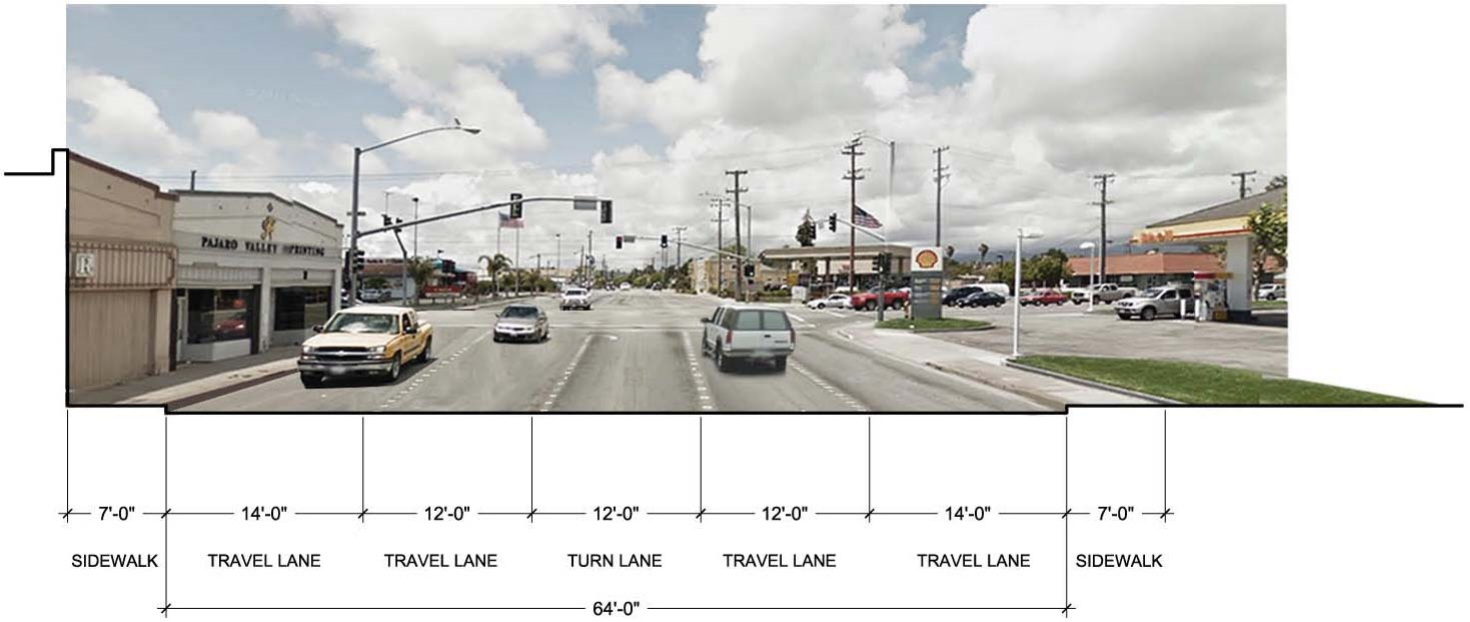


Freedom Corridor Concept from Vista 2030 proposed development plan

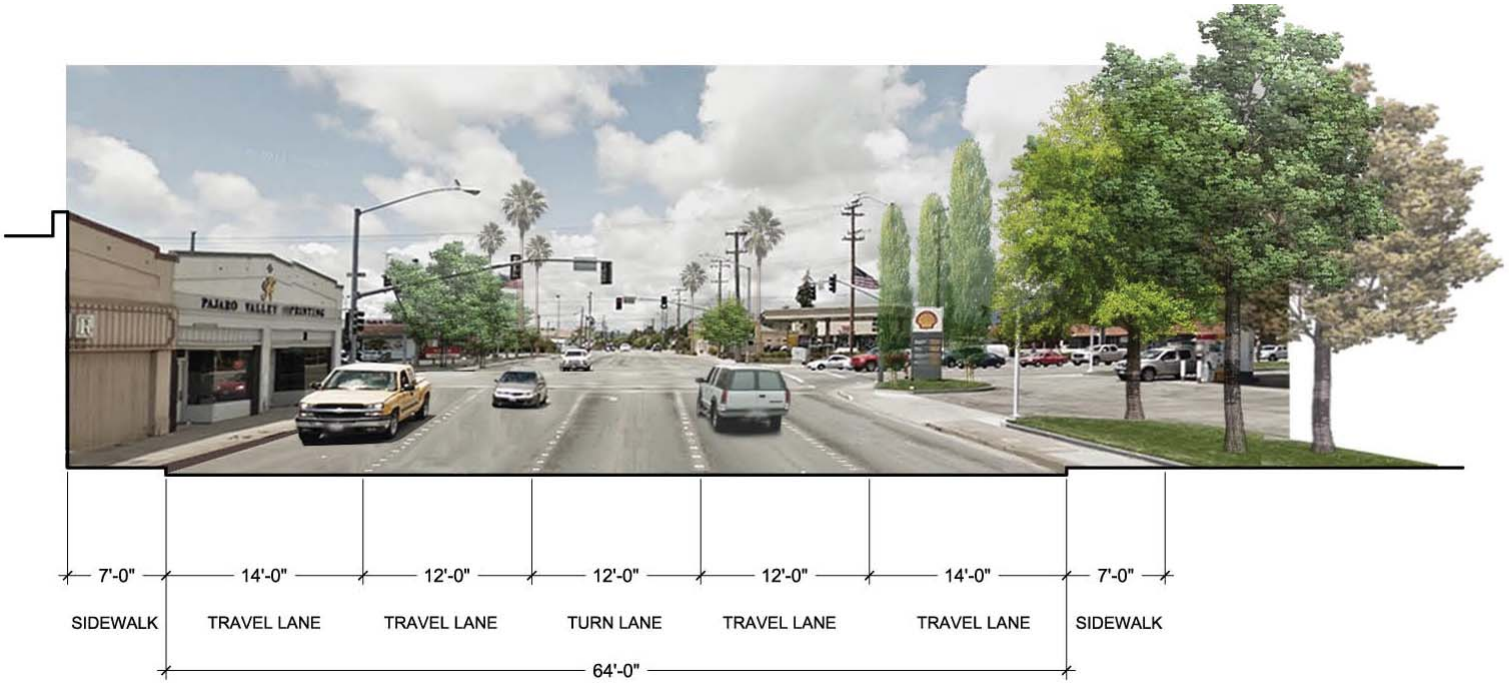


Before and after rendering depicting future condition for Freedom Boulevard from Vista 2030 proposed development plan

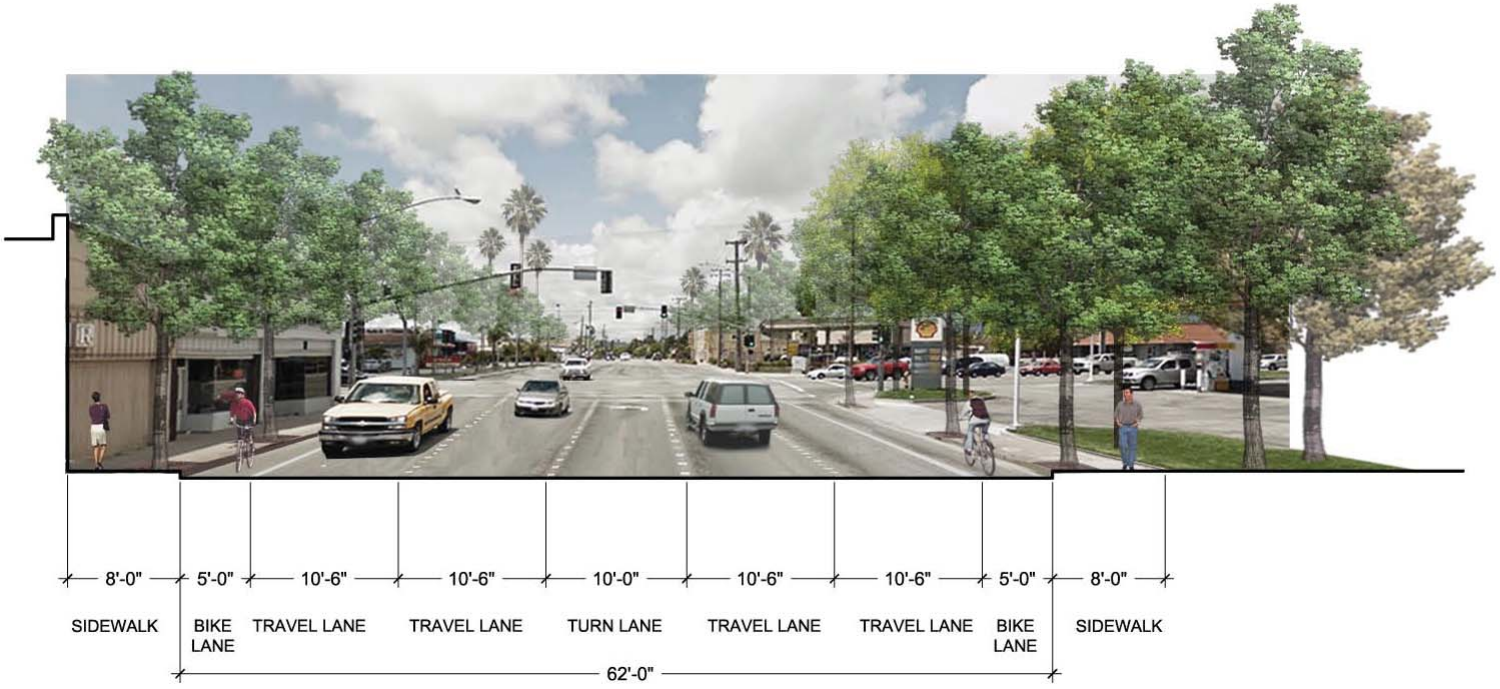




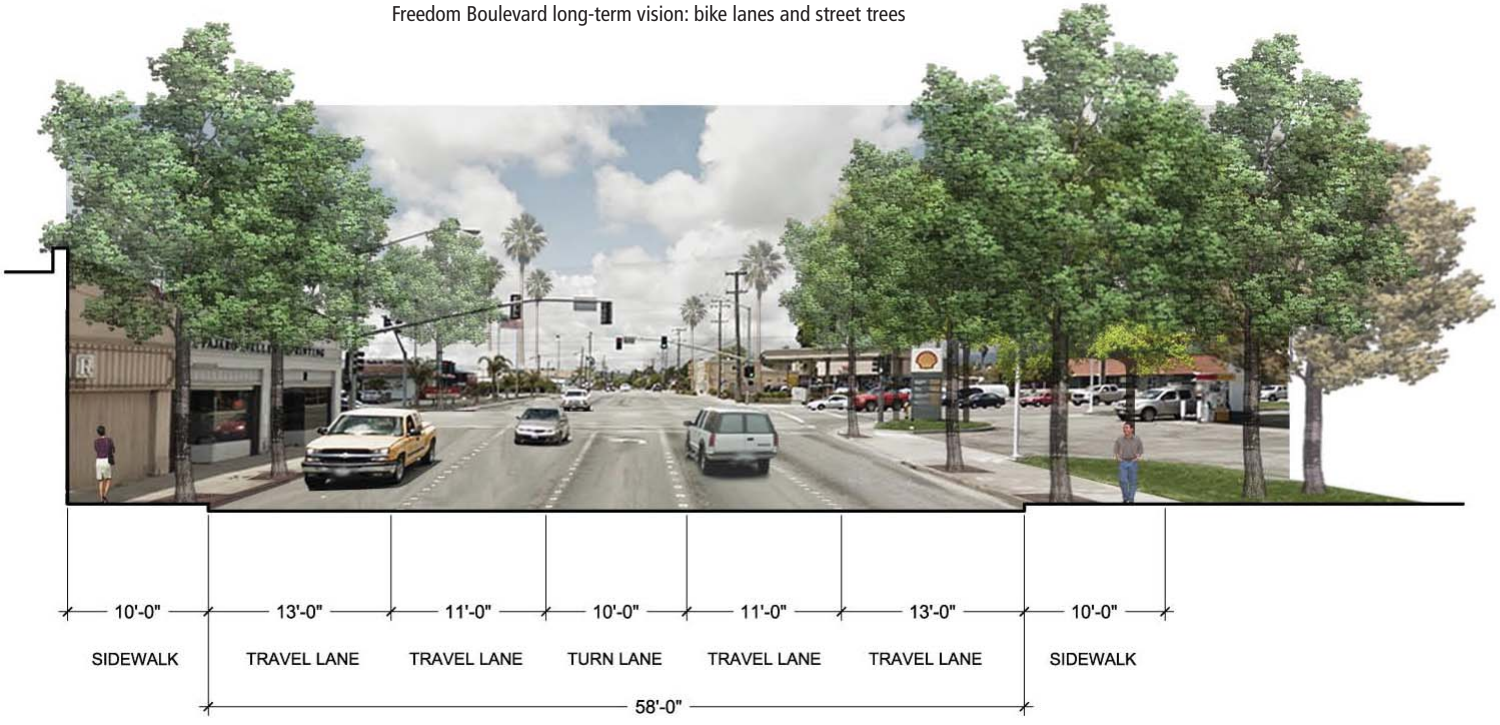
Freedom Boulevard existing condition



Freedom Boulevard near-term vision: trees in private properties



Freedom Boulevard long-term vision: bike lanes and street trees



Freedom Boulevard long-term vision: wide sidewalk and street trees

MARTINELLI STREET

Martinelli St. connects East Lake Ave. to Freedom Blvd. through the Martinelli residential neighborhood. The street is residential, and the houses have generous front yards. Some of the front yards contain large trees that contribute significantly to the streetscape. Most of the front yards do not have trees, and, as with most of Watsonville, a tree-planting incentive program could go a long way toward transforming Martinelli St. into a beautifully tree-lined street.

In addition to a front-yard planting program, Martinelli St. offers the opportunity for tree planting within the public right-of-way. The 40-foot curb-to-curb width provides ample room for one travel lane in each direction and parking on both sides of the street. In addition to meeting the parking and traffic needs, there may be the opportunity to incorporate planting areas within the existing roadway. These planting areas would serve several purposes: providing space for street trees and other planting, providing rain-gardens or bioswales for stormwater filtration and infiltration, calming traffic, and providing a buffer between the sidewalk and roadway.

These planting areas could take various forms to accommodate different levels of parking demand. Since the houses along Martinelli have garages and driveway space for off-street parking, it may be the case that on-street parking could be reduced to provide the benefits of the planting areas without eliminating the needed parking spaces. A parking-demand study should be done prior to the next stage of design for these proposed improvements.

This plan proposes a range of possible tree-planting options, depending on the amount of on-street parking that is needed. The first option is a full-length stormwater-management planting area, with interruptions only for driveways and intersections. Because homes along Martinelli tend to be sited on their lots so that driveways are clustered, there are long uninterrupted zones for linear planting areas. This concept allows for parking on one side of the street. The parking lane could be located consistently on one side of the street, or the parking aisle could alternate from one side of the street to the other from block to block, or even within one block. In that case, the lane-shifts could provide additional traffic-calming.

If more parking is required along Martinelli, the linear planting areas could be subdivided to provide parking spaces within the planting zone, similar to what has been done in the Seaview Ranch development (below, right).

Martinelli Street existing conditions

Sea View Ranch Development

Martinelli Street priority implementation project 1 ” = 800’

Planting within the planting areas could be either uniform and maintained by the City, or varied and maintained by the home-owners. A minimal approach could be for the City to install a very simple low-water landscape with no irrigation system and use a water truck to establish the plant material. In planting areas that are more significant, a single irrigation system may be warranted, providing a basic level of irrigation to low-water/drought-tolerant plantings. This could be operated and maintained by the City and serve the entire project. If residents or an organized group of residents wish to apply to the City to supplement this system to support a more robust planting area, separate, supplemental irrigation could be tied into each property's system, to be operated and maintained by the home-owners. Both public and private maintenance and control over this type of planting area have been successful in other cities. Successful examples of the private-maintenance model can be found in South Livermore and Second Avenue NW in Seattle, Washington.

The planting design for the stormwater-management planting areas should emphasize drought-tolerant species that are adapted to wintertime inundation. The plants should be low-maintenance species. Moreover, the unique character of Watsonville could be expressed by planting an eclectic mix of the types of plants found in many gardens in Watsonville, such as succulent rock-gardens.

Martinelli St. was chosen as a priority implementation project partly because it is in the agricultural influence zone. The street tree species should reflect that influence. Within the stormwater-management areas, the street trees should be selected from among the species that are adapted to seasonal inundation. Fruit trees could be planted to complement these street trees, either in the adjacent front yards, or along the edges of the stormwater-management zones which will not be inundated. Because Martinelli St. is named after the famous apple producer, apple trees would be a particularly meaningful choice.

Additional design considerations for the planting areas include:

- Providing access to parked cars with narrow paved walkways along the back-of-curb and across the planting areas at certain points;
- Providing paved areas for garbage and recycling receptacles to be placed on pick-up days;
- Allowing for street-sweeping operations.
- Plant appropriate trees under powerlines.

Martinelli Street priority implementation project, typical area enlargement (1"=60')

Martinelli Street Project Summary

Front-yard Tree Planting

Number of trees:	100 (approx.)
Tree Spacing:	Where possible on private properties
Tree size:	24” box
R.O.M. cost:	$40,000

Assumes no irrigation and no planting other than trees.

Tree Planting Within Public Right-of-Way (Opt. 2, p. 35)

Number of trees:	260
Tree spacing:	30’
Tree size:	24” box
Planting area:	54,000 square feet (stormwater management area)
Street reconfiguration:	Add stormwater management planting area, new sidewalk lane re-striping
R.O.M. cost:	$12 Million - $15 Million

Includes contractor mobilization, demolition, standard concrete sidewalks, import engineered stormwater management soil, irrigation, minimal utility work. Does not include street furnishings, new lighting, utility undergrounding or major utility work.

Martinelli Street existing condition

Martinelli Street near-term vision: trees in private properties

Martinelli Street long-term option 1: full stormwater management swale

Martinelli Street long-term option 2: planting islands alternating with parking

EAST LAKE AVENUE

East Lake Ave. is a busy mixed-use retail corridor with two lanes of traffic in each direction. There is not room within the curb-to-curb roadway for tree planting. The sidewalk is 7 feet wide, which is not wide enough for tree wells. The main opportunity for street tree planting lies within the residential and commercial private properties. There are many existing unpaved areas along the street that could be used for tree planting. The detail plan shows the potential number of trees that could be planted in one segment of East Lake Ave.

Building on the few existing trees along East Lake Ave., this plan proposes expanding the eclectic mix of trees through an incentive program. Individual property and business owners could choose trees from the list of approved street trees. (For planting under power lines, the list of trees approved for use under power lines should be used.) The resulting mix of trees could highlight and accentuate certain institutions and businesses with unique tree species and larger groupings of signature trees.

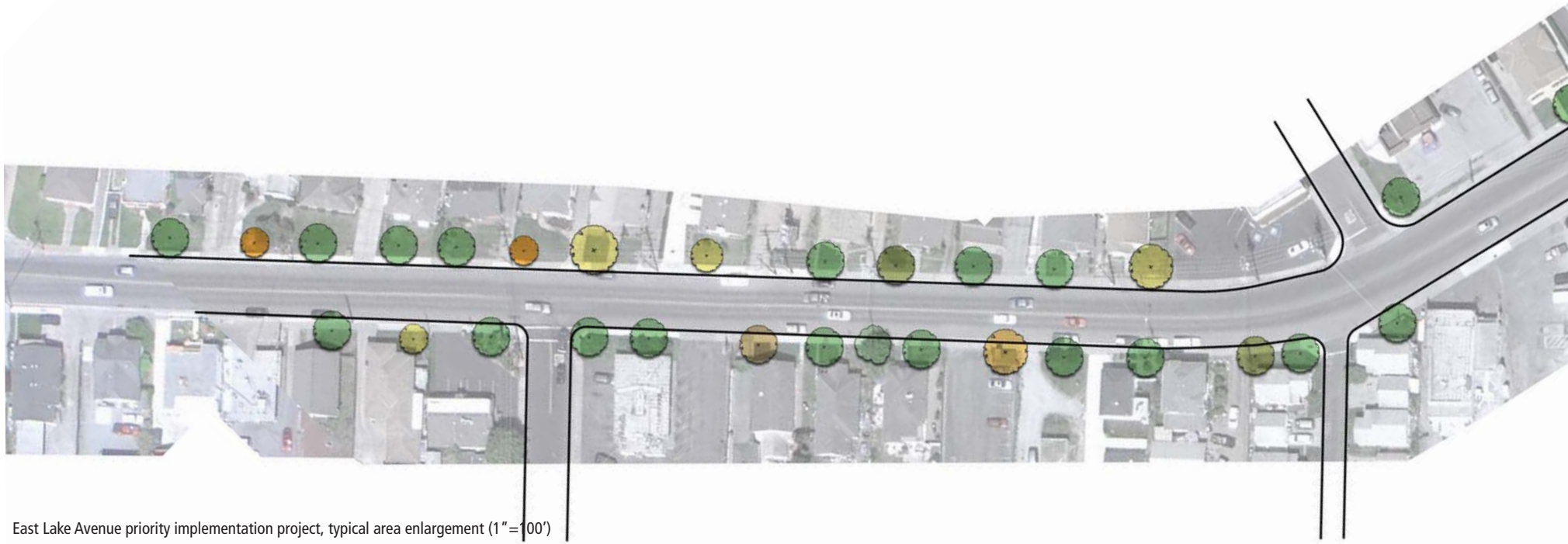
Where business signage might be hidden by trees, taller trees should be planted. Over time, these trees can be pruned ("limbed up") so that the lowest branches are above the sight-lines to the signs. Often, smaller trees are planted in front of businesses in the hopes that they will not obscure signage, however, smaller trees tend to grow just to the signage height, blocking the signs more that larger trees would.

East Lake Avenue existing conditions

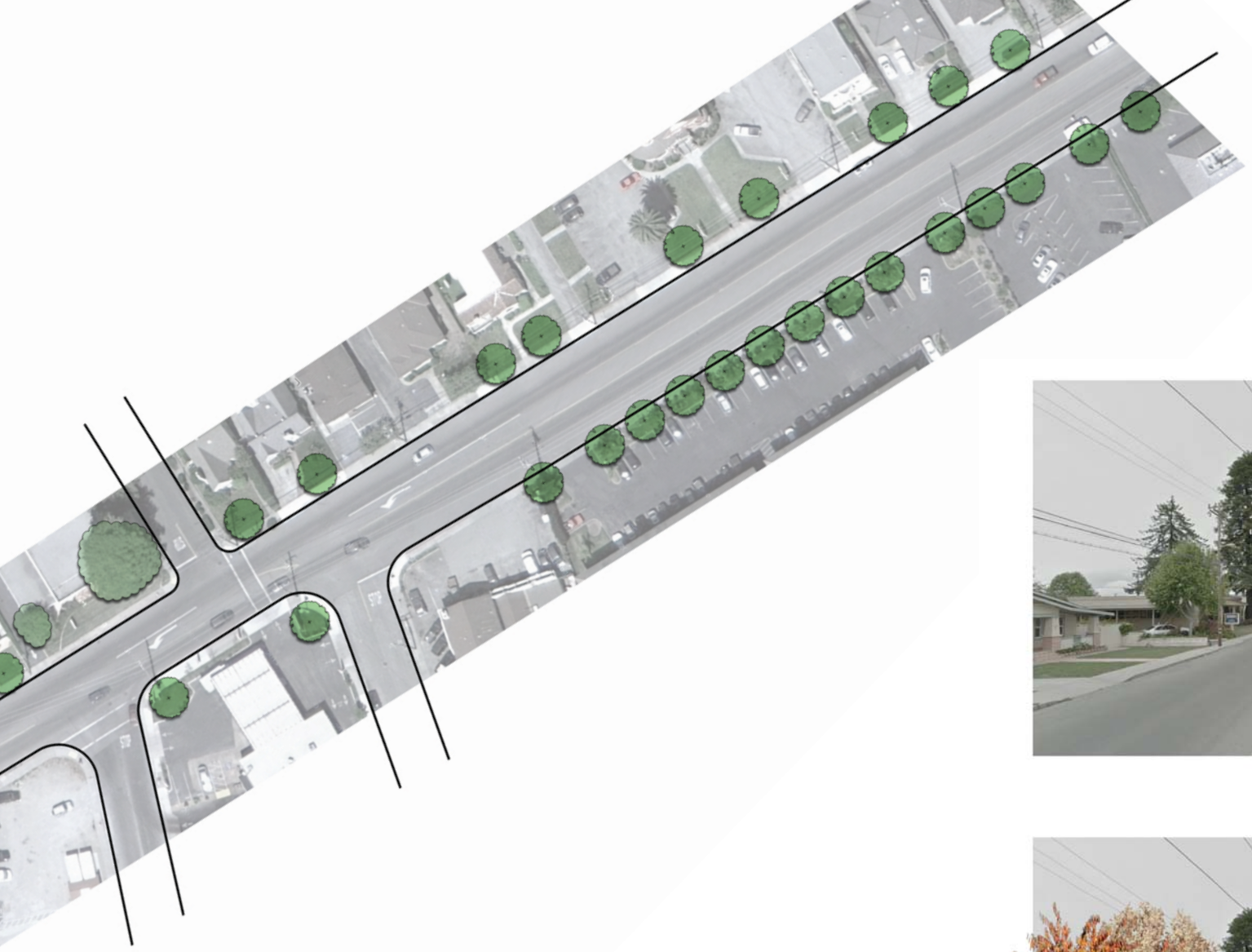
East Lake Avenue Project Summary	
Number of trees:	120 (approx.)
Tree Spacing:	Where possible within private properties
Tree size:	24" box
R.O.M. Cost:	$48,000

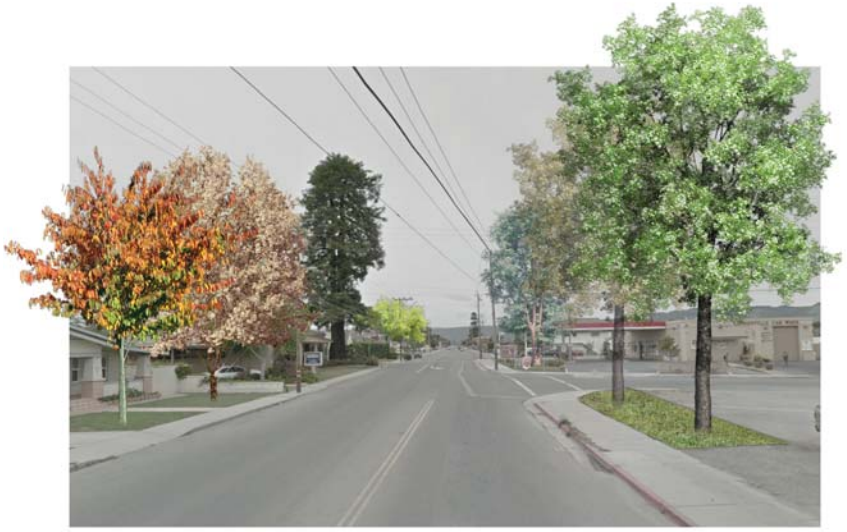
Assumes no irrigation and no planting other than trees.

East Lake Avenue priority implementation project 1"=800'



East Lake Avenue priority implementation project, typical area enlargement (1 ″ = 100′)





Before and after view showing proposed eclectic mix of tree planting in private property

UPPER MAIN STREET

Upper Main St. is a major gateway into Watsonville from Highway 1. This plan proposes enhancing Upper Main Street's gateway function by creating a linear gateway sequence. There are substantial planting areas on each side of the street within the public right of way, in which large-stature trees can be planted. There are many existing large-stature trees that can influence the tree-planting design. Also, there is an existing sequence of experiences from the forest-like western portion to the shopping-center zone to the slough-crossing to a finer-grained commercial zone.

Upper Main St. was selected as a priority implementation project because of its role as a major gateway into the city, because of the potential to plant trees in the abundant planting area, and because it is typical of what this report refers to as the "green arterial" type of street. The "green arterials" throughout Watsonville could be characterized with an arboretum-type planting of a variety of large-stature trees.

The proposed design enhances the western forest-like zone by adding large stature trees to create the experience of passing through a tunnel of trees before arriving at the slough-crossing. At the Watsonville Square Shopping Center, the large-stature trees would continue, while accommodating the shopping-center signage through tree spacing and higher-limbed trees. Riparian trees would announce the slough crossing before a break in the trees to provide views north and south to the slough itself. East of the slough, the tree planting would consist of a dense planting of large stature trees, with a more formal, urban character.

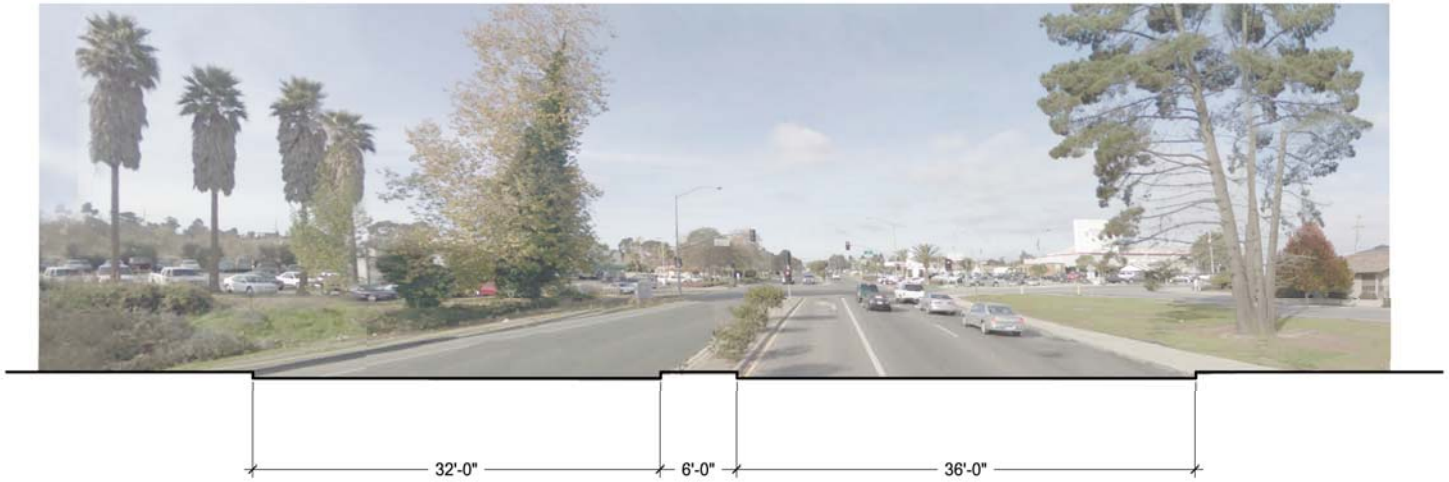
Upper Main Street priority implementation project 1"=800'

Upper Main Street Project Summary

Number of trees:	370
Tree Spacing:	25’ - 30’
Tree size:	170 @ 24” Box; 200 @ 15 gal.
Planting Area:	173,000 sf
R.O.M. Cost:	$2 Million - $2.5 Million

Includes irrigation, soil preparation, shrub and groundcover planting and mulch.

Upper Main Street existing conditions



Upper Main Street existing conditions

Upper Main Street priority implementation project, area enlargement showing existing trees and shrubs at slough crossing, with gateway trees on either side (1"=100')

Upper Main Street proposed planting

CLIFFORD AVENUE

Clifford Ave. is a residential street that runs between Freedom Blvd. and Upper Main St. to the east of Struve Slough. The street has three distinct zones. Toward Freedom Blvd., the street is straight and has narrow sidewalks with no tree-planting strip. This segment is typical of many post-war neighborhoods of single-family detached homes in the western part of Watsonville (including a rolled curb and gutter detail). The middle segment is a relatively short stretch running from the middle of the 200 block to Lassen Way that has a planting strip between the sidewalk and curb on both sides of the street. The third segment, between Lassen Way and Upper Main St. has no planting strip between the sidewalk and curb, and is dominated by multi-unit apartment buildings. The larger residential developments have large planting areas behind the sidewalk, some of which contain significant trees while others are treeless and poorly maintained.

Similar to Martinelli St., Clifford Ave. may be wider than necessary for the amount of traffic it handles. There is the opportunity to incorporate significant tree-planting area within the existing roadway. The middle segment shows the potential to add planting strips along the rest of the street. Where the slope is flat enough, these planting areas could function as stormwater-management areas.

The three segments offer the opportunity for a varied tree palette that corresponds to the different street configurations and land-use types. In the upper area, the street functions as a direct connector from the residential neighborhood to Freedom Blvd. This segment could be planted with a consistent species in a formal pattern that emphasizes this connection.

Along the middle segment, the existing planting strip should be planted with additional trees. As the middle segment is marked by a grade change and the road becomes curvy, the tree species could change from the upper, formal and consistent zone. Because of the slope and curviness of the street, views come into view at points which could be highlighted with a change in the tree species.

Section of Clifford Avenue with multi-unit apartment buildings.

Section of Clifford Avenue with existing planting strips.

Clifford Avenue priority implementation project 1"=800'

As the lower segment passes through multi-unit developments, the large planting areas on those properties offer a great opportunity to create a very lush environment by incentivizing tree planting on the private properties, in addition to the tree-planting strips in the public right of way. This lush environment could be punctuated with groupings of tree species at significant nodes, such as the Pennsylvania Dr. crossing and the entrance to the Struve Slough trail entrance at Montebello Dr.

Clifford Ave. was selected as a priority implementation project partly because it is in the wetland influence zone. The plantings along Clifford Ave. should reflect a connection to the wetland through the planting of riparian (or related) species, especially at nodes where there are views of the wetland, and at the Montebello Dr. intersection.

Clifford Ave. was selected also because neighbors have complained of speeding along the street. Clifford Ave. is crossed at many points by students because there are many schools nearby to the east and west of the street. Traffic calming should be a priority for the street, and would be a significant benefit of narrowing the street and adding street trees.

Clifford Avenue Project Summary

Tree Planting in Private Properties

Number of trees:	150 (approx.)
Tree Spacing: multi-	Where possible on single-unit properties; 30' on unit properties
Tree size:	24" box
R.O.M. cost:	$60,000

Assumes no irrigation and no planting other than trees.

Planter Strip in Public Right-of-Way

Number of trees:	320
Tree spacing:	30'
Tree size:	24" box
Street reconfiguration: Assumes management	Move curb, add planting strip, replace sidewalks. half of new planting area will be stormwater area.
R.O.M. cost:	$10 Million - $13 Million

Includes contractor mobilization, demolition, standard concrete sidewalks, minimal utility work. Does not include street furnishings, new lighting, utility undergrounding or major utility work.

Clifford Avenue priority implementation project, typical area enlargement (1"=100')

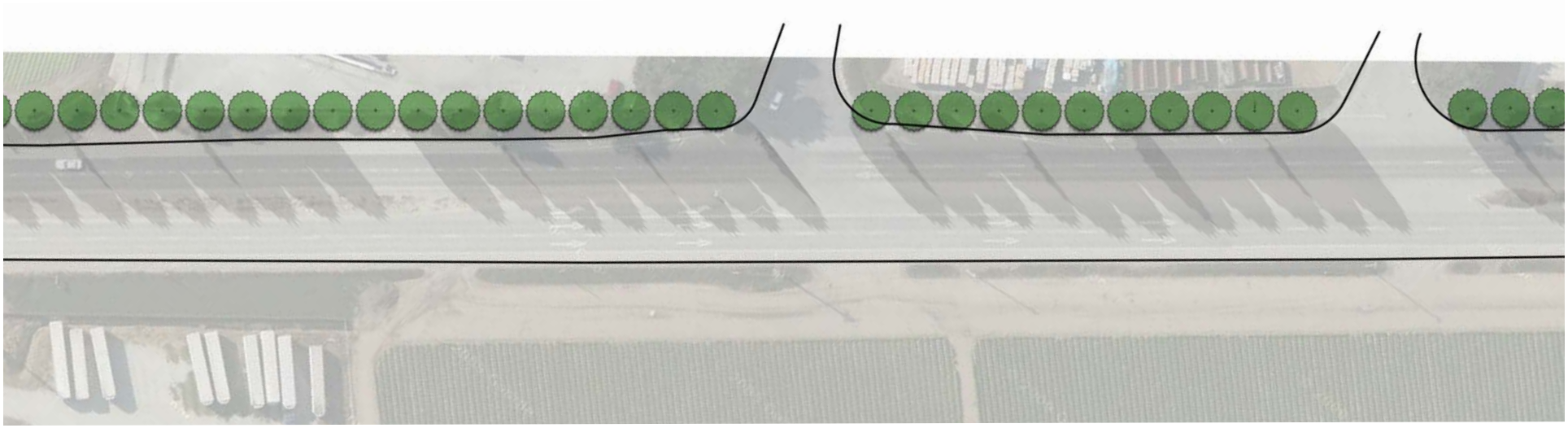
RIVERSIDE DRIVE

Riverside Dr. was selected as a priority implementation project as an example of an agricultural gateway. The agricultural gateways would be planted with tree species and patterns that are typical of the agricultural landscape. Notably, agricultural plantings are often different on each side of a street. The proposed planting for Riverside Dr. and the other agricultural gateways would therefore be asymmetrical, with trees on one side of the street only. The trees could either be windrows of tightly-spaced tall, columnar trees, or orchards of fruit and nut trees found typically in the region. The orchard planting would be at least two rows deep, and so would require more space than the windrows, which could be planted in relatively constrained areas. These agricultural gateway plantings would typically occur on the private farmland, and would require the cooperation of the land-owner.

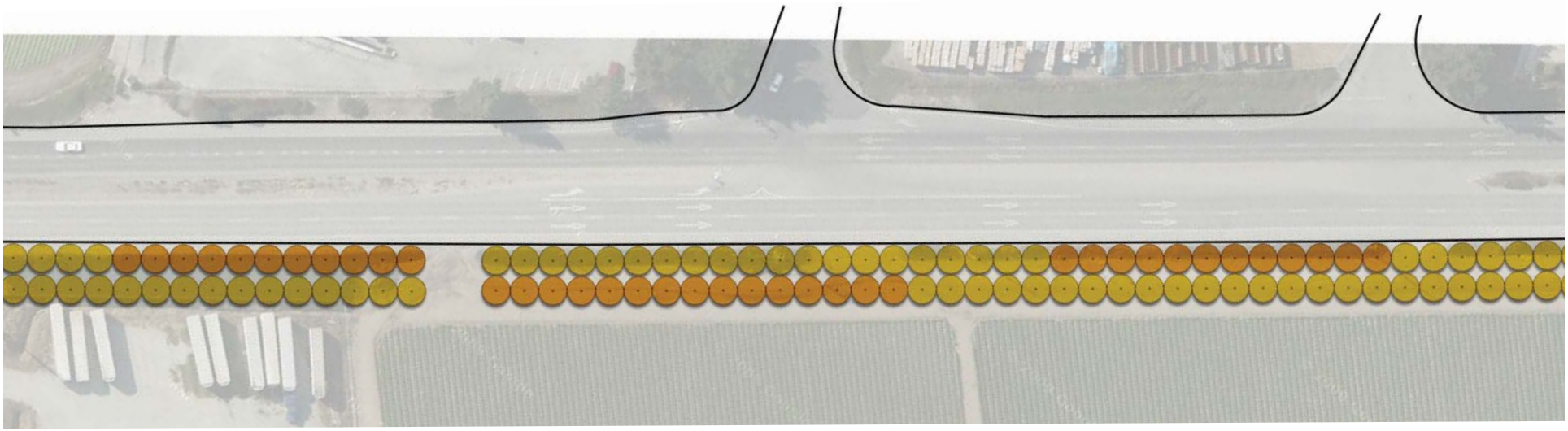
Riverside Drive existing conditions

Riverside Drive Project Summary	
Number of trees:	450 (windrow), 800 (orchard)
Tree Spacing:	20’
Tree size:	15 gal.
Planting Area:	N/A
R.O.M. Cost:	$90,000 - $160,000

Riverside Drive priority implementation project 1"=800'



Riverside Drive priority implementation project windrow option, typical area enlargement (1"=100')



Riverside Drive priority implementation project orchard option, typical area enlargement (1"=100')

Before and after view showing proposed windrow trees as gateway to Watsonville.

BOCKIUS STREET

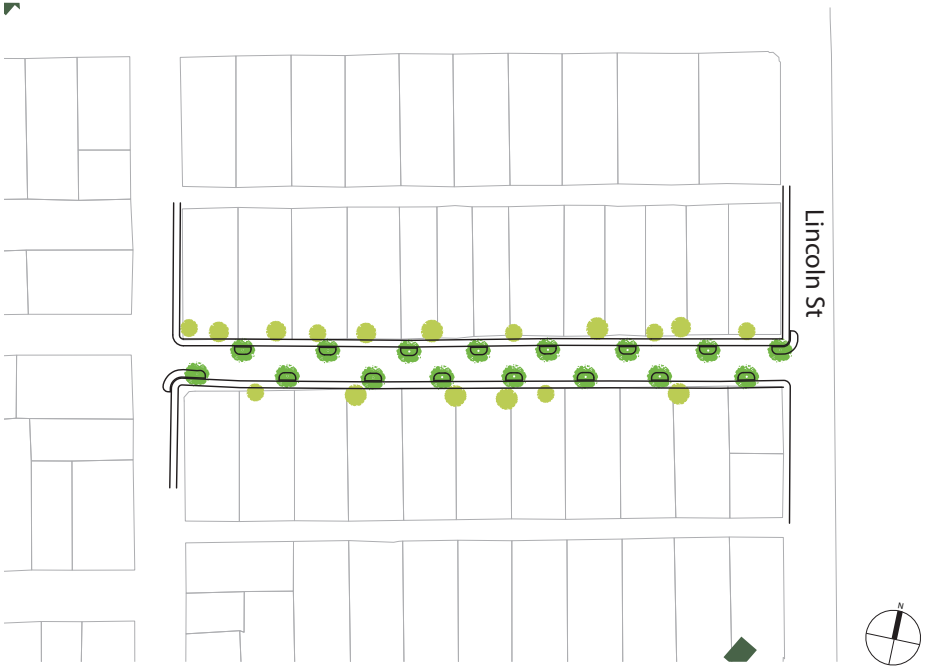
Bockius St. is a small residential street in the historic core of Watsonville. The street is typical of Watsonville's narrowest streets, with parking on both sides, two travel lanes, and seven-foot-wide sidewalks without planting strips between the curb and sidewalks. In the historic core neighborhoods, there is limited off-street parking; the on-street parking is heavily used. The main opportunity for tree planting is in the front yards of the private residences, which could be encouraged through incentive programs as described above. Additional trees could be planted in tree islands on the street where there is currently no parking, such as between driveways and at corner bulb-outs. If tree islands are installed, the planting and irrigation strategy could be similar to that described for Martinelli above.

The tree species for front-yard plantings should be an eclectic mix that reinforces the exuberance typical of Watsonville's residential neighborhoods. There is a wide range of small-sized trees that would be appropriate under the power lines. Where there is room for tree islands, the species planted within the roadway could be a consistent species on each block or in each neighborhood.

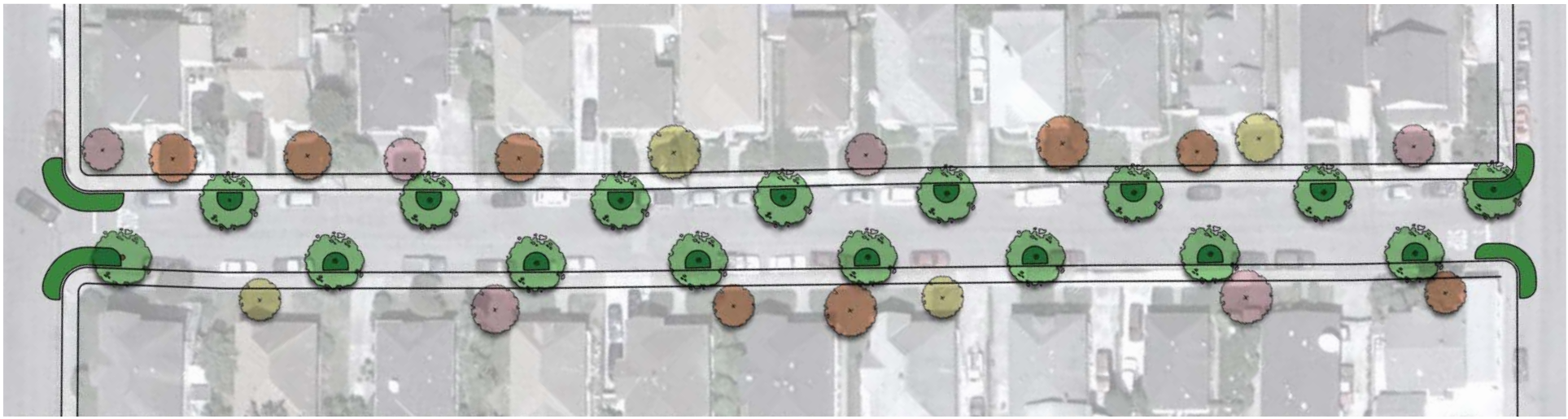
The intent of the Bockius St. concept presented here is that more than one similar street within the city could become part of a priority implementation project, depending on funding. Ideally groups of several similar streets within several neighborhoods could be funded as one implementation project. A front-yard tree-planting incentive program could require that a certain percentage of a block's residents agree to plant trees, so that the trees have a significant impact on the streetscape. Funding could be distributed throughout the city on a block-by-block basis, as each block gathers enough support among neighbors. Trees and planting supplies could be delivered to each block on a tree-planting day which would become a community event.

Bockius Street Project Summary	
Number of trees:	24 (one per home) + 8 in tree-islands or bulb-outs
Tree Spacing:	N/A
Tree size:	24" box
Planting Area:	N/A
R.O.M. Cost:	$9,600 (basic) - $70,000 with tree-islands and bulb-outs

Bockius Street existing conditions



Bockius Street priority implementation project 1"=400'



Bockius Street priority implementation project 1" = 60'

Bockius Street existing condition

Bockius Street private residence planting option

Bockius Street tree island planting option

Watsonville Tree Planting Palette

The following is a list of approved trees for street tree planting in the City of Watsonvillle. The list is divided into the three influence zones described in the "Understanding Watsonville" and "Street Tree Program Framework" sections above. The tree types are: Broadleaf Deciduous Large, Medium and Small (BDL, BDM, BDS); Broadleaf Evergreen Large, Medium and Small (BEL, BEM, BES); Conifer Evergreen Large, Medium and Small (CEL, CEM, CES); and Palm Evergreen Large, Medium and Small (PEL, PEM, PES). "RPI" refers to the relative performance index. An RPI value of 1.0 or better indicates that the species is performing as well or better than average when compared to the other species currently found in Watsonville. "BVOC Emissions" refers to biogenic volatile organic compounds. While all tree species emit some BVOCs, most species contribute benefits to overall air quality that far outweigh these emissions. "SPL" and "RST" are susceptible and resistant, respectively. The community types are Agricultural Orchard (AO), Agricultural Edge (AE), Cultural Corridor (CC), Cultural Neighborhood (CN), Cultural Specimen (CS), and Native Riparian (NR). Several species fit into more than one community type.

Scientific Name	Common Name	Tree Type	Watsonville RPI ≥ 1.0	Utility Friendly	Allergen	Hardscape Damage Potential	BVOC Emissions	Edible Fruit	Anthracnose	Powdery Mildew Resistant	Community Type
Agricultural Influence Zone											
Acca sellowiana 'coolidge'	Coolidge pineapple guava	BES		Ut				F			AO
Citrus paradisi	Grapefruit	BES		Ut	A	M	M	F			AO
Citrus sinensis	Orange	BES		Ut	A		M	F			AO
Diospyros kaki	Japanese persimmon	BDM		Ut				F			AO
Diospyros texana	Texas persimmon	BDS		Ut				F			AO
Diospyros virginiana	American persimmon	BDS				M		F			AO
Fortunella margarita	Kumquat	BES		Ut	A			F			AO
Juglans nigra	Black walnut	BDL			A	H		F	SPL		AO
Persea americana	Avacado	BEM						F			AO
Persea americana x drymifolia	Avacado	BES			A			F	SPL		AO
Prunus amygdalus	Almond	BDS			A			F		SPL	AO
Prunus angustifolia	Chicksaw plum	BDS		Ut				F			AO
Prunus armeniaca	Apricot	BDS		Ut	A			F		SPL	AO
Prunus avium	Sweet cherry	BDM			A	M		F		SPL	AO
Pyrus communis	Pear	BDS			A			F		SPL	AO
Brahea armata	Mexican blue palm	PES						F			CC AE CS
Eucalyptus globulus	Blue gum	BEL									AE
Populus nigra	Lombardy poplar	BDL									AE
Washingtonia filifera	California fan palm	PES			A	M	M				CS AE
Cultural Influence Zone											
Acer rubrum	Red maple	BDM			A		M				CC
Nyssa sylvatica	Tupelo	BDM			A						CC
Sophora japonica 'Regent'	Regent Japanese pagoda	BDM								SPL	CC
Brahea armata	Mexican blue palm	PES						F			CC AE CS
Fraxinus american 'Autumn Purple'	Autumn purple ash	BDM				H			SPL		CC CN
Gleditsia triacanthos	Honeylocust	BDM	x								CC CN
Jacaranda mimosifolia	Jacaranda	BDM	x								CC CN
Lagerstroemia indica 'biloxi'	Biloxy crapemyrtle	BDS		Ut						SPL	CC CN
Magnolia grandiflora	Southern magnolia	BEM	x		A	H	M				CC CN
Pistacia chinensis	Chinese pistache	BDM	x		A		M				CC CN
Platanus acerifolia	London planetree	BDL	x		A	H	H		SPL	SPL	CC CN
Platanus acerifolia 'bloodgood'	Bloodgood London planetree	BDL							RST		CC CN
Platanus acerifolia 'Columbia'	Columbia London planetree	BDL									CC CN
Platanus acerifolia 'yarwood'	Yarwood London Planetree	BDL								RST	CC CN
Pyrus calleryana 'Chanticleer'	Chanticleer pear	BDS									CC CN
Ulmus parvifolia 'Drake'	Drake Chinese elm	BDM			A	M					CC CN
Ceratonia siliqua	Carob	BEM				H	M	F			CC CS
Arbutus unedo	Strawberry tree	BES	x		A			F	SPL		CN
Celtis australis	European hackberry	BDL			A	M		F			CN
Celtis occidentalis	Common hackberry	BDL			A	M		F			CN
Malus arnoldiana	Arnold crabapple	BDS		Ut	A			F		SPL	CN
Malus atrosanguinea	Carmine crabapple	BDS		Ut	A			F			CN

Malus 'dolgo'	Malus 'dolgo'	BDS			A			F				CN
Malus 'hopa'	Hopa crabapple	BDS		Ut	A			F			SPL	CN
Malus 'red jade'	Red-jade crabapple	BDS		Ut	A			F				CN
Podocarpus macrophyllus	Yew pine	BES						F				CN
Aesculus carnea 'Briotii'	Red Horsechestnut	BDM										CN
Agonis flexuosa	Peppermint tree	BES				M	H					CN
Albizia julibrissin	Silk tree	BDM			A	M	M					CN
Arbutus 'Marina'	Marina madrone	BEM							SPL			CN
Bauhinia variegata	Purple orchid tree	BDS					M					CN
Brachychiton acerifolius	Flame tree	BDM				M						CN
Brachychiton populneus	Bottle tree	BEM				M						CN
Callistemon citrinus	Lemon bottlebrush	BES	x		A		H					CN
Celtis laevigata 'all seasons'	All seasons hackberry	BDL				H						CN
Cercis canadensis	Eastern Redbud	BDS		UT	A				SPL			CN
Lagerstroemia fauriei	Japanese crapemyrtle	BDM									SPL	CN
Lagerstroemia indica 'Muskogee'	Crepemyrtle	BDS		UT					RST			CN
Lagerstroemia indica 'Natchez'	Crepemyrtle	BDS		UT					RST			CN
Lagerstroemia indica 'Tuscarora'	Crepemyrtle	BDS		UT					RST			CN
Magnolia soulangiana 'speciosa'	Speciosa suacer magnolia	BDS		Ut								CN
Maytenus boaria	Mayten	BEM				M						CN
Melaleuca linarifolia	Flaxleaf paperbark	BES					H					CN
Melaleuca quinqueneriva	Cajeput	BES			A		H					CN
Nyssa sinensis	Chinese tupelo	BDM										CN
Photinia serrulata 'aculeata'	Aculeata Chinese photinia	BES		Ut								CN
Quercus flacata	Southern red oak	BDM		Ut								CN
Quercus rubra	Northern red oak	BDL	x									CN
Quercus shumardii	Shumard oak	BDM										CN
Quercus suber	Cork oak	BEL			A	M	H					CN
Tilia americana 'Redmond'	American linden	BDM							SPL		SPL	CN
Eriobotrya japonica	Loquat	BES						F				CN AO
Eriobotrya japonica 'coppertone'	Coppertone loquat	BES		Ut				F				CN AO
Morus alba	White mulberry	BDM	x		A	H		F				CN AO
Cinnamomum camphora	Camphor	BEL			A	H			SPL			CN CS
Araucaria bidwillii	Bunya-bunya	CEL				M		F				CS
Butia capitata	Pindo palm	PES						F				CS
Ficus macrophylla	Moreton bay fig	BEL				H	H	F				CS
Pinus pinea	Italian stone pine	CEL			A	M		F				CS
Cedrus deodara	Deodar cedar	CEL	x		A	M						CS
Juniperus silicicola	Southern red cedar	CEM										CS
Prunus serrulata	Kwanzan cherry	BDS	x									CS
Quercus acuta	Japanese evergreen oak	BES		Ut								CS
Quercus rober	English oak	BDL			A	M	H				SPL	CS
Quercus virginiana	Southern live oak	BEM			A	M	H					CS
Syagrus romanzoffianum	Queen palm	PES	x									CS
Yucca gloriosa	Moundlily yucca	PES	x									CS
Washingtonia filifera	California fan palm	PES			A	M	M					CS AE
Native Habitat Influence Zone												
Juglans hindsii	California black walnut	BDL			A	M	M	F				NR
Prunus ilicifolia	Hollyleaf cherry	BDS						F				NR
Sambucus mexicana	Hairy blue elderberry	BDS		Ut				F				NR
Acer macrophyllum	Bigleaf maple	BDL			A		M					NR
Aesculus californica	California buckeye	BDS		Ut	A						SPL	NR
Alnus rhombifolia	White Alder	BDL			A						SPL	NR
Platanus racemosa	California Sycamore	BDL			A		H		SPL			NR
Sambucus canadensis	American elderberry	BDS						F			SPL	NR
Sambucus canadensis 'aurea'	Aurea American elderberry	BDS		Ut				F			SPL	NR
Quercus agrifolia	Coast live oak	BDL			A	M	H					NR CN

Conclusion and Next Steps

Individually, each of the proposed priority implementation projects represents a case study for a typical street type and influence zone described in the Street Tree Program Framework. As these projects are implemented, they should serve as models for street-tree planting that can be duplicated throughout the city. Together, these projects also form a cohesive network throughout the city that reinforces the urban form and character, and is equitably distributed throughout the city's neighborhoods. As such, it would be best to implement these projects concurrently, if possible. Several of the projects could be implemented in short-term and long-term phases, depending on available funds. For all of the projects, the public should be involved from the beginning of the next phase of planning and design. Short-term and long-term implementation strategies are described below.

SHORT-TERM IMPLEMENTATION: TREE PLANTING INCENTIVES

All of the priority implementation projects could begin immediately with the same short-term strategy: incentivizing tree planting in the setbacks on private properties. Depending on available funding sources, the incentive strategy will need to be determined. A community-organizing process (e.g., town-hall meetings and a publicity campaign) could be used to develop a "critical mass" of property owners who agree to tree-planting before the implementation begins. This would take advantage of the incentive program's momentum and maximize the impact of the project. Tree species selection could be left up to individual property owners, or a unified concept could be developed through a community process.

Trees planted on private properties should be located at least 5 feet from adjacent paving and neighboring property lines to prevent damage, and should be a maximum of 10 feet from the street right-of-way to maximize the positive effect on the public realm. (These dimensions refer to the distance to the tree trunk.)

Because so much of Watsonville's tree-planting potential is within the front yards of private properties, front-yard tree-planting initiatives should be encouraged and fostered throughout the city, whether or not they are associated with these priority implementation projects. Such city-wide greening efforts could be ongoing and concurrent with the implementation of the priority projects.

LONG-TERM IMPLEMENTATION: SCHEMATIC DESIGN, DESIGN DEVELOPMENT AND CONSTRUCTION DOCUMENTATION

This document provides design concepts that will serve as the starting point for the Schematic Design phase, which would then lead to Design Development and Construction Documentation phases. Public input should be gathered through public meetings and workshops at regular intervals throughout the Schematic Design and Design Development phases. Each of the priority implementation projects has a unique long-term strategy, described below.

Freedom Boulevard: Sidewalk widening and overall streetscape improvements

Sidewalk widening will be necessary in order to plant trees in the public right-of-way. This would entail a redesign of Freedom Boulevard, including traffic analysis and civil engineering as well as landscape architecture. The Schematic Design phase would begin with a traffic analysis to determine the potential to narrow or otherwise reconfigure the traffic lanes, and an analysis of the underground utilities that might be affected. These factors will determine the amount of sidewalk widening that is possible, as well as the required construction budget. Additional streetscape design considerations, such as street furnishings and lighting, should be considered during the Schematic Design phase. It is anticipated that the Schematic Design, Design Development and Construction Documentation phases would take approximately 18 months, total. Given the high cost of full implementation, the improvements could be phased over several separate construction projects.

Martinelli Street and Clifford Avenue: Stormwater management and roadway narrowing

The Schematic Design phase of the Martinelli Street and Clifford Avenue projects would begin with a traffic and parking-demand analyses to determine the potential to narrow or otherwise reconfigure the traffic lanes and remove on-street parking. The results of this analysis will determine the extent of the planting areas, and set the framework for the design. The stormwater management design would begin with setting stormwater-management goals, which depend on the drainage area, the area available for stormwater management planting areas, and the local soil conditions and infiltration potential. These factors should be analyzed by a stormwater management expert (civil engineer or hydrologist). In the case of Martinelli Street, this plan proposes that all of the new planting areas be stormwater management areas.

Along Clifford Avenue, the slopes in some areas may be too great for all of the planting areas to serve stormwater management purposes, so a determination of the extent of stormwater management areas would be part of the analysis. The traffic and parking reconfiguration and stormwater management design would together become the basis for the streetscape design. It is anticipated that the Schematic Design, Design Development and Construction Documentation phases would take approximately 18 months, total. Given the high cost of full implementation, the improvements could be phased over several separate construction projects.

Upper Main Street and Riverside Drive: Large-scale gateways

Both Upper Main Street and Riverside Drive are conceived as large-scale gateways that depend on planting in the setbacks on public and private properties. The implementation of these projects should start with outreach to the private property owners along the streets to assess their willingness to help implement the project, and to determine any special criteria they have, such as maintaining signage visibility. The Riverside Drive concept is simple enough that the design process would be relatively short. The design concept does depend on a certain length of contiguous planting on adjacent properties to create the desired windrow effect. The Upper Main Street concept will require a thorough Schematic Design and Design Development process, including public input. As neither of these gateway concepts requires sidewalk widening or street reconfiguration, traffic and stormwater management analyses would not be a necessary next step, however stormwater management could be incorporated into either design. It is anticpated that the Upper Main Street design phases would take approximately 12 months, total. The Riverside Drive project could be implemented as soon as construction funding is available and the planting areas are committed.

East Lake Avenue and Bockius Street: Setback tree-plantings on private properties

East Lake Avenue and Bockius Street primarily require plantings on private properties and would be implemented through an incentive strategy. As mentioned above, a critical mass of participants would take best advantage of grant funding as well as creating the highest impact. The concept described for Bockius Street could be implemented on any number of small-scale residential streets throughout the city. It may be best to offer a tree-planting incentive program to the entire neighborhood—or even city-wide—and implement the planting on the blocks that garner the largest participation rates in each neighborhood or region of the city. Tree-islands and bulb-outs should be considered on a case-by-case basis. Both of these projects could be impleted as soon as construction funding is available and the planting areas are committed.

C4.

Plant Palette & Landscape Guidelines

Landscape Guidelines and Policy

ACKNOWLEDGEMENT:

This work was funded through the Urban Greening Grant Program which is under the authority of the State of California Natural Resources Agency and pursuant to The Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coastal Protection Bond Act of 2006 - Proposition 84.

COVER PHOTO: This view of Harkins Slough shows the abundant diversity of native species.

Intent

The landscape guidelines introduce sustainable practices that may be applied to both City owned and private landscapes and are intended to address implementation strategies, design aesthetics, and maintenance of planting and irrigation. The guideline language may be useful to reference during plan review or maintenance audits. Future City ordinances and policies may reference or build upon these principles to incorporate sustainable practices into new legislation. Finally, homeowners, maintenance personnel, property managers and owners, may reference the guidelines to learn about sustainable practices and find links to useful information.

The guidelines are developed around a series of sustainability principles and goals that are tailored to the Watsonville environment. The urbanized areas of town are interlaced with natural wetlands, creeks, and rivers that elevate the importance of sensitive habitats and water resource protection. Guidelines also address particular design goals – each strengthening the unique character of Watsonville. The organizing principles are:

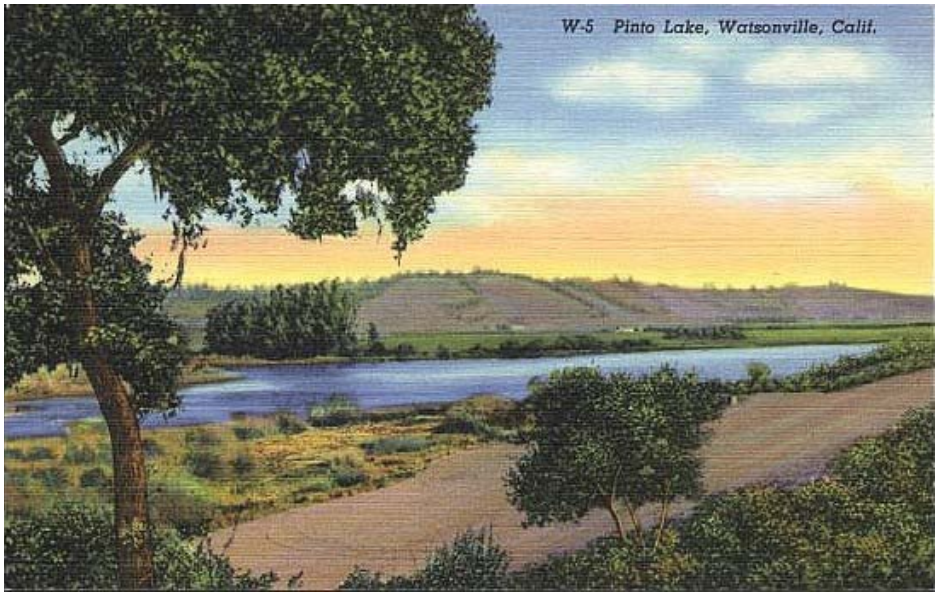
Sustainability Principles

- Protect Natural Waterways – Wetlands and River
- Conserve Groundwater and Prevent Water Waste
- Preserve and Create Habitat
- Conserve Materials and Energy

Design Principles

- Reinforce a Sense of Place
- Make Watsonville More Beautiful and Livable
- Improve Safety
- Protect Buildings and Infrastructure

Aerial View of the Pajaro River Watershed (Source: pajarowatershed.org)



Historic postcard of Pinto Lake, Wastonville (Source: Santa Cruz Public Librareis)

Sustainability Guidelines

Protect Natural Waterways – Wetlands and River

All of the rainwater that falls within the city of Watsonville makes its way through drain pipes into either the city's wetlands (sloughs) or the Pajaro River. Any pesticides, herbicides and sediment from soil erosion that is picked up in rainwater will make its way into these valuable natural resources. The following practices will protect the wetlands and river from pollution from the city's gardens and planted areas.

CAPTURE AND TREAT RAINWATER ON SITE

Typically, city drainage systems are designed to move rainwater to the drainage system and into the nearest water body as quickly as possible. This increases pollutants in the natural water bodies and increases erosion, which is harmful to the natural ecology of the rivers and wetlands. Gardens and other planted areas are the perfect places to begin to change this pattern. When rainwater is absorbed into gardens, living soil and plant roots filter out pollutants and slow the water down before it enters into natural waterways. The main approaches to sustainable stormwater management that can be implemented in gardens and other landscapes are:

- Prepare the soil properly to absorb water. Avoid soil compaction during construction, and add a 1-3" layer of compost and aerate or till compacted soils. Add a 2-4" layer of recycled woodchip mulch to increase the soil's water-holding capacity.
- Drain impervious areas into planting areas. This means sloping walkways, patios and driveways toward planted areas rather than towards drain inlets. Downspouts carrying roof water can also be directed into planted areas, swales or rain gardens. Erosion can be controlled by adding gravel or cobble stones where water enters planting areas.
- Minimize impervious areas. Consider permeable types of paving, such as permeable precast concrete pavers and gravel for driveways and patios.

EROSION CONTROL

Soil that enters the stormwater drainage system causes flooding and harms the plants and animals that live in the wetlands and rivers. The following methods should be used to minimize erosion:

- Planting: Plant bare areas as soon as possible during construction. Use plants that will quickly cover bare soil and provide a network of roots to stabilize the soil. On slopes, create watering basins or berms downslope of plants or planted areas.

A vegetated swale filters stormwater at the Redwood Shore Library in Redwood City, CA.

Rain garden in Highland Park, NJ

- Mulch: After construction, cover bare soil with a minimum of 2 inches of mulch to prevent erosion.
- Erosion-control materials: On steep slopes where mulch will not stay put, install jute netting or other biodegradable erosion-control materials until the plants have matured.
- Irrigation: Drip irrigation systems are less wateful than spray systems, and they cause less erosion. Install drip irrigation underneath the mulch layer. Observe the irrigation system during operation for signs of runoff. Set the irrigation timer to apply only as much water as can be absorbed into the soil without creating runoff. Use the "multiple start time" or "cycle and soak" functions on your timer so that the soil is given time to slowly absorb the water.
- Construction site best practices: Utilize erosion control and sediment barriers to prevent erosion and off-site transport of sediment during construction process.

Conserve Groundwater and Prevent Water Waste

One of the biggest environmental impacts of planted areas is the over-use of water, which is an increasingly precious resource. To ensure that groundwater will be available for future generations of Watsonville citizens, it is critical that our gardens, parks and other planted areas are watered as efficiently as possible.

PREPARE THE SOIL TO STORE WATER

Creating healthy soils is the link between protecting water quality and conserving water resources. Healthy soils store water and nutrients, regulate stormwater flow, neutralize pollutants by immobilizing or degrading them, and resist pests by providing habitat for beneficial organisms. Healthy soils contain living organisms such as beneficial bacteria, micorrhizae (fungi that cooperate with plants) and earthworms.

Create healthy, drought-resistant soils by adding compost and mulch. A robust, living soil with sufficient organic matter will hold more water, and require less frequent irrigation than a soil without sufficient organic matter. A 2-4" layer of mulch prevents evaporation of water from the soil, also reducing the need to irrigate.

Properly selected soil amendments can go a long way towards achieving the goal of establishing beautiful, successful, low-water-use landscapes. Soil amending should be based on the results of a soil analysis performed by a soil laboratory. Healthy soils should have a minimum organic content of 5% by dry weight.

Steps to creating healthy soil:

Suggested stormwater management area plants
Additional information can be found at www.centralcoastlidi.org.

Street runoff flows through curb cuts into stormwater planters, El Cerrito, CA

- Remove and store topsoil before grading
- Protect soil from compaction and aerate compacted soils
- Defend against erosion
- Amend the soil with compost
- Maintain a 2-4" layer of mulch in planted and unplanted areas
- Avoid synthetic, quick-release fertilizers
- Minimize the use of chemical herbicides and insecticides

Use organic compost. As a rule of thumb, apply 9 cubic yards per 1,000 square feet and till into top 9 inches. Compost can be bought at garden-supply outlets. Home composting is also a great way to generate compost on an ongoing basis and keep yard and food waste out of the landfills. For home-composting, use only vegetable waste. (See further discussion of compost in the "Reduce Waste" section below.)

CHOOSE CLIMATE-APPROPRIATE PLANTS

The most important aspect of creating a water-efficient landscape is to use low-water-use plants. Water-loving plants should be used in smaller, less sunny areas, and located to maximize their impact. Also consider micro-climatic conditions such as topography, solar orientation and soil conditions to locate plants according to water need.

Recommended water-conserving plants reference publications:

- *City of Watsonville Recommended Plant List for the Pajaro Valley*
- *Water-Smart Gardening for Santa Cruz County (www.watersavingtips.org)*
- *Water Conserving Plants and Landscapes for the Bay Area and Plants, EBMUD*
- *Landscapes for Summer-Dry Climates of the San Francisco Bay Region, EBMUD*
- *Landscape Plants for California Gardens, by Bob Perry*
- *California Native Plants for the Garden, by Carol Bornstein et. al.*
- *Water Use Classification of Landscape Species (WUCOLS), University of California Cooperative Extension (www.emwd.org/conservation/pdf/wucolsb.pdf)*

MINIMIZE LAWNS

Lawns are often the highest water-using areas in the lanscape. A typical 1,000 square-foot lawn irrigated with sprinklers in Watsonville needs about 35,000 gallons ow water a year to stay green and healthy. The same 1,000 square feet planted with low-water-use plants and watered with drip irrigation needs about 8,000 gallons a year -- a 77% savings!

Lawns should be limited to a maximum of 20% of the total irrigated landscape area, unless used for sport or recreational function. In heavily used sports fields, high-quality synthetic turf may be appropriate. Do not specify turf on slopes exceeding 20 percent, or areas narrower than 8 feet. Where the planting area is not expected to take foot traffic, use other drought-tolerant groundcovers. Where turf is proposed, a drought tolerant variety should be specified.

Suggested Lawn Alternatives:

- "No Mow" fine-leaf fescue blend (*Festuca rubra, F. rubra ssp. fallax, F. ovina ssp. hirtula, F. longifolia*): Shade tolerant, moderate water use
- Buffalo Grass - *Buchloe dactyloides*: Full sun, takes hard wear, low water use


Blue Grama Grass


Wooly Thyme


Dune Sedge


"No Mow" Fescue


Silver Carpet


Carex praegracilis, unmown

- Blue Grama Grass - *Bouteloua gracilis:* Full sun, tolerates alkaline and saline soils, mixes well with Buffalo Grass, low water use
- Dune Sedge - *Carex pansa:* Full sun to partial shade, best unmowed, low water use (2 times per month)
- California Field Sedge - *Carex praegracilis:* Full sun to partial shade, moderate foot traffic, moderate water use
- Wooly Thyme - *Thymus pseudolanuginosus:* Full sun to partial shade, moderate foot traffic, moderate water use
- Roman Chamomile - *Chamaemelum nobile*: Full sun to partial shade, moderate water use, flowers
- Silver Carpet - *Dymondia margaretae:* Prefers full sun to partial shade, tolerates full shade, moderate to regular water but very drought tolerant, can take light traffic.

PLANT IN HYDROZONES

Different plants have different water requirements. Divide the landscape into low, medium, and high water use areas to prevent overwatering. Limit thirstier plants to smaller, high-visibility areas near the building and a water source, and to areas that naturally collect water.

CONSIDER XERISCAPING OR NATURAL LANDSCAPING

Xeriscapes and Natural Landscapes need no summer water once established because they are designed with California Native and other drought tolerant plants that have adapted to our summer-dry climate. Materials such as crushed rock, pebbles and stone are used as an alternative to plants in many of Watsonville's neighborhoods. This can be an effective way to reduce water use. Rock and gravel-gardens should be shaded by trees to minimize glare and heat, and can be planted with succulents to add color and character. Rock gardens should be weeded by hand or with propane flaming, rather than with herbicides. Use permeable weed-control fabric rather than plastic sheeting so that rainwater can infiltrate into the soil.

USE MULCH TO RETAIN SOIL MOISTURE

Mulch reduces evaporation, suppresses weeds, moderates soil temperature, prevents soil erosion, and adds soil nutrients as it decomposes. Planting areas should have a minimum of 2 inches of mulch, except where covered by groundcover plants. Sheet mulching with recycled wood chips and/or compost is the most effective and sustainable method of mulching.

The Applebees landscape retrofit in Watsonville reduced the amount of lawn.

Xeriscape planting (Source: www.allianceforwaterefficiency.org)

INSTALL AN EFFICIENT IRRIGATION SYSTEM

New irrigation systems in Watsonville must be designed to prevent runoff, low head drainage, overspray, or other similar conditions where irrigation water flows onto non-targeted areas, such as adjacent property, non- irrigated areas, sidewalks, roadways, or structures. Wasting water is a violation of Watsonville's Model Water Efficient Landscape Ordinance (MWELO) and Watsonville Municipal Code Section 6-3.432. These highlights from MWELO give excellent guidelines for designing efficient irrigation systems:

- Narrow and/or irregularly shaped areas, including turf, less than eight-feet wide in any direction must be irrigated with subsurface irrigation or a low volume irrigation system.
- Sprinklers must be set back at least 2 feet from any non-permeable surface (driveways, sidewalks, etc.).
- Irrigation on slopes of 25% or greater shall have a precipitation rate not to exceed 0.75 inches per hour. Lawns are not permitted on slopes of more than 25%.
- Each valve shall irrigate a hydrozone with similar site, slope, sun exposure, soil conditions, and plant materials with similar water use.

More informati on about irrigation design requirements of MWELO can be found at: htt p:// www.water.ca.gov/wateruseeffi ciency/landscapeordinance/.

The most efficient irrigation systems use low-volume, or drip irrigation methods that apply water directly to the plant root zone, rather than spraying water into the air where it can evaporate before reaching the soil, or can end up as run-off in the street.

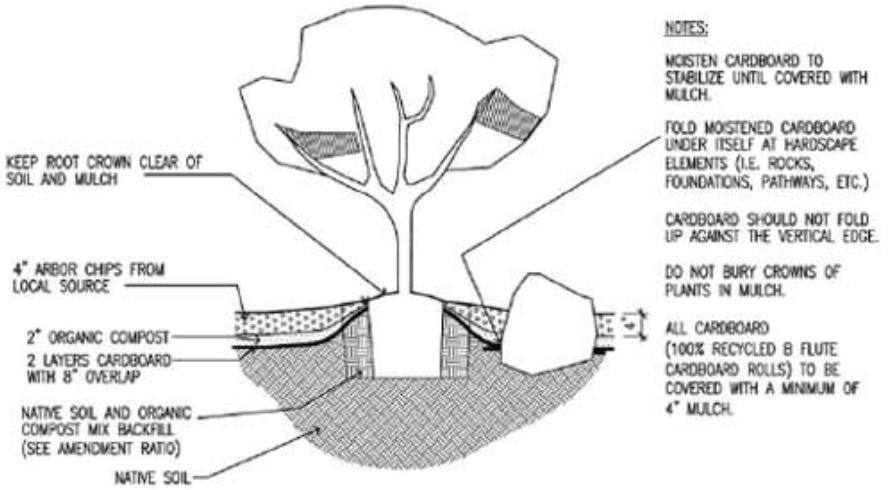
A weather-based irrigation controller, or an automatic controller equipped with multiple start times and a rain or soil moisture sensor, will assist the irrigation manager to apply water only when irrigation is needed.

INTEGRATE RAIN WATER AND GRAY WATER IRRIGATION

Rain water from roofs can be collected in rain barrels or cisterns and stored for irrigation during dry months. Even a small rain barrel can be useful for watering plants in pots. Graywater is waste water from laundry machines, showers, bathtubs and bathroom sinks that can be reused for subsurface landscape irrigation. Graywater irrigation has specific design guidelines to protect public and environmental health, and is best used to water high and medium water use plants (excluding lawns and root vegetables). More information about designing a low-maintenance, code-compliant greywater irrigation system can be found at the Central Coast Greywater Alliance page at www.ecoact.org.

UC Verde Buffalo Grass is used as an alternative to conventional lawn SOURCE: New Requirements for Landscape and Irrigation, City of Santa Monica

This Santa Monica home switched from a traditional to a xeriscape planting alternative. SOURCE: New Requirements for Landscape and Irrigation, City of Santa Monica



Sheet mulching diagram. Source: Sentient Landscapes, Inc., www.stopwaste.org.

Preserve and Create Habitat

Preserving and creating landscapes that support a range of plant and animal species brings beauty and interest to the landscape, supports the life of the regional ecology, and can reduce the need for pesticides. Watsonville is blessed with the rich natural habitat of the sloughs, the river, and the Pajaro hills to the east of the city. As these habitats are preserved and restored, their habitat value will increase. Residential and commercial landscapes play an important role in preserving and increasing biodiversity in the Watsonville region and complementing these natural areas. Private landscapes adjacent to the natural habitat areas are especially important to improving the greenways and habitat corridors that stretch from the Monterey Bay through Watsonville to the hillsides and beyond.

PLANT DIVERSITY

A diverse landscape of perennials, annuals and biennials with a range of blooming seasons, colors, shapes, fruit types, and sizes can support a wide range of animal species. Including California native plants in the landscape will support local fauna that are naturally adapted to them. Landscapes preserve and become habitat when plants native to the surrounding Watsonville wetlands, creeks, Pajaro River, coastal grasslands and other plant communties are incorporated into the landscape.

AVOID INVASIVE SPECIES

Invasive species out-compete natives and other plants and reduce biodiversity. Planting invasives must be avoided, especially near natural areas. Refer to lists of invasive species published by established research organizations such as the California Invasive Plants Council (CAL-IPC). California Horticultural Invasive Prevention (Cal-HIP). The California Native Plant Society (CNPS) maintains a useful comprehensive list of online resources.

- “Plant Right, Keep Invasive Plants in Check” (www.cal-ips.org/ip/inventory/index.php)
- www.plantright.org
- www.cnps.org

REDUCE PESTICIDE AND HERBICIDE USE

Pesticides and herbicides kill not only undesirable plants and animals, but they also harm or kill desirable and beneficial species, such as birds, butterflies and bees that pollinate many of Watsonville’s crops. Integrated Pest Management (IPM) is an approach to managing insects, plant diseases, weeds and other pests through environmentally-sound strategies that avoid the use of pesticides and herbicides. IPM seeks to prevent pests by fostering a healthy environment in which plants have the strength to resist disease and insect infestations and to out-compete weeds. If a pest problem is identified, IPM then considers a range of solutions before turning to pesticides. Some principles of IPM are as follows:

Rainwater funneled from the roof to a bioretention planting area at the Redwood Shores Library, Redwood City, CA

- Choose species that are well suited to the site.
- Select resistant plant varieties and species that attract beneficial insects.
- Give plants room for adequate air circulation and to reach their natural size and shape, so that they are not stressed. Avoid over-planting, which creates crowded environments for plants.
- Add compost to the soil, to encourage beneficial organisms that live in healthy soils and suppress disease-causing organisms.
- Use slow-release, organic fertilizers and avoid using synthetic fast-release fertilizers that have the potential to run-off and cause pollution in our waterways.
- Maintain at least 2” of mulch on the soil at all times to prevent weeds.
- Prune no more than 1/3 of vegetation to prevent stressing plants and minimize an overabundance of new growth that is vulnerable to pests and diseases.
- Control weeds by applying water only where it is needed. Use drip irrigation to water only desired plants.
- Eliminate noxious weeds before they go to seed.
- Understand that landscapes can tolerate certain levels of pests without causing significant or even noticeable damage.
- Control pests first with physical and mechanical controls, such as hoeing or pulling established weeds, spraying aphids with a strong jet of water and using sticky traps around tree trunks to keep ants and other insects away.
- Use biological controls to control pests. Attract beneficial insects to the landscape by planting a variety of native and annual plants that flower throughout the year. Introduce natural predators, parasites and beneficial microbes.
- Use safe, naturally occurring chemicals such as soaps and horticultural vinegar before resorting to synthetic chemicals.
- If pesticides or herbicides are necessary as a last resort, use the least toxic products available. Naturally occurring pesticides include soaps and oils, sulfur, corn gluten, horticultural vinegar (acetic acid). Take the necessray safety precautions, even when using natural pesticides.

Integrated Pest Management (IPM) discourages undesirable plants and insects (pests) while encouraging beneficial organisms, such as bees that pollinate fruit trees.

Conserve Energy, Protect Air Quality and Reduce Global Warming

PLANT FOR PASSIVE SOLAR HEATING AND SHADING

The proper placement of trees around buildings can significantly reduce energy use (and energy bills) for heating in the winter and cooling in the summer. The following general rules should guide tree planting around buildings. (Local microclimatic factors might imply modifications to these guidelines.)

- Deciduous trees should be used in south- and west-facing areas around buildings to provide solar access during winter months and shade in summer months.
- Plant evergreen trees on the north side of buildings to block winter winds.
- Use shrubs or small trees to shade air-conditioning units.

REDUCE THE USE OF GAS-POWERED MAINTENANCE EQUIPMENT

Lawn-mowers, leaf-blowers, hedge clippers and chainsaws produce extremely dirty exhaust. Their use should be minimized to protect air quality. These machines also contribute to noise pollution. Landscapes can be designed to require less lawn-mowing. leaf-blowing and hedging. Turf aeras can be minimized, planted with no-mow species, or mowed with electric mowers. Leaves can be raked by hand, or, if possible, left where they fall to provide mulch and nutrients to the landscape. Planting evergreen trees in paved areas such as parking lots will reduce the need to manage leaf litter. Hedges could be pruned naturally and informally rather than sheared. Designing landscapes to minimize the use of gas-powered maintenance equipment will also reduce the long-term maintenance cost to the owner.

Diagram describing appropriate placement of trees to promote energy savings (Source: PGE Guide to Power-wise Tree Planting)

Conserve Materials

MINIMIZE GREEN WASTE TO THE LANDFILL

Plant debris from yard trimmings is the second largest waste product found in landfills in the United States. The following techniques reduce waste and support a more sustainable and lower maintenance landscape.

- Scale: Understand the plants' mature size and plan accordingly so that the plants can grow to mature size in the space alotted and not require trimming and hedging.
- Placement: Select plants which are appropriate for the sun exposure, moisture and soil type on the site to avoid having to replace the plant later.
- Plant Communities: Consider groups of plants which have adapted overtime to the local climate and geography so they need minimal, seasonal pruning.
- Mulch: Reuse leaves and plant debris produced by the landscape as mulch to nurture growth of future plants. Use locally produced wood chip mulch made from recycled yard waste or tree-trimming companies. See www.omexchange for sources.
- Grasscycling: Leave clippings on the lawn after mowing so they decompose and release their nutrients into the soil.
- Fertilizing: Avoid using fertilizers that push vegetative growth that must be mowed or pruned.

REDUCE YARD WASTE BY COMPOSTING

Compost is fully decomposed organic matter used to amend the soil. Some benefits of composting include:

- Provides a natural fertilizer and pesticide for soil
- Reduces waste in landfills
- Saves money on garbage bills
- No need for imported fertilizers
- Keeps pests and rodents out of garbage cans

The process of composting can be as easy as alternating brown (carbon-rich) and green (nitrogen-rich) materials in a covered pile or composting bin and waiting for the materials to break down until the original materials resemble dark brown, crumbly, sweet-smelling soil. This process can take 3 to 6 months or more. Turning the compost to incorporate air will speed the process and eliminate undesirable odors.

The City of Watsonville provides compost bins to residents. Bins help keep compost tidy in small yards. To order a free compost bin call the City of Watsonville Customer Service Division at 768-3133 and schedule a delivery appointment.

Free compost bin provided by the city of Watsonville (Source: www.watsonvilleutilities.org)

Design Guidelines

The following planting design guidelines are intended to enhance Watsonville's outdoor environment for the city's human inhabitants. They address four main goals: reinforce a sense of place; make Watsonville more beautiful and livable; improve safety; and protect buildings and infrastructure.

Reinforce a Sense of Place

Watsonville already has a strong sense of place due to its unique characteristics, including its architecture and urban form, street network, natural and agricultural surroundings and eclectic mix of urban plants. Watsonville is generally well cared-for by its residents who take pride in the city. This sense of place can be enhanced through planting design by preserving and building on the city's strengths.

DESIGN THEMES

Watsonville's landscapes context is created by its cultural history, agricultural surroundings, and natural systems. Planting design should be influenced by these themes to reinforce Wastonville's unique character. These influences are described briefly below.

Neighborhood/Urban Cultural

Watsonville's neighborhoods are characterized by a lively and eclectic plant palette that includes a range of species from many parts of the world. Watsonville's climate is ideal for this eclectic mix, which includes temperate-climate plants and desert plants. Shade trees share space with palm trees, succulents can be found next to herbaceous perennials and shrubs, and rock gardens can be seen next to exuberant flower gardens.

Agricultural Influence / Urban Agriculture

Watsonville is first and foremost an agricultural community, supported by the agricultural industries that surround it. The city's historic development pattern and current planning policies have given Watsonville a clear edge, where residential and industrial parts of the city abut the adjacent farmlands in a striking way. This agricultural influence can be brought into the city by incorporating edible crops including fruit trees and vegetable gardens into its gardens and civic and commercial landscapes.

Examples of eclectic planting found in Watsonville

Natural Ecosystem Influence

Watsonville's wetlands are one of its most distinctive urban landscape features. As the wetlands are protected, restored and celebrated as an amenity, they can also become a guiding influence for designed landscapes that are near them. As discussed in the Sustainability section of this document, incorporating native wetland and riparian plants into the landscapes near the wetlands can enhance their habitat value. This plant palette can also enhance the design character of the city.

The Pajaro River and Salsipuedes Creek are less apparent contributors to the city's character. Designed landscapes adjacent to these waterways should could use riparian themes to establish physical and psychological connections to these resources.

DESIGN CONSIDERATIONS

Formal vs. Eclectic

As mentioned above, Watsonville's unique character is due largely to its eclectic mix of plant species. Generally, this mix should be continued as the city's main planting theme. Many recent housing developments have done an excellent job of providing ample planting areas and street trees, however, they often exhibit a generic "any-town" plant palette. Watsonville's sense of place would be enhanced with more varied plant palettes. Formal plantings, such as consistent street trees and large swaths of individual groundcover and shrub species, should be limited to major public corridors and open spaces.

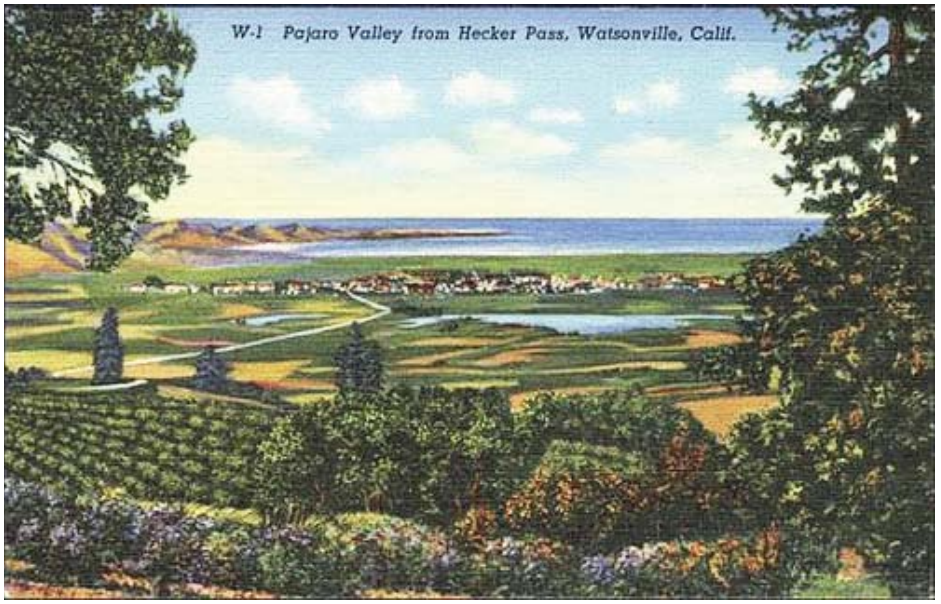
Cultural preferences

Watsonville is a culturally diverse community with varying styles of landscape design exhibited in its neighborhoods. Cultural differences should be respected and celebrated as they contribute to Watsonville's character. Increased urban greening and sustainable landscape design and maintenance practices should be encouraged within this context of exuberant cultural variety.

Drought Tolerance and Plant Aesthetics

Drought-tolerant landscape aesthetics are becoming more of the culturally accepted norm for landscape aesthetics. Increasing water-conserving landscapes and phasing out water-consumptive landscapes may require a shift in cultural expectations. For example, lush, green lawns cannot sustainably continue to be a symbol of a cared-for landscape. Luckily, many of the culturally accepted landscape types already found in Watsonville are drought tolerant. There are many examples of beautiful succulent, native and Mediterranean-influenced landscapes around the city that can serve as models of drought-tolerant landscape design.

Wastonville street mural depicting replica of agricultural crate labels from the 1900's



Historic postcard of Wastonville (Source: Santa Cruz Public Librareis)

PLANT SELECTION

The following lists of drought-tolerant shrubs and groundcovers represent each of the city's character influence zones. These are representative species that can be used a basis for developing plant palettes for specific projects. (For trees selections see Citywide Street Tree Program.)

Neighborhood/Urban Cultural

Artichoke Agave – *Agave paryii var. huachucensis*
Canyon Prince Wild Rye – *Leymus condensatus*
Dwarf Maindenhair Grass – *Miscanthus sinensus* 'Adagio'
Dwarf New Zealand Flax – *Phormium tenax* 'Jack Spratt'
Foxtail Agave – *Agave attenuata*
Inferno Mirror Bush – *Coprosma* 'Inferno'
Juniper Species – *Juniperus* species
Kleinia – *Senecio mandraliscae*
Lantana – *Lantana* species
Pheasant Grass – *Anemanthele lessoniana*
Tree Aloe – *Aloe bansii*

Agricultural Influence / Urban Agriculture

Beargrass – *Nolina parryi*
California Grape – *Vitus californica*
English Lavender – *Lavandula 'angustifolia* 'Hidecote'
Beavertial cactus – *Opuntia basilaris*
Pineapple Guava – *Acca sellowiana*
Pomegranite – *Punica granatum* 'Nana'
Rosemary – *Rosmarinus officinalis* 'Lockwood de Forest'
Wild Rose – *Rosa californica*

Orchard groundcover planting options may also be found under Lawn Alternatives in the Conserve Water section of the Sustainability Guidelines.

Natural Ecosystem

Cape Mendocino Reedgrass – *Calamagrostis filosa*
California Buckwheat – *Erigonum species*
California Fuschia – *Epilobium canum*
California Gray Rush – *Juncus patens*
Coyote Mint – *Monardella villosa*
Deer Grass – *Muhlenbergia rigens*

A great example of an established front yard oak tree on Tuttle Avenue, Wastonville, CA

Dwarf Coffeeberry – *Rhamnus californica* 'Eves Case'
Dwarf Coyote Brush – *Baccharis pilularis* 'Pigeon Point'
Dwarf Manzanita – *Manzanita* species
Prostrate Flannel Bush – *Fremontodendron* 'Ken Taylor'

TREE PRESERVATION AND MITIGATION

Established trees in good health should be preserved for the visual, cultural and ecological benefits the tree provided. Watsonville should develop specific criteria and review process for the removal of existing trees. Policies from other cities typically reference the species, potential invasiveness, assessed condition, location on public or private property, habitat value, and size.

Existing trees in areas of change require special consideration to either require their preservation, mitigate their loss, and or maintain their health during construction. Mature trees bring value to a property and can provide immediate effect when incorporated into new construction. If removal is approved, the loss of the existing trees should be mitigated by planting new trees. Where tree mitigation goals can't be achieved through allowed tree mitigation methods, cash mitigation to the City tree fund may be an option.

Even though a tree may be designated to remain, active monitoring and protection during construction is essential. The following points should inform policy for Watsonville:

1. A field construction meeting should be held prior to construction where existing conditions are documented and preservation practices are discussed.
2. A protective fence should be placed at the dripline of the existing trees during the entire construction period. No work should occur within the dripline except under the direct supervision of a certified arborist approved by the City.
3. Soil compaction and grading should be avoided within the dripline of the trees. Maintain a positive drainage away from the tree trunk. Irrigation should be avoided under native oak trees.
4. Tree branches interfering with construction equipment should be properly pruned prior to commencement of construction. Pruning should be as approved by the City and should comply with City approved practices.
5. No storage of materials or equipment should occur within 25 feet of the dripline of trees.
6. All roots 1" or larger that must be severed should be cut manually to produce a clean cut and treated with a tree sealant. Boring, rather than trenching, should be required where it is unavoidable for piping to cross though the dripline of a tree.


Tree protecton fencing at a construction site

7. Contractor should be responsible for providing comparable replacement trees, as well as a dollar fine per inch of tree trunk diameter (at breast height) for any existing trees that are found by the City to be irreparably damaged due to construction activity. Fines vary by jurisdiction. One example is $3,000 for trees less than 12" caliper diameter; $8,000 for 12" to 18" diameter, and $1,000 for each additional inch over 18".

Make Watsonville More Beautiful and Livable

VISUAL SCREENING

Screen unsightly elements and incompatible adjacent uses: storage areas, trash enclosures, parking areas, public utilities, and other similar elements which do not contribute to the visual enhancement of surrounding areas.

VISUAL RELIEF

Avoid large expanses of continuous asphalt and concrete surfaces by planting trees, and creating shrub areas. Flexible paving such as decomposed granite and permeable unit pavers can also help to add visual interest and provide mitigation to heat build up.

STREET TREES

The following are example street tree planting standards that have been adopted by other cities, and can be considered by the City of Watsonville as policy options.

- Minimum one 24" box tree for every 30 lineal feet of street frontage for commercial and muti-family residential projects. Minimum of one 15-gallon tree for every 30 lineal feet of frontage, or fraction thereof, for all single-family residential projects.
- One tree for every 20 lineal feet of building frontage, to be planted either in sidewalk or building setback.
- One tree for every 200 square feet of landscaped area.
- One shrub for every 25 square feet.
- 70 percent of all landscaped areas shall be underplanted with groundcover, with the remaining areas to incorporate a minimum two-inch layer of mulch.
- It may be stipulated that if a building owner cannot meet the required tree quantities, the owner can pay an in-lieu fee per tree into a dedicated tree-planting fund that the city can use to plant trees elsewhere in the city.

PARKING AREAS

Where parking areas face a major public street, they shall be screened from view using decorative earth berms, dense shrub planting, low walls, trees, or a combination thereof. Planting is required around the perimeter of parking areas adjacent to property lines.

Effective planting in parking area, Napa, CA

The following example parking lot tree-planting requirements have been adopted by other cities, and can be considered by the City of Watsonville as policy options.

- 1 tree per 5 parking stalls
- 1 tree per 8 spaces
- 1 tree for every 10 single-row parking stalls or every 20 double-row parking stalls
- 1 tree for every 2,800 sf of paved surface
- Within parking areas of greater than 20 parking spaces, an island a minimum width of 4' and length equal to the adjacent parking stall shall be provided for every 10 cars.
- 180 sf of planting area for each tree. 3' clear from trunk, minimum.
- 10% of total parking lot area shall be devoted to planting area.

Improve Safety

TRAFFIC CALMING

Statistics show that streets with broad tree canopies have lower vehicle speeds than identical streets with no or few trees. Traffic calming, paired with other positive effects of street trees, is beneficial to residential areas and arterials alike where speed can be a concern.

TRAFFIC SAFETY – SIGHT DISTANCES, ETC.

Planting can become an obstruction to good visibility at intersections, crosswalks, traffic signals, and other areas where conflicts can occur. Shrub and groundcover planting should be low growing by nature rather than require constant trimming. Trees should be pruned up to maintain visibility under the canopy. At some locations such as crosswalks, additional lighting should be considered that is placed below the tree canopy to reduce shadows. Sight obstructions such as above ground signal boxes and telecom switch boxes are common at intersections. These should be located back from the intersection or placed below ground. Tree trunks at intersections are no more a concern than signal poles if single trunked. Trees also have other calming benefits described herein.

SAFETY FROM CRIME

Good visibility is also an important factor to create a safe public environment. The planting principles applied to driver visibility also apply here. A clear zone between 3' and 8' of height should be encouraged within 20' of sidewalks and public walkways.

Example of a tree planted at an intersection. Davis, CA

Protect Buildings and Infrastructure

Care should be taken in the placement of trees to protect the tree from future impacts. Guidelines should be carefully developed with room for judgment and flexibility to provide adequate protection without overly restricting the placement of trees (there are unfortunate instances in urban street environments where no trees could be planted due to inflexible restrictions). General guidelines for locating trees suggest trees be planted a minimum of five feet from sewer, water, gas, cable, and electrical lateral services; seven feet from utility boxes; and fifteen feet from light poles. Locating trees in street conditions often requires unique application of guidelines and due to the common placement of utilities under the sidewalk and curb areas. For street renovation, consideration should be given to the relocation of select utilities in order to designate an appropriate planting zone for street trees.

Impacts by tree roots to paving can be avoided with good planning and implementation techniques. The cost of repair of pavement should be considered in the context of other benefits including increased property value, traffic calming, habitat, and cooling.

- Suitable planting areas for trees should be planned in the early stages of a project in order to avoid utility conflicts that result in damage, loss of trees, and reduced benefits.
- Each tree should be provided as large a non-compacted soil area as possible. James Urban, an expert on urban forestry recommends a minimum of 200 cubic feet of soil for larger trees. This equates to a 8’ x 8’ x 3’ deep planting area.
- Tree planters in sidewalks where space restriction due to accessibility, utilities, passing vehicles and buildings present challenges to an appropriately sized area of planting soil. These instances may require special treatments such as structural soil, structural cells, and cantilevered paving. Structural soil can be useful to guide tree roots under a walkway to access an adjacent rooting zone such as a front yard or park.
- The zone of root taper for most large trees requires planters of 4’ minimum width.

Overhead power lines require special species selection to prevent tree canopies reaching overhead power lines. While typical tree trimming practices under power lines is detrimental to tree health and aesthetically undesirable, there are practices such as “directional trimming” which can be encouraged or implemented by a city. See PG&E’s Guide to Power-Wise Tree Planting for good species selection under power lines.

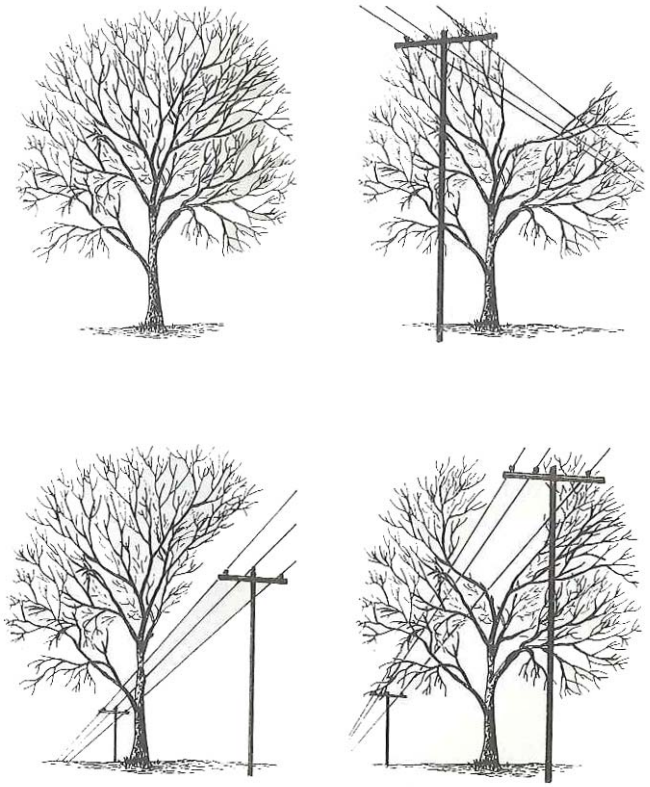


Illustration adapted from **Aboriculture** by Richard W. Harris

Conclusion and Next Steps

This Landscape Guidelines and Policy document describes a framework to guide Watsonville's landscape and planting designs in order to achieve the city's goals related to sustainability, place-making, and livability. This document can be used by property owners, developers, residents and landscape professionals to guide landscape design and maintenance.

This document can also be used during development-review. The City's design-review ordinance could be amended to refer specifically to these guidelines as the basis for landscape design review. In order for the quantifiable parts of these guidelines (e.g., required number of trees) to serve as criteria in the building entitlement and permitting process, the City may develop them into a landscaping ordinance. Where policy options are presented in this document, the City would need to define a specific policy.

C5.

Green Roof Design

GREEN ROOF REPORT

For: THE CITY OF WATSONVILLE, CA

WATSONVILLE GREEN URBAN PLAN

GREEN ROOF DESIGN CRITERIA

March 19, 2012

WRT

DESIGN ECOLOGY

Table of Contents

INTRODUCTION

Rooftops have typically been considered a liability due to overheating, leaking, emitting heat into the urban atmosphere, shedding pollutants into the watershed, contributing to impervious surface area for runoff, and requiring costly repair and replacement. Now roofs are being reclaimed for productive and sustainable purposes in cities throughout the US and abroad, through the creation of green roofs.

As green roofs have become better understood and more widely implemented, the opportunities rooftops can offer are being recognized. These include the use as catchment areas for stormwater, air and water filtration devices, habitat enhancement, reduced cooling loads, recreational open space, aesthetic improvements, and productive food and educational resources. In short, rooftops are being harnessed to improve cities and enhance the quality of life of inhabitants.

Building owners and developers are considering rooftop options of solar power, rainwater harvesting, and living roofs to maximize performance and function. Public and private stakeholders are coming together to create strategies for green roof implementation. Cities including Chicago, Seattle, Pittsburgh, Philadelphia, New York, Washington DC and Portland are stimulating the adoption of green roofs to alleviate infrastructure impacts, primarily stormwater, energy, food and community projects.

The purpose of this report is to provide an assessment of opportunities associated with implementation of green roofs in the City of Watsonville.

While green roofs have many benefits, not all of them are directly applicable in this geographic area with its unique climate, ecology, economic, political and social conditions. Due the presence of sensitive local riparian and wetland resources, this report focuses on the potential benefits to stormwater, habitat, energy and environmental education.

Green roofs are being considered in this context as one element of a larger watershed and infrastructure system described in the Watsonville Green Plan.

Image: An extensive green roof on a commercial building in Emeryville, CA.

The functions of stormwater retention and filtration can be critical in reducing overall storm surges and improving the water quality of urban discharges. Green roofs are assessed with regard to their impact in each of the watersheds and receiving waters of Watsonville.

This report also provides a general overview of living roof systems and important considerations for the implementation and promotion of these systems into the design and building industry.

Image: Green Roof Construction, H2Hotel, Healdsburg, CA.

WATERSHED OVERVIEW

The City of Watsonville lies within the Pajaro River Valley and straddles three sub-watersheds: the Watsonville wetlands, Salsipuedes Creek, and the Pajaro River. Salsipuedes Creek is a tributary of the Pajaro River, and both the Pajaro River and the Watsonville wetlands drain to the Monterrey Bay, which is a designated National Marine Sanctuary.

The map on the following page highlights each of these watersheds as well as indicating stormwater outfall locations throughout the city.

This map illustrates that the City stormdrain system, like in many other cities, is designed to transport runoff from developed areas to surrounding water bodies. This water carries with it toxins that accumulate in the urban environment, including hydrocarbons, heavy metals, asbestos powder from brake pads, and other chemicals from vehicles, fertilizers, and animal waste. These non-point source pollutions impact the water quality of surrounding water bodies. Runoff is also heated by impermeable surfaces, resulting in increased water temperatures. These impacts to water quality affect the ability of native species to survive and thrive in local habitats.

The surrounding water bodies would benefit from improvements to runoff volume and water quality that can be achieved before water enters the stormdrain system. According to Vista 2030, Watsonville's General Plan, "Given Watsonville's proximity to the sensitive water resources and the Monterrey Bay, the City must reduce non-point source pollution in urban run-off from residential, commercial, industrial, municipal and transportation land uses and activities." Green roofs can play a significant role in reaching this goal by treating stormwater before it reaches the street. Additionally, reducing runoff from rooftops will attenuate flows to the stormdrain system, providing ground plane best management practices with additional capacity to absorb pollutants from streets and other surfaces contributing to non-point source pollution.

WATSONVILLE WETLANDS

The majority of the area of the City of Watsonville lies within the Watsonville wetlands Watershed. This area is primarily residential, with some commercial areas that exist along Main Street and Freedom Blvd. This area includes the airport and surrounding industrial lands, and limited industrial areas within the southern triangle formed by Highway 1, Main Street, and Riverside Drive. Storm drains that collect runoff within this watershed empty directly into the wetlands at numerous outfalls.

These wetlands are one of the largest intact natural wetland systems in central California. They host a diverse range of flora and fauna, are an important tourist attraction, and serve as the cornerstone to many important environmental education programs in the vicinity.

Some important features include:

- Important migratory bird habitat.
- Key habitat for threatened plant and animal species.
- One of few remaining natural wetlands in coastal CA.
- Serves as an important natural filtration mechanism for municipal discharge.

Watsonville Slough has been listed by the EPA as impaired by pathogens, pesticides, and sedimentation. Total Maximum Daily Load (TMDL) regulations are in place to control the discharge of pathogens.

PAJARO RIVER

The downtown area of Watsonville lies mostly within the a sub-watershed of the Pajaro River, and storm drains from this area drain to the River. This area contains a mixture of residential, commercial and industrial uses.

In 2006, the Pajaro River was designated as America's most endangered river by the American Rivers organization, due to levees constructed by the Army Corps of Engineers along its lower 22 miles and severe runoff into the river from agricultural fields.

The Pajaro River serves as a migration pathway for adult Steelhead trout (Oncorhynchus mykiss) migrating to spawning and nursery habitat in the upper watershed creeks (Uvas, Llagas and Corralitos). The Pajaro River main stem provides poor spawning and rearing habitat due to low summer flows and high sedimentation loads. Coho salmon (Oncorhyncus kisutch) have not been present in the river since at least the late 1960s.

The Pajaro River is listed by the EPA as impaired by fecal coliform bacteria. Fecal coliform can come from non-point sources of pollution such as urban stormwater runoff, grazing, erosion, and natural sources. The River is also listed as impaired by boron, a toxic inorganic. The source of Boron is unknown, but it could also be linked to non-point source pollution.

SALSIPUEDES CREEK

The northeast area of the city, which is primarily residential, drains to Salsipuedes Creek, which in turn flows into the Pajaro River near downtown.

Corralitos Creek, of which Salsipuedes Creek is a subwatershed, is listed by the EPA as impaired by fecal coliform. In 2011 the State Water Resource Control Board issued a draft resolution to add the Corralitos/Salsipuedes Creek Watershed to the Domestic Animal Waste Discharge Prohibition and the Human Fecal Material Discharge Prohibition, and to establish Total Maximum Daily Loads (TMDLs) for fecal coliform in the Corralitos/Salsipuedes Creek Watershed.

TARGET AREAS

To better understand the implications of green roofs within the city, it may be useful to develop targets for site, neighborhood, and citywide improvements. Understanding the benefits of green roofs at these scales will inform Planning, Building, Public Works, and other stakeholders in working toward a unified goal.

There may also be some benefit to assessing the three receiving watersheds with regard to storm volume and water quality. This will allow prioritization of specific neighborhoods for green roof and other watershed protection interventions.

Figure 1.1 Storm Drain System of Watsonville, colored by subwatershed. Modified from City of Watsonville

GREEN ROOF SYSTEMS

Green roofs, also known as living roofs, eco-roofs, natural roofs, roof greening systems and including roof top gardens, are living, vegetative roofing alternatives (Velazquez, 2002).

Green roofs are comprised of several layers of material.

The layers of a typical green roof include:

- Plants, often selected for particular applications
- Irrigation, which is not always required
- Engineered growing medium, which differs from traditional landscape soil in that it is designed to meet roof requirements with specific qualities
- Geotextile to contain roots and growing medium, while allowing for water penetration
- A specialized drainage layer, often with built-in water reservoirs that re-hydrate media to reduce irrigation demand
- Waterproofing / roofing membrane, with an integral root repellent
- Roof structure/drainage, with conventional or custom insulation either above or below the membrane

(Sutic 2003, Peck and Kuhn 2001)

There are several different kinds of green roofs. Green roofs can be "intensive" or "extensive", or a combination thereof.

INTENSIVE SYSTEMS

Intensive green roofs accommodate of a diversity of plants, including flowering shrubs and even trees, and are usually intended for human interaction. Intensive green roofs are often much like typical gardens on the ground, except that they are located on a roof. Like gardens, intensive green roofs require regular maintenance and upkeep, including drainage, reservoir boards, irrigation and sometimes fertilization (Velazquez, 2002). In order to support this type of vegetation, intensive green roofs must have deep soils, resulting in heavy structural loads. They must conform to applicable roof loading requirements.

Intensive roofs are usually on flat roof surfaces or on a mild slope of up to 3%, and require a soil depth from 8-24 inches (20–60 cm) (Peck and Kuhn, 2001, 5).

Intensive green roofs are more expensive than extensive gardens in both their creation and their maintenance. The heavier structural loads mean that the roof must be able to take on the load or be upgraded to bear the load. The saturated weight increase can be between 60-200 pounds per square foot [lbs/SF] (290 - 967.7 kilogras per square meter) (Peck and Kuhn, 2001, 5). Therefore, intensive systems are best applied to new construction of concrete and steel buildings of sufficient structural integrity for heavy weight loads. In addition, the plants are larger and usually more diverse, which makes them more expensive to purchase (Sutic 2003). The benefits of intensive systems include reduced irrigation demand, increased stormwater retention, creation of recreational space and maximized biodiversity.

Figure 2.1 on the following page illustrates some of the common features of an intensive green roof installation.

EXTENSIVE SYSTEMS

In contrast, extensive green roofs are lightweight, low maintenance, and often inaccessible. They can be understood as "lightweight veneer systems of thin layers of drought tolerant self-seeding vegetated roof covers using colorful Sedums, grasses, mosses and meadow flowers requiring little or no irrigation, fertilization or maintenance" (Velazquez 2002). The use of drought-resistant and alpine plants results in lower maintenance requirements (Sutic 2003). Native plants often perform better than cultivars under the difficult rooftop conditions (Pearce, 2003).

Many roofs with slopes of up to 33% are capable of supporting extensive green roof systems with little or no additional structural support (Velazquez, 2002). The growing medium of most extensive green roofs is a mineral-based mixture of sand, gravel, lava rock and organic matter. The depth is generally less than 8" deep. Due to light weight and cost considerations, extensive systems are the most common green roof application. For most applications extensive roofs require irrigation and are limited to plants with shallow root systems. Weight ranges from 20-60 lbs/SF. Maintenance of extensive green roof systems is limited to watering in the first year (depending on plant species), so that plants can become established, and occasional weeding of any invasive species in the following years (Sutic 2003). Extensive roofs are typically not designed to serve as recreational space or to support people, trees or shrubs (Sutic 2003).

Figure 2.2 on the following page illustrates some of the common features of an extensive green roof installation.

Table 2.1 summarizes the differences between extensive and intensive green roofs by listing their respective advantages and disadvantages.

BUILT-IN-PLACE VS. MODULAR

In traditional built-in-place green roof systems, the layers of the living roof are installed sequentially at the job site. First the waterproofing membrane, protection layer and drainage are installed, then loose growing media is placed and plants are planted from containers, plugs, or seed. Modular systems are typically pre-grown in self-contained units that include growing media, and these modular units are brought to the site to be installed after other layers of the roof system are in place.

Some key considerations about modular systems include:

- Typically light weight and can be faster to install
- Provide fewer options for plant choices, thus limiting options and decreasing biodiversity
- May cut down initial maintenance during the establishment period since they are pre-grown and there is less opportunity for weed intrusion
- Have shown erratic and generally poor long-term vigor of plants
- Are typically more expensive than built-in-place
- Can degrade, leaving shards of material in the media
- Poor stormwater retention performance

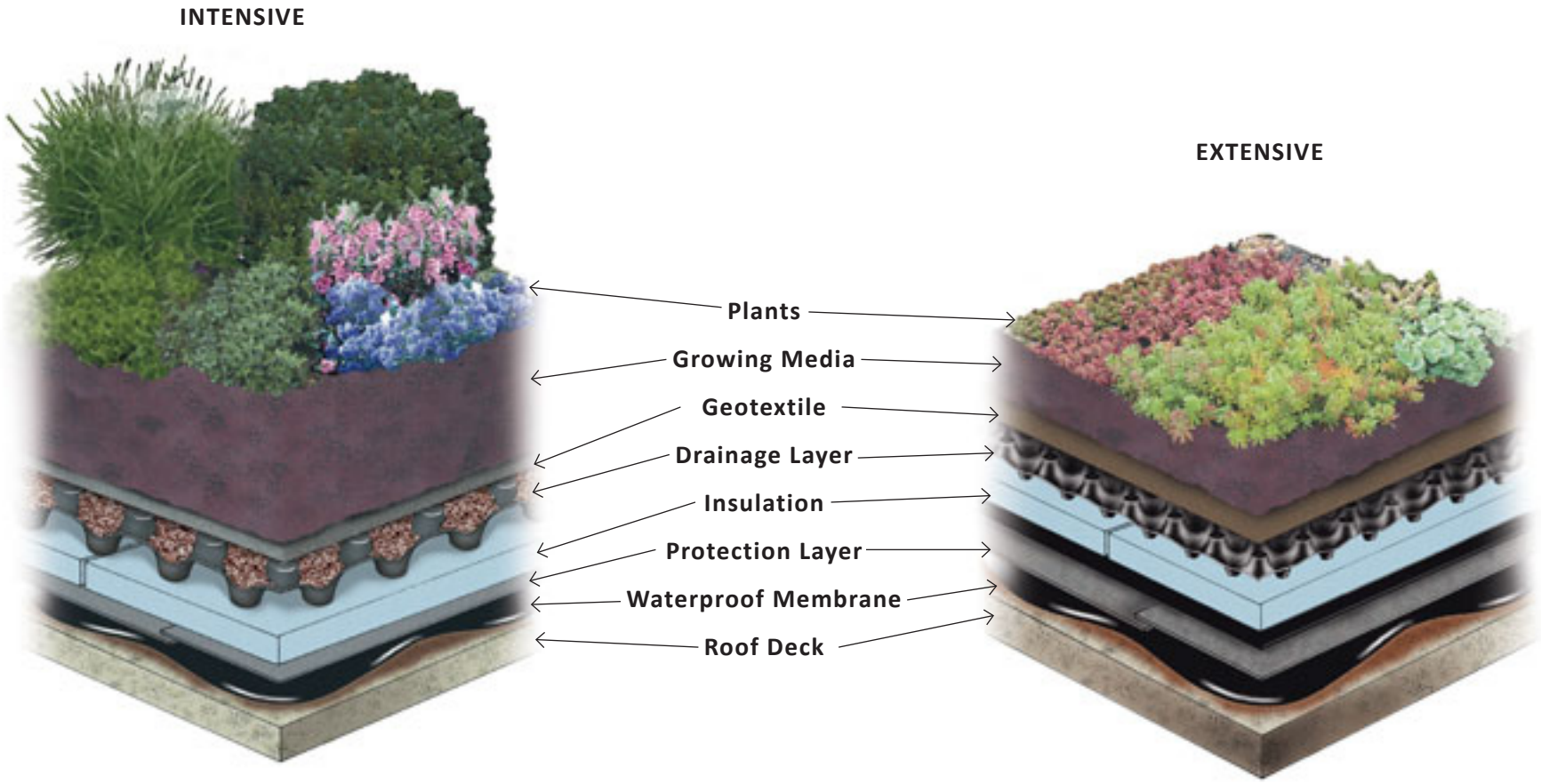


Figure 2.1 Typical installation components of intensive and extensive living roofs.

Images: http://www.hydrotechusa.com/

Figure 2.2 An example of an intensive living roof

Figure 2.3 5th and Madison green roof public park, Seattle - an example of an intensive living roof where trees are planted

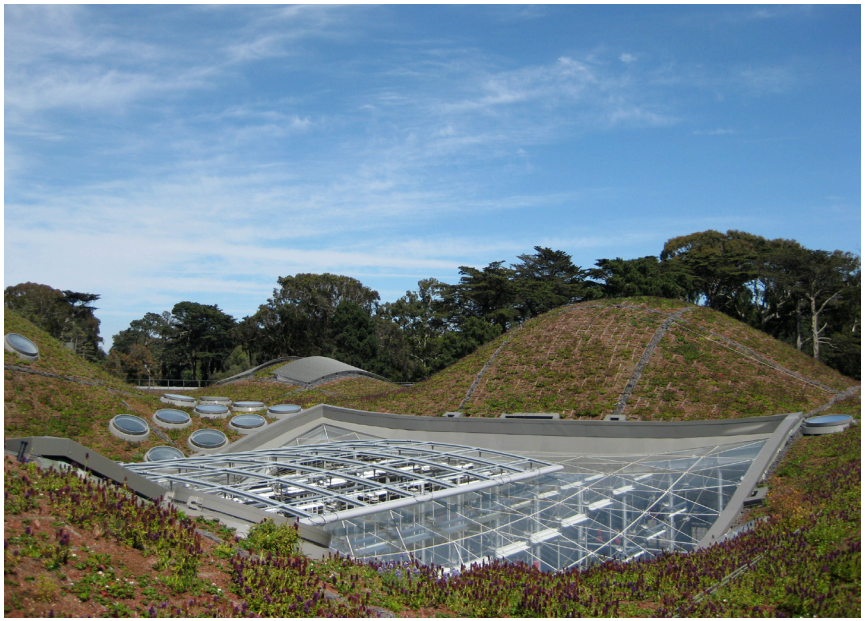


Figure 2.4 California Academy of Sciences just after installation - an example of an extensive living roof with steep slopes and a biodegradable tray system

Figure 2.5 Native wildflower meadow on an extensive green roof in Emeryville, CA

Table 2.1 Advantages and disadvantages of extensive and intensive green roof systems.

	EXTENSIVE	INTENSIVE
Characteristics	· shallow growing media · little or no irrigation · low-growing plants · relatively lightweight	· deeper growing media · irrigation system · larger plants · relatively heavy
Advantages	· lightweight · suitable for large areas · suitable for roofs with 0-30° slopes · low maintenance · often no need for irrigation and drainage systems · often suitable for retrofit projects · can leave vegetation to develop spontaneously · relatively inexpensive · looks more natural · more universally applicable	· greater diversity of plants and soil · better insulation properties · can simulate garden on the ground · more habitat opportunity · can be made very attractive · often accessible as amenity · can produce food
Disadvantages	· more limited choice of plants · usually no public access · unattractive to some, especially in winter · little or no food production possible	· greater weight loading on roof · need for irrigation and drainage · higher cost · more complex systems and expertise needed · more maintenance required · not suitable for steeper roof angles

STORMWATER QUALITY

Green roof applications meet municipal requirements for stormwater in many cities as "self mitigating," due to improved stormwater quality and a reduction in the volume of runoff. With green roofs, water is stored in the substrate and then taken up by plants and released into the atmosphere through the processes of evaporation and transpiration. In this way, green roofs reduce the amount of stormwater runoff and also delay the time at which runoff occurs, resulting in decreased stress on stormwater or combined sewer/stormwater systems at peak flow periods.

A study by the EPA found that green roofs are capable of removing 50% of the annual rainfall volume from a roof through retention and evapotranspiration (Berghage et al. 2009). The rest of the rainfall not retained by green roofs is detained, effectively increasing the time to peak, and slowing peak flows for a watershed (Berghage et al. 2009). A conventional flat roof has a runoff coefficient of 0.95 (meaning that 95% of rain water runs off), an extensive green roof (with growing media less than 4 inches deep) has runoff coefficient of 0.50 and an intensive green roof (with growing media 4– 8 inches deep plus) has a runoff coefficient of 0.30. A green roof therefore prevents 50% to 70% of the stormwater that reaches it from running off. For example, a 2 inch storm event on a 5,000 square foot conventional flat roof would result in 5,922 gallons of runoff. If this roof were covered with an extensive green roof, the same storm would result in 3,117 gallons of runoff - a difference of 2,805 gallons. Other benefits related to roof runoff reduction include reduced flooding and erosion, reduction in runoff water temperature and prevention of sediments, suspended solids, and other airborne or rooftop pollutants from reaching waterways.

HABITAT

Green roofs can be designed as integrated habitat elements, extending and supporting urban open space and nearby restoration efforts. In particular, birds and invertebrates have consistently utilized rooftops designed for habitat. Native pollinator species including native bees, butterflies, and hummingbirds can be targeted in the design process. The primary predator of migratory songbirds in the United States is domestic cats, and green roofs can offer cat-free refuge for these species, many of which are threatened or endangered. Other species that have been found on green roofs include frogs, salamanders, and hawks. The proximity of ecologically significant wetland and riparian areas increases the likelihood of utilization for habitat.

AIR QUALITY

A green roof will not only absorb heat, reducing overheating effects of urbanization, but will also filter the air moving across it. Green roofs filter particulate matter from the air and absorb greenhouse gases. One square meter (10.76 ft2) of grass roof can remove up to 2 kg (4.4 lbs) of airborne particulates from the air every year, depending on foliage type. The practice of planting trees to offset carbon emissions has gained wide acceptance. The plants on an extensive green roof act on a smaller scale than do the trees but one specific project using prairie grasses, which probably have a comparable carbon sequestration capacity, resulted in having sequestered close to 770 tons (700 metric tons) of carbon in 2002.

The temperature moderating effects of green roofs can also reduce demand on power plants, and potentially decrease the amount of CO2 and other polluting by-products being released into the air.

URBAN HEAT ISLAND (UHI) REDUCTION

The average American city overheats by 7˚ F due to urbanization, and extreme cases may reach 14˚ F peak temperature increases. Surprisingly, this increase in temperature is the leading cause of death by natural disaster in the US. These factors also dramatically increase peak energy loads associated with cooling and can become exacerbated by heat exhaust from those cooling systems.

Green roofs mitigate the heat island effect through the daily dew and evaporation cycle, by which plants on vertical and horizontal surfaces are able to cool cities during hot summer months. The light absorbed by vegetation would otherwise be converted into heat energy. UHI is also mitigated by the covering of some of the hottest surfaces in the urban environment – black rooftops. Green roofs can also help reduce the distribution of dust and particulate matter throughout the city, as well as the production of smog. This can play a role in reducing greenhouse gas emissions and adapting urban areas to potential future climate change with warmer summers.

It is not clear that the City of Watsonville experiences overheating due to thermal mass associated with urbanization. The relatively small area of the city, combined with relatively low density and coastal influences work to minimize heat island effects. As Watsonville considers higher densities and concrete construction associated with street improvements and public, commercial, and apartment buildings, thermal mass impacts may become a greater concern.

ECONOMIC BENEFITS & ENERGY SAVINGS

Green infrastructure benefits property values by making properties more attractive and functional. Studies have shown that "good tree cover" can increase property values by 6-15% (Peck & Associates 1999). According to Hopkins and Goodwin (2011), "It is well established that green space adds to the attractiveness of properties and generally results in increased property values, and it is becoming more evident that real estate values increase around green roofs, especially for those looking down onto the green roof."

Other economic benefits are derived from green roofs through energy savings and reduced consumption.

The energy demand for the interior space heating or cooling is determined by heat flow through the building envelope. Savings on energy heating and cooling costs result from the benefits of plant shading, plant and soil insulation, and evaporative cooling. Soil acts as a thermal mass to lessen heat exchange through the roof system. Field experiments by Karen Liu in Ottawa Canada, found that a 6 inch extensive green roof reduced heat gains by 95% and heat losses by 26% compared to a conventional roof. Using a Micro Access Simulation model, Environment Canada found that a typical one story building with a

grass roof and 10 cm (3.9 inches) of growing medium would result in a 25% reduction in summer cooling loads. Studies in Miami and Toronto showed 90°+ peak temperature reductions at the membrane with a green roof applied. While Watsonville may not be subject to the weather extremes of these other locations, such temperature benefits can reduce total energy demand in the community, along with the associated atmospheric carbon and air pollution releases.

Planted roofs also protect the roof membrane from intense ultra violet degradation, mechanical damage, and expansion/contraction due to temperature extremes. By mitigating these three primary causes of failure, green roof systems result in a longer material lifespan. Green roof membranes will last up to twice as long as conventional roof systems, reducing overall maintenance and providing savings in membrane replacement costs. These savings are recognized by NRCA (National Roofing Contractors Association) and other institutions. Associated cost savings include removal and replacement of the entire waterproofing system.

Additionally, green roofs can improve the performance of solar panels. According to a paper from the Department of Energy and Mineral Engineering at Pennsylvania State University, green roofs are thermally cool, outperforming white roofs and other alternatives. On a hot summer day, a green roof can be 30°C (57°F) cooler than a typical roof, and maximums of a 98°F decrease in temperature have been recorded. By keeping the microclimate beneath a solar panel cooler, green roofs can passively improve Photovoltaic efficiency by 16% or more. This efficiency can be increased through the implementation of sensors integrated with irrigation controls. Alternative complex mechanical cooling systems for this use can be expensive and involve additional maintenance concerns, energy use, etc.

The following list describes some additional benefits that could be achieved depending on the design of the green roof system and how it is integrated with other building systems:

• Reduce the size of HVAC equipment on new or retrofitted buildings (capital and operational savings).
• Reduce the amount of standard insulation used.
• Incorporate cooling and/or water treatment functions.
• Local, regional, and national market exposure, depending on the uniqueness of the project. (This has actually been a major factor in quite a large percentage of recent projects. Benefits can be seen from the amount of free press that tends to be associated with doing something that hasn't been done in an area before.)
• Reduce the number of roof drains and associated plumbing infrastructure.
• Reduce community resistance to new development.

RATING SYSTEMS

Green roofs can also help in achieving credits in Green Point Rating System and/or LEED.
Green Point Rating System:
Without the green roof, available landscape credits are capped at 4. With it the project can achieve up to 23 credits in the landscape section.

LEED Rating System:
Green roofs can contribute to as many as 15 credits under the system, depending on design and level of integration with other building systems. In some instances, while green roofs may not contribute directly to achieving points under the system, they contribute to earning LEED credits when used with other sustainable building elements. For example, green roofs can earn direct credits under the following:

- Reduced Site Disturbance, Protect or Restore Open Space
- Landscape Design That Reduces Urban Heat Islands, Roof
- Storm Water Management
- Water Efficient Landscaping
- Innovative Wastewater Technologies
- Innovation in Design

WASTE DIVERSION

Green roofs can contribute to landfill diversion by:

- Prolonging the life of waterproofing membranes, reducing associated waste.
- Through the use of recycled materials in the growing medium.
- Prolonging the service life of heating, ventilation, and HVAC systems through decreased use.

AMENITY CREATION

Green roofs help to reach the principles of smart growth and positively affect the urban environment by increasing green space and providing amenities. Green roofs can serve a number of public functions and uses, including:

- Community gardens (e.g. local food production or co-ops)
- Commercial space (e.g. display areas and restaurant terraces)
- Recreational space (e.g. lawn bowling and children's playgrounds)

SOUND INSULATION

Green roofs have excellent noise attenuation, especially for low frequency sounds. Soil, plants and the trapped layer of air can be used to insulate for sound. Sound waves that are produced by machinery, traffic or airplanes can be absorbed, reflected or deflected. The substrate tends to block lower sound frequencies and the plants block higher frequencies. A green roof with a 12 cm (4.7 inches) substrate layer can reduce sound by 40 decibels; a 20 cm (7.9 inches) substrate layer can reduce sound by 46-50 decibels (Peck et al. 1999). For example the GAP building in San Bruno recorded a 42dB reduction with the addition of an extensive green roof. This was an important factor since the office building is adjacent to San Francisco Airport.

BENEFITS OF GREEN ROOFS

FIRE RETARDATION

Green roofs have a much lower burning heat load (the heat generated when a substance burns) than do conventional roofs (Köehler 2004). In Germany, green roofs are given better fire ratings than conventional roofs due to the non-flammable mineral media layers in green roofs. Green Roofs for Healthy Cities (GRHC), a not-for-profit green roof industry association working to promote the industry throughout North America, has codeveloped ANSI-approved Fire Design Standards with Single Ply Roofing Industry (SPRI) that ensure that green roofs offer fire protection and follow local fire codes (SPRI 2010). Green roof design practices such as non-vegetated border zones, fire stops, and succulent plantings reduce the risk of fire.

AESTHETIC IMPROVEMENTS

Urban greening has long been promoted as an easy and effective strategy for beautifying the built environment and increasing investment opportunity.

Figure 3.1 Living roof at H2Hotel, Healdsburg CA

BUILDING TYPES

Green roof implementation can occur in 2 areas: existing building retrofits and new construction, and for both residential and commercial applications. In general, flat roof structures are much simpler to retrofit than sloped roofs. Ballast roof systems, in which gravel or cobble is used to hold exterior insulation in place, are particularly well suited for retrofit and often have existing parapet systems to retain soil and drainage. It is generally found that slate and tile roofing systems are designed to hold weight similar to that of a green roof system.

A wide variety of building types can be found throughout the city of Watsonville. Unfortunately specific information on Watsonville roof types was not available for this report. The chart in Table 4.1 was taken from a report by Bay Localize, an Oakland non-profit organization. The report, "Tapping The Potential of Urban Rooftops, Rooftop Resource Neighborhood Assessment," looked at a neighborhood in Oakland with comparable building types, and assessed existing building typology as well as the feasibility of implementing green roofs on both existing and new structures. Table 4.1 outlines typical building types and the additional loads they can potentially accommodate. This relates to flat roofs only because pitched roofs are more complex than flat roofs for green roof retrofit, and were considered preferable for rainwater harvesting and solar photovoltaic prototypes.

The Bay Localize study suggests the greatest load that typical existing structures not designed for green roofs may be able to bear is 20 pounds per square foot: approximately equal to the most light-weight extensive green roof systems. Additional analysis by a structural engineer may determine that minimal upgrades are needed to bear the additional weight of a green roof. In all cases, a structural engineering report should accompany any proposal to add a green roof system to an existing structure.

The study shows the following existing building types to be most likely to accommodate weight loads consistent with green roof systems:

- Wood Frame Residential (2 stories or less)
- Commercial Shops
- Apartment Buildings (4 stories or less)
- Office Buildings
- Selected Community Buildings

A more specific assessment of commercial and residential building types within the city of Watsonville may illuminate districts with building characteristics likely to accommodate the additional weight associated with green roofs.

Some considerations that relate to building type include:

- Weight/Structural loading
- Roof slope
- Irrigation water use
- Maintenance

To effectively integrate green roof strategies into the larger framework of civic infrastructure benefits, some assessment of existing building types will inform the viability of various systems and associated metrics. The extent of information available with regard to typical building stock and associated constraints/opportunities will provide the basis for recommendations and standards for green roof retrofits. New building stock can likely be more easily predicted and incentivized. Identifying appropriate existing buildings and buildable lots within watershed areas of specific stormwater concern will indicate perhaps the highest municipal value for green roof applications.

LOAD CALCULATIONS

Green roofs vary greatly in weight, depending on depth and the material components. The important measurement is 'wet' weight – when fully saturated soil, geotextiles, and plants are at their heaviest.

Green roofs, engineered to be both lightweight and efficient, generally weigh between 5 and 7 pounds per square foot for each inch of media depth. Thus, the saturated weight of a 3-inch deep system is about 20 pounds per square foot, including a mature plant cover. Mid-range, 5-inch depth systems weigh approximately 30 pounds per square foot and are compatible with wood or steel decks. Heavier intensive green roofs generally require a concrete supporting deck. For more information, the ASTM (Standards E2397 and E2399) have published specific protocols for determining the weight and dead load of green roofs.

The chart in Table 4.2 demonstrates the total weight of a typical living roof built-up system. The weight of the growing media is the largest factor in the load equation. The load of the soil, fully saturated is estimated to be between 60-80 lbs./ cu. ft. The weight of the rest of the system components may change minimally when an actual design is developed but this will have a small effect on the overall system weight.

ENVIRONMENTAL CONDITIONS

Rooftops are extreme environments with strong, variable wind patterns and little protection from the sun's intense heat. Vegetation, soils, and micro-topography are all design considerations that counteract the extreme conditions.

Drying winds will be stronger at higher roof elevations and a roof with different levels will create many small micro-climates. These areas should be carefully studied to incorporate plant communities adapted to the varied climatic conditions. Treated graywater used for irrigation is an abundant water resource used to keep soil wet in high wind areas.

Roofs are broken down into 3 different levels of wind stresses:

- Corners; stress levels are very high
- Edges; stress levels are high
- The central area; stress levels are low

Vegetation free zones should be used at the highest wind areas of the roof, typically directly adjacent to the roof parapet. Gravel is used in these areas unless wind speeds are so high as to blow the gravel off the roof. In these cases a slab or pavers should be used.

Table 4.1 Building Typology - Typical Characteristics. From Bay Localize.

Building Type	Land Use	Occupied Stories	Construction Material	Construction Era	Size/Scale	Additional Loading Capacity* (psf)
House	Residential	1-2	Wood-framed	Any	Up to 4 units	20
Apartment Building	Residential	1-4	Wood-framed	After 1950	4 to 10 units	15
Apartment Tower	Residential	5+	Concrete or Steel	After 1980	More than 10 units	5-7
Mixed Use	Retail/ Residential	2-5	Wood framed	Any	Varies	Varies (8-12)
Shops	Commercial	1	Wood-framed	After 1970	Varies	17
Warehouse	Varies	1	Masonry or Concrete block walls, riveted steel or large-timber columns	Prior to 1960	Large, open floor plan	5
Big-Box	Retail, Industrial	1	Concrete block or tilt-up concrete walls, interior steel posts	After 1960	Large, open floor plan	5
Repair shop	Commercial	1	Concrete block	Any	Smaller, open floor plan, open storefront	7
Office Building	Office	2+	Varies	After 1960	Varies	17
Community Building	School, hospital, church, auditorium, library, theater, police, fire, post office, etc.	1+	Varies	Varies	Varies	Varies (5-17)

* A removal of pea-gravel/rock ballast (secured on the roofs of any of these buildings) can increase the "dead-load" capacity by an average of 4-5 psf for every inch of ballast removed.

Table 4.2 Weight Calculations for Extensive Living Roof System

Extensive Living Roof Section Weight			
Material	Thickness (In.)	Unit Weight (Lbs/Cu.Ft.)	Weight (Lbs./Sq.Ft.)
Plant Load			2.00
Irrigation System*			(Negligible)
Growing Media*	6.0	70	35.00
Filter Fabric			0.22
Drainage Panel			0.95
Moisture Mat			1.13
Root Barrier			0.21
Air Layer			3.75
		Total	**43.26**

* Fully saturated with water. No Aggregate Fill

Careful considerations should be taken during the living roof establishment period that plants, seed or soil are not damaged by wind. Jute blankets installed over seed and around small plants will help hold things in-place until plants have a chance to become established. A pre-grown vegetated system, the alternative to built-in-place systems may be able to withstand wind conditions that would blow away seed, small plants and exposed soil.

VEGETATION & GROWING MEDIA

Vegetation types and growing media composition have effects on infiltration rates, temperature fluctuations and the function of the living roof system. Soil color and composition can effect cooling and heating performance of the living roof. Moisture levels of growing media and air effects insulation values. Recommended plant selection for the Watsonville area includes ground covers, low evergreen perennials and perennial grasses, with annual forbes for additional visual interest, habitat, and biodiversity. Typically, an initial commissioning period is required while plants become established and is usually conducted by the contractor who installs the roof. After the establishment period, on-going maintenance can be intensive or minimal, depending on the aforementioned factors.

The growing media consists of both organic and inorganic components. A combination of lightweight aggregate, sand and compost are often specified to meet the media requirements. Light-weight expanded shale, slate and clay are the most popular aggregates.

High quality composts (and even worm composts) are used as the organic component in green roof media. Compost holds moisture and nutrients, as well as binds and degrades certain pollutants. However a high quality and consistent compost must be used in order to assure both quick plant establishment and long-term success. The compost must be stable/mature, to assure minimal shrinkage and no plant damage, and must possess the horticultural characteristics (pH and soluble salt content) compatible with the plants being established. Use compost that is enrolled in the US Composting Council's Standard Testing Assurance Program.

A proper green roof media will possess the following properties:

- Proper drainage and aeration.
- Good water holding capacity.
- Good nutrient holding capacity (CEC).
- Permanent, light weight, but sturdy, and stable media (that can physically support the plants).

Green roof media recipes must be designed with the specific project in mind, and for that reason, it is difficult to provide a media recipe that will perform well in all situations. A soils specialist should be consulted when designing a living roof growing media specification. Free consultations are often available at local soil distributors including American Soil Products and Lyngso.

PLANTING SYSTEMS

As discussed earlier in this report plants can either be installed on the roof via nursery pots, plugs, seed, or pre-grown mats similar to sod.

Modular systems, while common, do not necessarily offer all the benefits touted by manufacturers in the industry. In fact, many studies have shown that actual performance of the plants and the system is weaker for modular systems than built-in-place or in situ systems.

While popular in the US today, modular systems virtually disappeared from the German green roof marketplace 15 – 20 years ago. This is because after long time application of green roof technology contractors began to notice the long-term implications of modular systems including:

- Plant health and vigor inconsistent and not comparable to the quality of in situ systems.
- Insufficient protection of waterproofing system.
- Reduced stormwater management performance.
- Cost increases of materials and use of unneeded materials especially where PVC and plastic is concerned.
- Breaking-off of and degradation of materials.

One important European discovery in green roof design was to recognize that plants installed in thin exposed soils can draw strength and durability from the laterally contiguous movement of soil and plants. A continuous root mat also has enhanced water retention capacity.

While one of the most important benefits of green roofs is their capacity to manage rainfall runoff volume, rate, and intensity, modular systems have shown in recent studies to impede this function. Modules are ineffective at reducing runoff rate or lengthening runoff times (intensity). Once the water-absorbing potential of a module is exceeded, the runoff drains rapidly between the units to roof drains, effectively short circuiting both retention and filtration functions. In-situ green roof assemblies create a monolithic system that water must pass through to reach an internal drain or downspout.

Modules are different than pre-grown mats and this is an important distinction. Pre-grown mats are cheaper to install than modules. They offer the benefits of plants fully filled in at time of install similar to a module but also has the continuous sub-system of an in-situ system. Mats are inexpensive, easy to install, and provide immediate full cover, erosion control, and a degree of slope stability.

Many green roofs are planted directly with one gallon and smaller nursery stock. This is most commonly seen for accessible rooftops intended as usable outdoor space. These direct planted green roofs experience high plant survival rates and offer more flexibility and diversity to the plant plan and species than other applications. Direct planting is the most expensive in-situ green roof approach.

Plugs are very small plants inserted at high density, and are a cost effective way of direct planting large quantities of plants for rapid cover. As with seed, plug systems take up to 90 days to reach full coverage and erosion can be an issue if not properly applied. Plants have high survival rates because they grow to maturity on the roof and are therefore well adapted to the conditions. Primary advantages of plug/seed systems are:

- Low cost
- Rapid cover
- High plant survival rates

Seeded applications can be very effective when budgets are tight and allowing 60-90 days for full vegetative cover is acceptable. Wind and rain erosion protection may be needed during the initial stages of a seeded roof to allow plants to fill in and secure loose soils. Following germination, seeded roofs often require a second "overseeding" to fill in areas that did not germinate as densely as other. Seeded systems are not recommended for slopes exceeding 1:12.

When roof slopes exceed 8%, a variety of soil stabilization products are available to prevent slippage. These can be custom selected by a knowledgeable designer, and must be consistent with manufacturer assemblies to maintain warranty.

Materials for each of these applications are readily available regionally.

IRRIGATION

Irrigation is generally required for at least an establishment period. Once plants are established it may not be required depending on soil depth, climate, and plant selection. Drip irrigation is the recommended method for water conservations and sustainability. Drip irrigation can be in-line surface or subsurface lines or subsurface capillary applications, in which water is broadly dispersed through subsurface "wicks." Capillary irrigation can reduce unwanted irrigation drainage, provide a more uniform soil moisture content, and reduce overall irrigation demand.

PEST CONTROL

Typically pest control is not a serious issue on green roofs due to isolation from other landscapes and exposure to predators associated with elevated spaces and low-growing vegetation. A diverse planting of native species will further reduce the likelihood of infestation. In the event that unwanted pests do occur on rooftops, pesticides and other poisons should be avoided. These may be transported into drainage and associated natural waterways, compromising water quality and reversing the benefits of green roof filtration.

An Integrated Pest Management (IPM) approach should be taken, beginning with design considerations and mechanical removal of pests and considering organic pesticides only as a last resort.

MAINTENANCE

Green roofs should be designed to be low maintenance. Factors that affect maintenance include plant selection, proper design of drainage system, testing of waterproofing systems prior to installation of green roof system, irrigation, and tolerance for variation in aesthetic of the green roof throughout the year. Routine maintenance will be needed approximately 2-4 times a year and consisting of the following items:

- Inspect drains and overflows, remove any debris or potential blockages to ensure proper drainage.
- Inspect irrigation system including valves and controllers. Ensure system is functioning properly, with no leaks, and the timer is adequately set.
- Tasks to be conducted on an as-needed basis during the 4 visits include: weeding, overseeding to fill in areas, and cutting back of dead plant material.

A typical maintenance checklist is included in Table 4.3 and outlines routine tasks included in green roof maintenance.

For green roof projects a Maintenance Manual should be provided by the design team or installation contractor to the green roof maintenance staff. Training and proper maintenance is one of the most important factors to the long term success and viability of a green roof. Careful care needs to be taken when working on the roof especially when plant placement or removal and repair of the built-up-system is concerned.

WARRANTY OPTIONS

The type of warranty selected is a very important consideration for the building owner and should be decided upon as early as possible in the design or construction process. The type of warranty may affect the design of the system since certain products may need to be used to meet warranty requirements. Some green roof warranties now cover the full cost of removal and replacement of "overburden" in the event of a membrane leak, regardless of application when applied according to manufacturer recommendations. These "full coverage" warranties are the most expensive and have very specific guidelines to consider during construction.

The following is a summary of basic warranty options for living roofs:

Single Source

A single source warranty is negotiated with the prime contractor who then negotiates individual warranty agreements with each stakeholder. The single source covers the membrane and the living roof system (overburden). If there were a failure in the membrane the manufacturer would pay to replace the overburden and the leaking membrane. This is only the case if a leak is due to a product failure and not caused by outside factors (i.e. maintenance punctures the roof with a shovel). This is the most expensive warranty option. It may also require the roof system be installed by an "approved contractor" and that approved components are used in the built-up system. Often these products are made by the same manufacturer as the membrane.

Full Warranty

Full warranty covers the membrane only. The Owner is responsible for removing and replacing the overburden to fix a leak. If membrane failure is due to a flaw in the membrane the manufacturer covers the cost of the membrane only. This warranty may allow for more flexibility in the design of the roof since products do not have to be within the "approved list" of the membrane provider.

Additional Considerations

A separate warranty with the contractor who installs or maintains the vegetated system is common. This is to ensure the vegetated system is installed properly and the contractor does not cause damage during construction. It also includes an establishment period to ensure viability of the roof.

ELECTRONIC LEAK DETECTION

Electronic leak detection may be required for a warranty and should be verified with the manufacturer early on in the process. This component is highly recommended since it enables the pinpointing of a leak within inches to greatly reduce any costs of roof replacement if a leak should occur. In the case of a leak for any membrane system, an electronic survey, such as EFVM®, can identify the leak without removal of the green roof or disruption of the cover. Once the area of the leak is identified, a small area of vegetative cover is pulled back and the membrane is repaired. Electronic leak detection systems generally need to be installed at the time of membrane installation, and can be either fully automated or manually performed on a regular schedule and/or in the event of a suspected leak.

Electronic leak detection comes in two different varieties, high voltage and low. For the purposes of this report, low-voltage impedance testing is referred to as Electric Field Vector Mapping (EFVM). High voltage is not discussed here since low voltage is the more commonly used method. Both have advantages over other forms of testing such as flood testing in that they pinpoint the actual breach in the membrane, not simply the presence of water.

The key to these methods is that water conducts electricity very well—at least 10 times as well as most roofing membranes.

Electric Field Vector Mapping uses low voltages than and has several advantages over other testing methods. For instance, EFVM works on exposed, ballasted or concealed membranes, and the roof doesn't have to be perfectly dry. It can be employed on vertical, sloped or flat surfaces, overburden can stay in place during testing, and it locates leaks and breaches with pinpoint accuracy.

EFVM involves wetting the top of the membrane to create an upper electrical "plate". Often, the overburden will contain enough moisture that wetting the roof is not necessary. Like the high-voltage system described above, the structural deck acts as the lower electrical plate, and the roof membrane located in between acts as the insulator. (http://www.waterproofmag.com/back_issues/201001/roof-leaks.php)

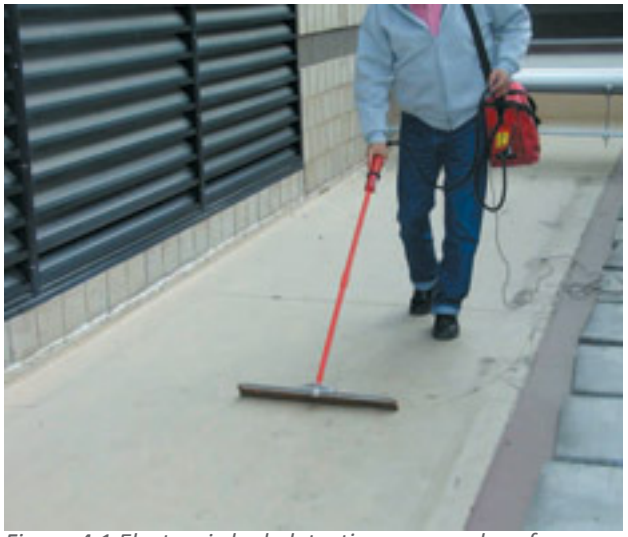


Figure 4.1 Electronic leak detection on a cool roof

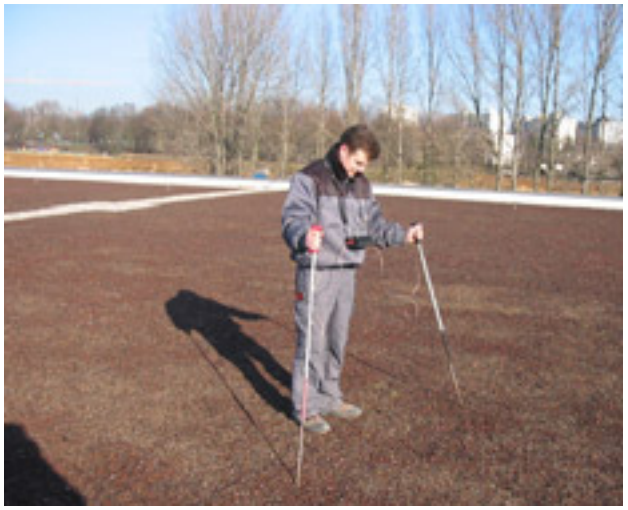


Figure 4.2 Electronic leak detection on a green roof

Table 4.3 Living Roof Inspection & Maintenance Checklist

Property Address: **Property Owner:** **Date of Inspection:** **Inspectors:**		**Type of Inspection:** ☐ Monthly ☐ Pre-Wet Season ☐ After heavy runoff ☐ End of Wet Season ☐ Other		
Categories/ Tasks	**Conditions When Maintenance Is Needed**	**Maintenance Needed? (Y/N)**	**Comments (Describe maintenance completed and if needed maintenance was not conducted, note when it will be done).**	**Results Expected When Maintenance Is Performed**
Plant Health	Vegetation is dead, diseased and/or overgrown.			Vegetation is healthy and attractive in appearance.
Plant Coverage	Vegetation coverage is greater than 75% after establishment period.			Vegetation coverage is complete. Where needed bare spots have been addressed with additional plants or seeds, as needed.
Sediment, Trash and Debris Accumulation	Sediment, trash and debris accumulated at drains or in vegetation free zones. Roof does not drain immediately after rainfall.			Sediment, trash and debris removed from roof drains and vegetation free zones and disposed of properly. Roof drains immediately after rainfall.
Drain Rock At Vegetation Free Zones	Top of drain rock does not match top of soil, either it is higher (built up) or lower (due to erosion).			Finish grade of vegetation free zone matches finish grade of soil.
Weeds	Weeds are overgrown, out-competing with the native plants.			All weeds removed by hand pulling so that native vegetation is thriving.
Irrigation System	Water is ponding, leaks or dry spots are noticeable.			Even and consistent application of water is apparent.
Miscellaneous	Any condition not covered above in order for the living roof to function as designed.			Meet the design specifications.

Figure 4.3 Hooks for safety equipment in the vegetation-free zone.

Figure 4.4 Vegetation-free zone at parapet, with irrigation boxes showing.

Figure 4.5 Concrete curb with vegetation-free zone.

Figure 4.6 Metal edge restraint contains gravel in vegetation-free zone.

PERMIT REQUIREMENTS

Typically living roofs for existing buildings require documentation that justifies that the existing building would be able to sustain the new load. This would have to comply with the current code for vertical and lateral loading (dead load).

FIRE SAFETY

Properly maintained extensive green roofs are fire resistant. It has been shown that green roofs with grasses, perennials and Sedums are 15-20 times less likely to fuel a fire than traditional roofs with fully adhered bituminous waterproofing membranes (Breuning 2008).

However, care must be taken to design green roofs for proper fire safety. The local fire marshal should be consulted with early on so that their specific requirements can be incoporated into the design. Some considerations that typically relate to fire safety include:

- Slope
- Access
- Materials Selection
- Plant Selection
- Maintenance
- Irrigation

See ANSI/SPRI VF-1 External Fire Design Standard for Vegetative Roofs. This standard should be used in conjunction with the installation specifications and requirements of the manufacturer of the specific products used in the vegetative roofing system.

According to the EPA's publication "Reducing Urban Heat Islands: Compendium of Strategies" (2008), one of the most common ways to increase fire safety is to avoid using plants that could dry up in summer, and to instead use fire resistant plants and a growing medium that is low in organic material content. Another common precaution is to construct fire breaks on the roof— 2-foot (0.6 m) widths of concrete or gravel at 130-foot (40 m) intervals (EPA 2008).

Additionally, fire marshals may impose plant species restrictions, irrigation requirements, integrated rooftop fire sprinklers, minimum clearance at eaves for access, or other limitations on design aspects considered to impede emergency response efforts.

These factors should be coordinated between jurisdictions within the City to ensure a seamless and consistent message to the public regarding green roof policy in Watsonville.

TECHNICAL GUIDELINES

ASTM Methodologies:

With very few exceptions, building products must comply with accepted industry material standards. Amazingly, until recently, there have been no American green roof standards. In the absence of American standards, responsible providers of green roof materials and systems would typically demonstrate compliance with the German FLL (see below) standards, which are little-known in the general design and construction industries.

Within the past few years, the ASTM convened a Green Roof Task Force to create green roof standards. The methods described in the new ASTM standards establish a common basis for comparing fundamental green roof properties, such as maximum weight and moisture retention potential. These methods are designed to measure critical material properties for green roof materials under conditions similar to those encountered in the field. The tests referenced in these standards can be run at a number of American laboratories.

The five new standards are in the Annual Book of ASTM Standards, Volume 04.12.

- E2396 Standard Testing Method for Saturated Water Permeability of Granular Drainage Media [Falling-Head Method] for Green Roof Systems
- E2397 Standard Practice for Determination of Dead Loads and Live Loads Associated with Green Roof Systems
- E2398 Standard Test Method for Water Capture and Media Retention of Geocomposite Drain Layers for Green Roof Systems
- E2399 Standard Test Method for Maximum Media Density for Dead Load Analysis*
- E2400 Standard Guide for Selection, Installation, and Maintenance of Plants for Green Roof Systems

*Method E2399 includes tests to measure moisture retention potential and saturated water permeability of media.

FLL Guidelines:

The FLL (Forschungsgesellschaft Landschaftsentwicklung Landschaftsbau e.V.) is the German Research Society for Landscape Development and Landscape Design.

The German guidelines cover all aspects of green roof design, including (but not limited to) designing appropriate media (engineered soil) for different applications; selecting plants palettes, and managing drainage. The FLL has also developed specific tests, including:

- To determine the root resistance of waterproofing materials and root-barriers,
- To evaluate water-holding capacity of media, or
- To estimate maximum weight of green roof media.

ANSI/SPRI Standards:

The Approved American National Standard (ANSI) and the Single Ply Roofing Industry (SPRI), in cooperation with Green Roofs for Healthy Cities (GRHC), have jointly developed a Wind Design Standard and a Fire Design Standard for vegetative roofing systems. The Wind Design Standard provides a method of designing wind uplift resistance of green roofs, and the Fire Design Standard provides a method for designing external fire resistance for green roofs. These organizations presently are drafting a standard for investigating resistance to root penetration on green roofs.

TECHNICAL RECOMMENDATIONS AND METRICS

As previously discussed, living roofs can be extensive, intensive, or some combination thereof. Within those categories there are numerous variations on system buildups, with a variety of materials and manufacturers to choose from.

The system specified for a particular project will depend on the design considerations discussed above. Generally, based on our assessment of the climate, building types available, and ecological goals, we recommend the following suite of options and metrics for living roofs in Watsonville:

- Use extensive light-weight systems
- Use locally native plant materials
- Use species with relevant habitat associations
- Restrict or prohibit use of pesticides and fertilizers
- Target areas of high discharge and/or poor water quality
- Use green roofs to keep runoff from reaching streets
- Consider areas of high density for increased benefit
- Create a pilot project on a city facility
- Involve area environmental education programs

Table 6.1 "Rooftop Resource Prototypes" - Prototype Characteristics. credit: Bay Localize

Prototype	Major Components	Maximum Weight	Annual Productive Yield
Extensive Green Roof	½" Drainage Mat 4" Mineral Substrate Sedums	22 psf	drainage and energy benefits
Intensive Green Roof—Vegetables	2¼" Drainage Board 18" Organic/Mineral Substrate Variety of Vegetable Crops	108 psf	1.86 psf vegetables
Intensive Green Roof—Herbs	1 ¼" Drainage Board 8" Organic/Mineral Substrate Herbaceous Plants	51 psf	perennial yield
Hydroponic Rooftop Garden	Growing Container Reservoir Container 4" Inert Substrate Variety of Vegetable Crops	16 psf	4 psf vegetables
Solar Photovoltaics	Multicrystalline PV Panels Mounting Hardware	5 psf	1 kilowatt per 100 square feet
Rainwater Harvesting	Conveyance-Gutters/Leaders Debris Screen First-flush Diverter Roof Washer Storage Tank/Cistern	N/A	average 3,000 ga. per structure (1" rain on 100 sf = 60 gal.)

TYPICAL DETAILS

The following details illustrate a typical extensive living roof installation that would likely be appropriate for new buildings and retrofits in Watsonville.

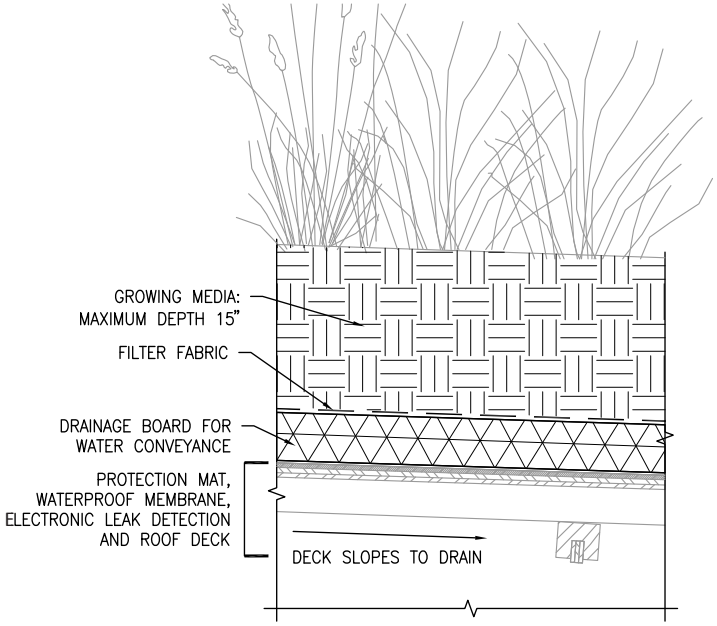


Figure 7.1 Typical extensive living roof system.

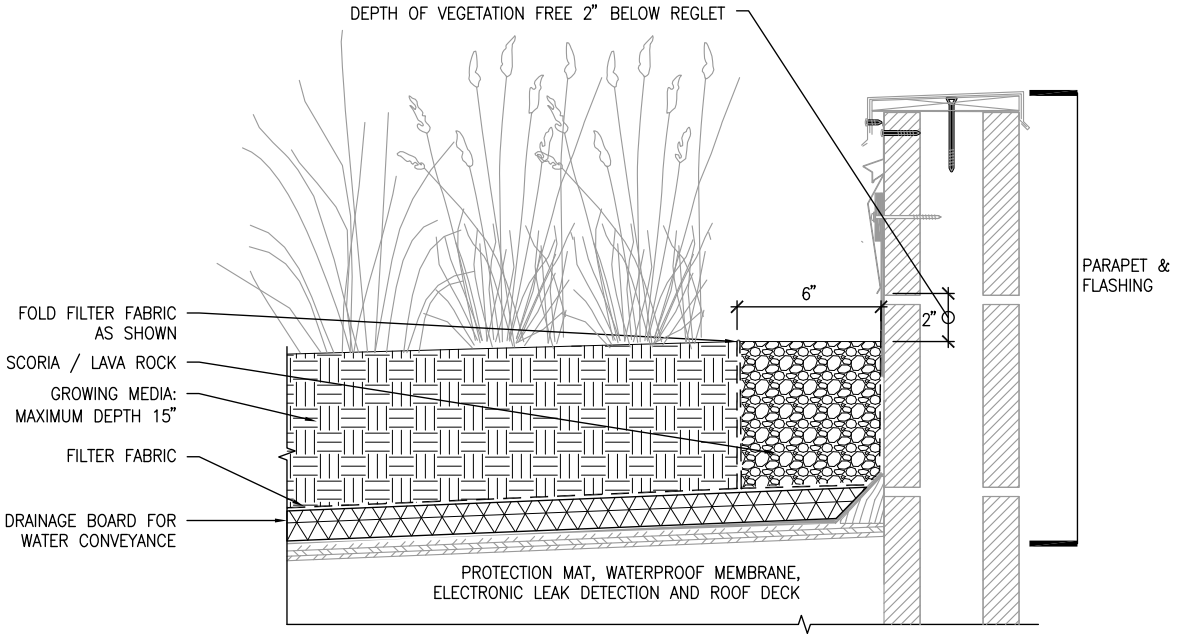


Figure 7.2 Typical extensive living roof system at parapet.

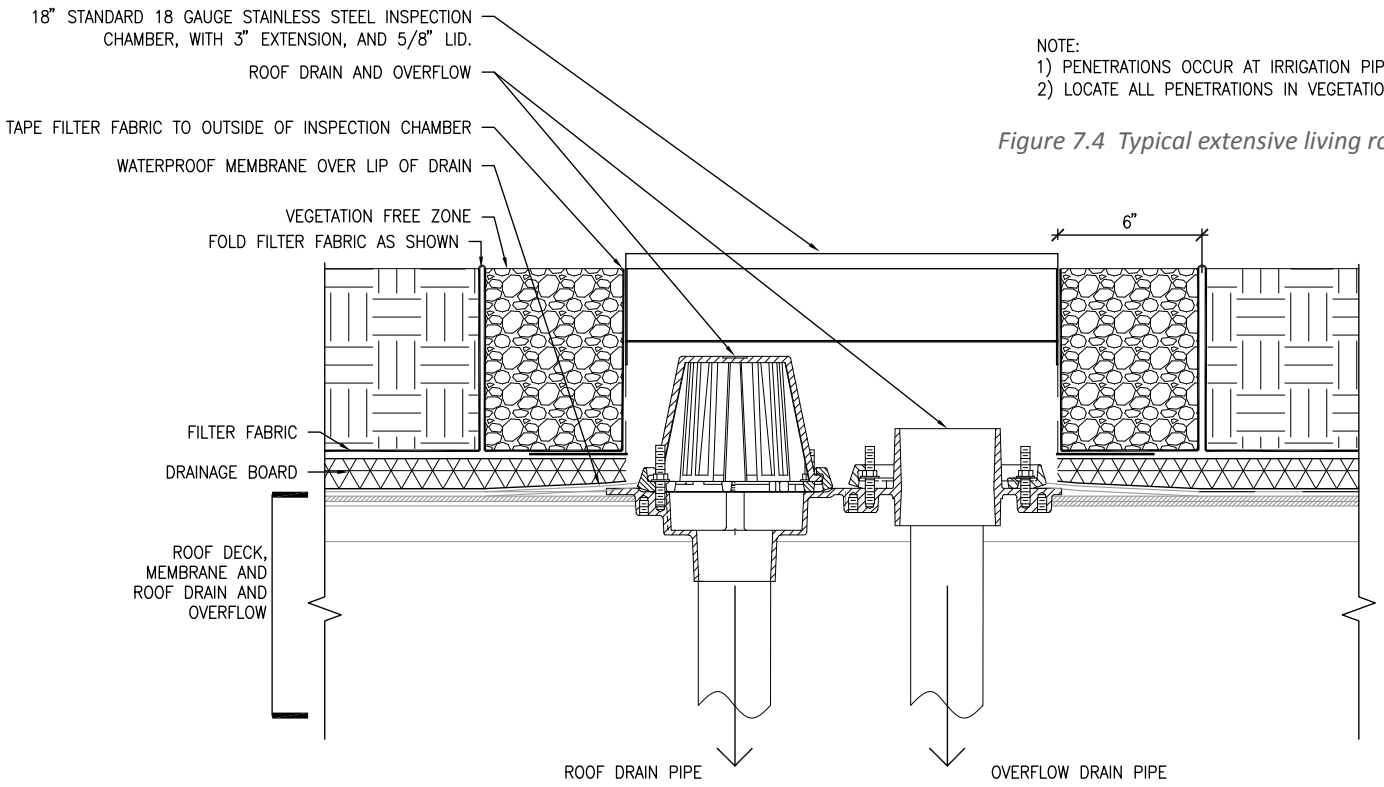


Figure 7.3 Typical extensive living roof drain and overflow.

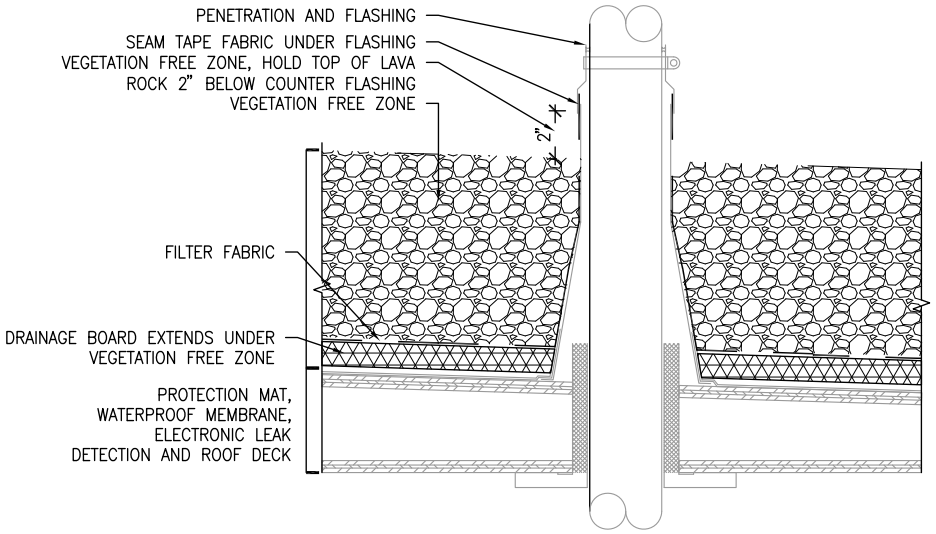


Figure 7.4 Typical extensive living roof penetration in living roof.

POLICY GOALS

For policy to be effective it should address residential and commercial structures, both existing and new construction. From an engineering standpoint, new construction will be easier and less expensive for the inclusion of green roofs due to structural integration of the additional weight. Nevertheless, many conventional residential and commercial buildings can support green roof systems and these building types should be encouraged to implement green roofs if structural capacity is adequate.

Should a watershed assessment strategy be pursued, it would be wise to consider integration of green roof and ground plane functions to maximize the impact of coordinated Best Management Practices

EXISTING POLICY: NATIONAL

In 1972, Congress passed the Clean Water Act (CWA) to regulate the discharge of pollutants to receiving waters such as oceans, bays, rivers and lakes. Under the CWA, waste discharges from industrial and municipal sources are regulated through the National Pollutant Discharge Elimination System (NPDES) Permit Program. NPDES permits for stormwater specify a suite of activities that municipalities must undertake to reduce pollution in stormwater runoff. One of these is the development, implementation, and enforcement of a program to reduce pollutants in stormwater runoff from new development and redevelopment projects. This effort is commonly referred to as a post-construction stormwater control program.

The EPA has recently begun providing guidance and support for cities to implement green infrastructure, including green roofs, as a tool for reducing stormwater runoff and pollution. On April 29, 2011, The EPA announced the release of its new "Strategic Agenda to Protect Waters and Build More Livable Communities through Green Infrastructure," which outlines the activities that the Agency will undertake to help communities implement green infrastructure approaches. EPA's strategy focuses on clarifying how green infrastructure can and should be used within the regulatory and enforcement contexts, outreach and information exchange, financing, and tool development and capacity building.

As part of the strategy, EPA will work with partners including local governments, watershed groups, tribes and others in ten cities that have utilized green infrastructure and have plans for additional projects. EPA will encourage and support expanded use of green infrastructure in these cities and highlight them as models for other municipalities around the country. The ten cities are: Austin, Texas; Boston, Mass.; Cleveland, Ohio; Denver, Colo.; Jacksonville, Fla.; Kansas City, Mo.; Los Angeles, Calif.; Puyallup, Wash.; Syracuse, N.Y.; and Washington, DC and neighboring Anacostia Watershed communities.

Concurrent with the release of the Strategic Agenda, EPA's Office of Water and Office of Enforcement and Compliance Assurance issued a joint memorandum encouraging communities to use green infrastructure to manage wet weather and meet Clean Water Act Requirements.

On October 28, 2011, EPA announced a commitment to using an integrated planning process to help local governments identify opportunities to achieve clean water by controlling and managing releases of wastewater and stormwater runoff more efficiently and cost effectively. The integrated planning process, outlined in a guidance memo to EPA's regional offices from EPA's Office of Water and Office of Enforcement and Compliance, will help municipalities prioritize infrastructure investments to address the most serious water quality issues and provide flexibility to use innovative, cost-effective stormwater and wastewater management solutions, including green infrastructure such as green roofs.

EXISTING POLICY: STATE OF CALIFORNIA

2010 California Green Building Standards Code, California Code of Regulations, Title 24, Part 11 (CALGreen Code) became effective on January 1, 2011. This addition to the California Building Standards Code specifies that new buildings shall incorporate green building practices.

While green roofs are not required by CALGreen Code, they are recommended as a Voluntary Measure for nonresidential construction under the category of Low Impact Development (Section A5.106.3).

EXISTING POLICY: CALIFORNIA CITIES

San Francisco

San Francisco has adopted its own Green Building Code which is more restrictive than CALGreen Code. Under San Francisco Building Code Chapter 13C, newly constructed buildings (of any size or occupancy), as well as renovations to areas over 25,000 sq ft in existing buildings must meet green building standards. Depending on the category of construction, the San Francisco Green Building Code requires LEED, GreenPoints, or other more locally restrictive standards for most projects. San Francisco's Green Building Code also incorporates measures required by their Stormwater Management Ordinance.

San Francisco's Stormwater Management Ordinance, effective from May 22, 2010, requires new and redevelopment projects built in San Francisco to reduce their impacts on the wastewater system according to San Francisco Stormwater Design Guidelines (2009). This review process, enforced by San Francisco Public Utilities Commission, applies to all projects disturbing 5,000 square feet or more of the ground surface. The Guidelines introduce the stormwater performance measures that must be achieved for project approval and provide detailed instructions for developing a Stormwater Control Plan (SCP), a document which allows City staff to assess compliance.

The Guidelines require low impact development (LID) and stormwater best management practices (BMP's), which can include green roofs, to be incorporated into the site design. The Guidelines also highlight green roofs as an especially suitable opportunity for stormwater management in high density residential areas, mixed-use areas, and former shipyards.

Los Angeles

"Green Roofs - Cooling Los Angeles: A Resource Guide" was published by The City of Los Angeles Environmental Affairs Department in 2006. This document, though not enforceable, "proactively brings together people and resources to educate and develop ways to improve the Los Angeles environment." It outlines green roof technology, benefits and incentives, planning, design, and maintenance.

On September 28, 2011, the Los Angeles City Council passed a landmark Low Impact Development (LID) Ordinance, which calls for development and redevelopment projects to mitigate runoff in a manner that captures rainwater at its source using green infrastructure and stormwater BMP's. The ordinance will require 100 percent of rainwater from a three-quarter inch rainstorm to be captured, infiltrated and/or used onsite at most developments and redevelopments where more than 500 square feet of hardscape is added.

Los Angeles also has a Green Building Ordinance, signed into law in 2008, which created a series of requirements and incentives for developers to meet the US Green Building Council's Energy and Design (LEED) standards. Among other things, the Private Sector Green Building Ordinance requires that all new projects greater than 50 units or 50,000 square feet show compliance with the LEED Certified level. It also expedites processing through all departments if LEED Silver designation is met.

POLICY & INCENTIVES: OUT OF STATE

Portland

Portland is the first city in the U.S. to pass legislation promoting green roofs. Ecoroofs (as the city has termed them) have been formally recognized as a best management practice (BMP) in the City's stormwater manual since 1999. Several policies in place encourage ecoroofs.

Incentives under the Gray to Green Initiative, passed in 2008, fund up to $5 per square foot of an ecoroof project. Installation costs for ecoroofs in Portland range from $5 to $20 per square foot. Under Gray to Green, the City of Portland is making a five-year, $55 million investment to accelerate implementation of the Portland Watershed Management Plan. One target of the initiative is adding 43 new acres of ecoroof. Applications for the incentive are reviewed by committee twice per year.

Projects that install ecoroofs in the Central City Plan District are eligible for a floor area ratio (FAR) bonus, which increases the building's allowable area, and can use ecoroofs to conform to the Central City Design Guidelines. Buildings can receive bonus FAR based on three ranges of ecoroof coverage in relation to the building's footprint: 10-30%, 30-60% and 60% or greater earns one, two and three square feet of additional floor area per square foot of ecoroof respectively.

The City's Green Building Policy resolution requires that all new municipal projects are designed and constructed with an ecoroof and/or Energy Star rated roof material. All roof replacement projects must include an ecoroof when technically feasible.

In 1977 Portland created a separate stormwater utility fee to help pay for the increasing cost of managing stormwater runoff. To reward ratepayers who keep stormwater from leaving their property, the Portland City Council adopted a stormwater discount program in 2000, and the City successfully launched Clean River Rewards in 2006. Under this program, property owners can receive up to 100% discount on their stormwater fee. Qualifying ecoroofs can account for a maximum 35% discount.

Ecoroofs are also a means to comply with the City's Stormwater Management Manual that applies to all new and redevelopment projects.

Chicago

Interest in green roofs in Chicago began when Mayor Daley visited Europe in 1998 and noticed the large number of green roofs. In 2003, the City Department of Environment designed and installed a 20,300 sq. ft. demonstration project on the roof of City Hall. Other city-sponsored green roof projects followed. Incentives were designed based on surveys to determine what would make green roof installation most attractive.

The 2005 Green Roof Grants Program helped realize more than 20 green roof projects throughout Chicago. In 2006 the City of Chicago Department of Environment awarded an increased number of grants to assist with residential and small commercial green roof projects. Grants of up to $5,000 were awarded to forty selected projects. Based upon the popularity of the program, the Department of Environment extended its Green Roof Grants Program to 2007, awarding twelve additional grants.

LEED-Gold standard is required for all new City buildings and LEED certified for all renovations for City buildings

The Green Permit Process offers qualifying projects an expedited permit process and possible reduction of the permit fees. Permit applications that include green technologies such as green roofs are required to be submitted through a Green Permit Program Project Administrator.

There is also a density bonus for downtown buildings, which allows developers to build larger buildings if they include a significant amount of green roof. This is measured in terms of "floor area ratio (FAR)", or the ratio of floor space to the area of the lot. The bonus FAR for qualifying green roofs is calculated as follows: bonus FAR = (area of roof landscaping in excess of 50% of net roof area ÷ lot area) × 0.30 × Base FAR.

In 2006 a Green Roof Improvement Fund was implemented for eligible projects in a downtown redevelopment district. These projects could receive reimbursement grants for up to 50% of green roof costs (up to $100k). Eligibility criteria included: having a vegetated area that covers more than 50% of the net roof area of the building, a design that included a palette of plants that are drought tolerant and minimize the need for irrigation, a green roof that is highly visible to nearby buildings, and a plan to collect green roof performance measurements for storm water and urban heat island mitigation.

Toronto

Toronto is the first City in North America to have a bylaw to require and govern the construction of green roofs on new development. It was adopted by Toronto City Council in May 2009, under the authority of Section 108 of the City of Toronto Act. The bylaw requires green roofs on new commercial, institutional and residential development with a minimum Gross Floor Area of 2,000 square meter as of January 31, 2010. Starting April 30, 2012, the Bylaw will require green roofs on new industrial development. The green roof coverage requirement is graduated, depending on the size of the building. Residential buildings less than 6 stories or 20m in height are exempt from being required to have a green roof. In 2012, the coverage requirement for industrial buildings will be the lesser of 10 per cent of Available Roof Space or 2,000 m2.

Adopted by City Council in 2009, the Eco-Roof Incentive Program is a key element of the City's Climate Change Action Plan, an aggressive environmental framework aimed at reducing Toronto's greenhouse gas emissions by 80 per cent by 2050. Funds for the Eco-Roof Incentive Program will be renewed annually until 2012. To date, the City has approved over 50 applications for funding, totalling a combined eco-roof area of more than 90,000 square meters.

The Eco-Roof Incentive Program provides funds for green or cool roof retrofit projects on existing commercial, industrial and institutional buildings. For 2010, the program will also provide funding for green roofs on new industrial buildings with a Gross Floor Area of 2,000 m2 (21,528 sq ft) or greater, and new institutional and commercial buildings of less than 2,000 m2. Eligible green roof projects will receive $50 / square meter up to a maximum of $100,000. Eligible cool roof projects will receive $2 - 5 / square meter up to $50,000.
Funding recipients will be selected based on the Eligibility Criteria.

Minneapolis

In 2005, the city established a stormwater utility to charge separately for stormwater fees. Concurrent programs were implemented whereby property owners could qualify for fee reductions by establishing onsite water quality and/or quantity treatment systems, such as rain gardens, dry wells, pervious pavement, ponds and green roofs. To encourage green roofs, the system offered a 100 percent abatement for each square foot of green roof that offset a parcel's estimated amount of impervious surface. The 100 percent abatement was granted even for extensive green roof systems not capable of holding more than 80 percent of the average rainfall from all rainfall events.

COOL ROOFS

We have identified stormwater quality as a primary issue of concern for the City of Watsonville. Green roofs are the ideal roof treatment to address this issue, due to green roofs' ability to absorb and filter rainwater, reducing runoff. Cool roofs do not address stormwater concerns, but they do provide other benefits and may be a viable alternative for many of Watsonville's buildings. The energy savings enabled by cool roofs may be especially beneficial for cold storage facilities.

The following information on cool roofs is excerpted from the EPA's 2008 document, "Reducing Urban Heat Islands: Compendium of Strategies - Cool Roofs." Please see this document for more information and additional references.

"Cool roofing" refers to the use of highly reflective and emissive materials on roof surfaces.

Cool roofing products are made of highly reflective and emissive materials that can remain approximately 50 to 60°F (28-33°C) cooler than traditional materials during peak summer weather. Building owners and roofing contractors have used these types of cool roofing products for more than 20 years. Traditional roofs in the United States, in contrast, can reach summer peak temperatures of 150 to 185°F (66-85°C), thus creating a series of hot surfaces as well as warmer air temperatures nearby.

HOW COOL ROOFS WORK

Solar reflectance, or albedo, is the percentage of solar energy reflected by a surface. Traditional roofing materials have low solar reflectance of 5 to 15 percent, which means they absorb 85 to 95 percent of the energy reaching them instead of reflecting the energy back out to the atmosphere. The coolest roof materials have a high solar reflectance of more than 65 percent, absorbing and transferring to the building 35 percent or less of the energy that reaches them. These materials reflect radiation across the entire solar spectrum, especially in the visible and infrared (heat) wavelengths.

ROOF TYPES

There are generally two categories of roofs: low-sloped and steep-sloped. A low-sloped roof is essentially flat, with only enough incline to provide drainage. It is usually defined as having no more than 2 inches (5 cm) of vertical rise over 12 inches (30 cm) of horizontal run, or a 2:12 pitch. These roofs are found on the majority of commercial, industrial, warehouse, office, retail, and multi-family buildings, as well as some single-family homes.

Steep-sloped roofs have inclines greater than a 2-inch rise over a 12-inch run. These roofs are found most often on residences and retail commercial buildings and are generally visible from the street.

LOW-SLOPED COOL ROOFS

Low-sloped and steep-sloped roofs use different roofing materials. Traditionally, low-sloped roofs use built-up roofing or a membrane, and the primary cool roof options are coatings and single-ply membranes.

Cool Roof Coatings:
Coatings are surface treatments that are best applied to low-sloped roofs in good condition. They have the consistency of thick paint and contain additives that improve their adhesion, durability, suppression of algae and fungal growth, and ability to self-wash, or shed dirt under normal rainfall. Building owners can apply cool roof coatings to a wide range of existing surfaces, including asphalt capsheet, gravel, metal, and various single-ply materials.

There are two main types of cool roof coatings: cementitious and elastomeric. The important distinction is that elastomeric coatings provide a waterproofing membrane, while cementitious coatings are pervious and rely on the underlying roofing material for waterproofing.

Single-Ply Membranes:
Single-ply membranes come in a pre-fabricated sheet that is applied in a single layer to a low-sloped roof. The materials are generally glued or mechanically fastened in place over the entire roof surface, with the seams sealed by taping, gluing, or heat-welding. A number of manufacturers formulate these products with cool surfaces.

Building owners generally consider cool roof options when their roof begins to fail. They typically use a cool roof coating if an existing roof needs only moderate repair, and a single-ply membrane for more extensive repairs.

STEEP-SLOPED COOL ROOFS

Most cool roof programs focus on the low-sloped roofing sector, but cool roof options are becoming available for the steep-sloped sector as well. Asphalt shingles are the most common roofing materials used on steep-sloped roofs. Other products include metal roofing, tiles, and shakes. The market for steep-sloped cool roofing materials is growing, although the solar reflectance for these products is generally lower than for low-sloped cool roofs. A number of products are available for tiles and painted metal roofing.

BENEFITS AND COSTS

The use of cool roofs as a mitigation strategy brings many benefits, including lower energy use, reduced air pollution and greenhouse gas emissions, and improved human health and comfort. At the same time, there can be a cost premium for some cool roof applications versus traditional roofing materials.

Reduced Energy Use:
A cool roof transfers less heat to the building below, so the building stays cooler and uses less energy for cooling. Every building responds differently to the effects of a cool roof.

Local climate and site-specific factors, such as insulation levels, duct placement, and attic configuration, play an important role in the amount of savings achieved. Other site-specific variables also can strongly influence the amount of energy a particular building will save. For example, a study of a San Jose, California, drug store documented cooling energy savings of only 2 percent. The cooling demands in this store were driven by the design

of the building, including a radiant barrier under the roof and a well ventilated plenum space, so that heat transfer through the roof contributed little to the store's cooling demand. Thus, in gauging potential energy savings for a particular building, the building owners will need to consider a range of factors to make cool roofing work for them.

Another benefit of cool roofing is that it saves energy when most needed—during peak electrical demand periods that generally occur on hot, summer weekday afternoons, when offices and homes are running cooling systems, lights, and appliances. By reducing cooling system needs, a cool roof can help building owners reduce peak electricity demand. Lower peak demand not only saves on total electrical use but also can reduce demand fees that some utilities charge commercial and industrial building owners. Unlike residential customers, who pay for only the amount of electricity they use, commercial and industrial customers often pay an additional fee based on the amount of peak power they demand. Because cool roofing helps reduce their peak demand, it lowers these costs.

Reduced Air Pollution and Greenhouse Gas Emissions: The widespread adoption of heat island mitigation efforts such as cool roofs can reduce energy use during the summer months. To the extent that reduced energy demand leads to reduced burning of fossil fuels, cool roofs contribute to fewer emissions of air pollutants, such as nitrogen oxides (NOX), as well as greenhouse gases, primarily carbon dioxide (CO2).

Potential Adverse Impacts

Cool roofs can have a wintertime heating penalty because they reflect solar heat that would help warm the building. Although building owners must account for this penalty in assessing the overall benefits of cool roofing strategies, in most U.S. climates this penalty is not large enough to negate the summertime cooling savings because:

- The amount of useful energy reflected by a cool roof in the winter tends to be less than the unwanted energy reflected in the summer. This difference occurs primarily because winter days are shorter, and the sun is lower in the sky. The sunlight strikes the Earth at a lower angle, spreading the energy out over a larger area and making it less intense.
- Many buildings use electricity for cooling and natural gas for heating. Electricity has traditionally been more expensive than natural gas per unit of energy, so the net annual energy savings translate into overall annual utility bill savings. Note, however, that natural gas and electricity prices have been volatile in some parts of the country, particularly since 2000.

Costs

A 2006 report (see Table 2) investigated the likely initial cost ranges for various cool roof products. The comparisons in Table 2 are indicative of the trade-offs in cost and reflectance and emittance factors between traditional and cool roof options. For low-sloped roofs, the report noted that:

- Cool roof coatings might cost between $0.75 and $1.50 per square foot for materials and labor, which includes routine surface preparation like pressure-washing, but which does not include repair of leaks, cracks, or bubbling of the existing roof surface.
- Single-ply membrane costs vary from $1.50 to $3.00 per square foot, including materials, installation, and reasonable preparation work. This cost does not include extensive repair work or removal and disposal of existing roof layers.
- For either type of cool roof, there can be a cost premium compared to other roofing products. In terms of dollars per square foot, the premium ranges from zero to 5 or 10 cents for most products, or from 10 to 20 cents for a built-up roof with a cool coating used in place of smooth asphalt or aluminum coating.
- As with any roofing job, costs depend on the local market and factors such as the size of the job, the number of roof penetrations or obstacles, and the ease of access to the roof. These variables often outweigh significantly the difference in costs between various roofing material options.

Benefit-Cost Considerations

Based on the benefits of cool roofs and the cost premiums noted in Table 2, Watsonville can develop a benefit-cost analysis to determine whether a cool roof project or program will provide overall net benefits in a given area. For example, the cost study referenced in Table 2 also evaluated the cost effectiveness of low-sloped cool roofs for commercial buildings in California by quantifying five parameters (see summary results in Table 3):

- Annual decrease in cooling electricity consumption
- Annual increase in heating electricity and/or gas
- Net present value (NPV) of net energy savings
- Cost savings from downsizing cooling equipment
- Cost premium for a cool roof

Other parameters can provide benefits or reduce costs that were not part of the analysis. These include:

- Reduced peak electric demand for cooling
- Financial value of rebates or energy saving incentives that can offset the cost premiums for cool roofing materials
- Reduced material and labor costs over time resulting from the extended life of the cool roof compared to a traditional roof

Given the information at hand, the study found that expected total net benefits, after considering heating penalty costs, should range from $0.16 to $0.66/square foot (average $0.47/ft2) based on the California climate zones studied (see Table 3).

CURRENT REGULATIONS

The implementation of cool roofs is included in California Title 24 Building Energy Efficiency Standards. The 2008 update to these standards became effective in 2010. Title 24 sets an energy budget (in units of energy, not dollars) for new buildings as well as for additions and alterations. The budget varies by climate zone (Watsonville is located in Zone 3). Under Title 24, cool roofs are not mandatory, but they are part of the list or "prescription" of minimum levels of energy efficiency. Builders have different options to show that a building will meet or exceed the energy budget.

Table 1: Reported Cooling Energy Savings from Buildings with Cool Roofs[12]

Building	Location	Citation	Size (ft^2)	Roof Insulation*	Roof Space	Annual Cooling Saved	Peak Demand Savings
Residence	Merritt Island, FL	(Parker, D., S. Barkaszi, et al. 1994)	1,800	R-25	Attic	10%	23%
Convenience Retail	Austin, TX	(Konopacki, S. and H. Akbari 2001)	100,000	R-12	Plenum	11%	14%
Residence	Cocoa Beach, FL	(Parker, D., J. Cummings, et al. 1994)	1,795	R-11	Attic	25%	28%
Residence	Nobleton, FL	(Parker, D., S. Barkaszi, et al. 1994)	900	R-3	Attic	25%	30%
School Trailer	Volusia County, FL	(Callahan, M., D. Parker, et al. 2000)	1,440	R-11	None	33%	37%
School Trailer	Sacramento, CA	(Akbari, H., S. Bretz, et al. 1993)	960	R-19	None	34%	17%
Our Savior's School	Cocoa Beach, FL	(Parker, D., J. Sherwin, et al. 1996)	10,000	R-19	Attic	10%	35%
Residence	Cocoa Beach, FL	(Parker, D., J. Cummings, et al. 1994)	1,809	None	Attic	43%	38%
Residence	Sacramento, CA	(Akbari, H., S. Bretz, et al. 1993)	1,825	R-11	None	69%	32%

* Note: These insulation levels are lower than the energy efficiency levels recommended by ENERGY STAR. If insulation levels were higher, the cooling savings likely would be less.

Table 3: Example Cool Roof Cost/Benefit Summary for California[26]

California Climate Zone	Roof R-Value	Annual Energy/1000 ft^2			Peak Power/1000 ft^2		Net Present Value (NPV)/1000 ft^2			
		kWh	therm	Source MBTU	kW	$equip	$kWh	$therm	$energy	$total
1	19	115	-8.3	0.3	0.13	67	157	-62	95	162
2	19	295	-5.9	2.4	0.20	100	405	-43	362	462
3	19	184	-4.9	1.4	0.15	76	253	-35	218	294
4	19	246	-4.2	2.1	0.18	90	337	-31	306	396
5	19	193	-4.7	1.5	0.17	83	265	-35	230	313
6	11	388	-4.1	3.6	0.22	111	532	-29	503	614
7	11	313	-2.6	2.9	0.25	125	428	-20	408	533
8	11	413	-3.7	3.9	0.25	125	565	-28	537	662
9	11	402	-4.5	3.7	0.20	101	552	-33	519	620
10	19	340	-3.6	3.1	0.18	89	467	-26	441	530
11	19	268	-4.9	2.3	0.15	75	368	-37	331	406
12	19	286	-5.3	2.4	0.19	95	392	-39	353	448
13	19	351	-5.1	3.1	0.19	96	480	-37	443	539
14	19	352	-4.7	3.1	0.21	105	483	-33	450	555
15	19	380	-1.7	3.7	0.16	82	520	-13	507	589
16	19	233	-10.6	1.3	0.18	90	319	-78	242	332
min		115	-10.6	0.3	0.13	67	157	-78	95	162
max		413	-1.7	3.9	0.25	125	565	-13	537	662
avg		297	-4.9	2.6	0.19	94	408	-36	372	466

* This table presents dollar savings from reduced air conditioning use (in kWh) and reduced air conditioning equipment sizing ($equip), offset by natural gas heating penalty costs (measured in therms). The "Net Present Value (NPV)/1000 ft^2" column uses the kWh and therm information to project savings for energy only and in total (energy plus equipment).

Table 2: Comparison of Traditional and Cool Roof Options[23]

Warmer Roof Options				Cooler Roof Options			
Roof Type	Reflectance	Emittance	Cost ($/$ft^2$)	Roof Type	Reflectance	Emittance	Cost ($/$ft^2$)
Built-up Roof			**1.2-2.1**	**Built-up Roof**			**1.2-2.15**
With dark gravel	0.08-0.15	0.80-0.90		With white gravel	0.30-0.50	0.80-0.90	
With smooth asphalt surface	0.04-0.05	0.85-0.95		With gravel and cementitious coating	0.50-0.70	0.80-0.90	
With aluminum coating	0.25-0.60	0.20-0.50		Smooth surface with white roof coating	0.75-0.85	0.80-0.90	
Single-Ply Membrane			**1.0-2.0**	**Single-Ply Membrane**			**1.0-2.05**
Black (PVC)	0.04-0.05	0.80-0.90		White (PVC)	0.70-0.78	0.80-0.90	
				Color with cool pigments	0.40-0.60	0.80-0.90	
Modified Bitumen			**1.5-1.9**	**Modified Bitumen**			**1.5-1.95**
With mineral surface capsheet (SBS, APP)	0.10-0.20	0.80-0.90		White coating over a mineral surface (SBS, APP)	0.60-0.75	0.80-0.90	
Metal Roof			**1.8-3.7**	**Metal Roof**			**1.8-3.75**
Unpainted, corrugated	0.30-0.50	0.05-0.30		White painted	0.60-0.70	0.80-0.90	
Dark-painted, corrugated	0.05-0.08	0.80-0.90		Color with cool pigments	0.40-0.70	0.80-0.90	
Asphalt Shingle			**0.5-2.0**	**Asphalt Shingle**			**0.6-2.1**
Black or dark brown with conventional pigments	0.04-0.15	0.80-0.90		"White" (light gray)	0.25-0.27	0.80-0.90	
				Medium gray or brown with cool pigments	0.25-0.27	0.80-0.90	
Liquid Applied Coating			**0.5-0.7**	**Liquid Applied Coating**			**0.6-0.8**
Smooth black	0.04-0.05	0.80-0.90		Smooth white	0.70-0.85	0.80-0.90	
				Smooth, off-white	0.40-0.60	0.80-0.90	
				Rough white	0.50-0.60	0.80-0.90	
Concrete Tile			**1.0-6.0**	**Concrete Tile**			**1.0-6.0**
Dark color with conventional pigments	0.05-0.35	0.80-0.90		White	0.70	0.80-0.90	
				Color with cool pigments	0.40-0.50	0.80-0.90	
Clay Tile			**3.0-5.0**	**Clay Tile**			**3.0-5.0**
Dark color with conventional pigments	0.20	0.80-0.90		White	0.70	0.80-0.90	
				Terra cotta (unglazed red tile)	0.40	0.80-0.90	
				Color with cool pigments	0.40-0.60	0.80-0.90	
Wood Shake			**0.5-2.0**	**Wood Shake**			**0.5-2.0**
Painted dark color with conventional pigment	0.05-0.35	0.80-0.90		Bare	0.40-0.55	0.80-0.90	

Tables 8.1 - 8.3: Cool Roof Studies. Source: US EPA "Reducing Urban Heat Islands: Compendium of Strategies - Cool Roofs," 2008.

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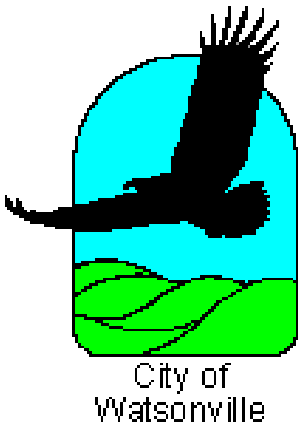
Community Gardens



City of Watsonville
Community Garden Program Guide

May 21, 2012

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Lowell Hurst, Councilman
Peter Howley, Gardener
Tony Rubio, Gardener
Ana Rasmussen, Mesa Verde Gardens
Jonathan Pilch, Watsonville Wetlands Watch
Michelle Templeton, City of Watsonville
Ana Espinosa, City of Watsonville
Ernest Contreras, City of Watsonville
David Rosenow, City of Watsonville

Table of Contents

1.0 Executive Summary

The Community Garden Program Guide is one component of the City of Watsonville Urban Greening Plan. The Urban Greening Plan is being developed under a grant from the Strategic Growth Council. Funding for the grant by the State of California Natural Resources Agency was approved with passage of Proposition 84, The Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coastal Protection Bond Act of 2006. The Urban Greening Plan will include a trails master plan, a street tree plan, a habitat restoration plan and guidelines for green roofs, landscaping and community gardens.

The goal of the Community Garden Program Guide is to provide a framework for creating and managing community gardens on City-owned property. The plan explores the context of community gardening and recommends how the City of Watsonville could work with community partners to promote the establishment and operation of community gardens. The Community Garden Program Guide can be modified and then used for management of community gardens by owners of other public as well as private property, such as schools and churches.

A “community garden” is typically defined as any land collectively gardened by a group of people, allowing individuals to grow food for themselves. Nationally, community gardening has been recognized for its many benefits, such as promoting healthy eating, providing outdoor recreation and building vibrant communities. In our region, community gardening has shown strong demand in recent years, as evidenced by the growth of formal and informal local groups promoting gardening and healthy food choices.

The development of this document involved representatives from multiple City of Watsonville departments, including Public Works and Utilities, Parks and Community Services and Community Development, as well as representatives from community gardening groups, and gardening enthusiasts, among others. This group became known as the Community Garden Working Group.

In the process of developing this plan, the group studied other community garden program models and identified potential garden sites on City-owned parcels as well as at churches, schools and other properties. They identified six existing community gardens in the city. Three of the gardens on church property, are open to the public. Three additional gardens are restricted to residents of homeowner’s associations or apartment complexes.

This plan recognizes that City of Watsonville has very limited resources to advance a community garden program at this time, and as such, recommends a program model that leverages the City’s expertise and other potential non-financial contributions. The recommended program model relies upon groups of neighbors, community-based organizations and other entities to establish, manage, and sustain the garden sites. The City’s limited role would involve coordinating use agreements and helping to connect interested parties with existing community garden groups and potential garden sites.

2.0 Background and Context

2.1 Purpose and Scope

The City of Watsonville Community Garden Program Guide is an plan that explores the context of community gardening and recommends how the City of Watsonville could work with community partners to promote the establishment and operation of community gardens on City of Watsonville-owned properties. The Program Guide also may be modified and used by churches, schools, other public agencies and private property owners for management of community gardens on their property.

The plan describes the roles and responsibilities the City of Watsonville would have in a community gardens program. This plan recognizes that City of Watsonville has very limited resources to advance a community garden program, and as such, recommends a program model that leverages the City's expertise and other potential non-financial contributions. The proposed plan recommends a program limited to low-cost or no-cost ways the City can advance community gardening throughout the community. The City's limited role would involve making vacant or unused property available for community gardens, coordinating use agreements and helping to connect interested parties with existing community garden groups and potential garden sites. The City would monitor gardens on City property to ensure compliance with the rules and guidelines contained in the Community Garden Program Guide.

Establishing community gardens is consistent with *Chapter 8 of the General Plan (Parks & Recreation) Section 8.0.10 Community Gardens - Consider Implementation of a Community Garden Program, Undeveloped land that is being held for future use by the City is on example of land that could be used for community gardens.* This program is also consistent with the *City's Strategic Plan, specifically Goal IV Safe and Healthy Community, Objective 3 Healthy Community*.

2.2 Value of Community Gardens

Community gardens provide people a place to grow produce or other crops for their own use on land that may be owned by the City, other local government agencies, non-profit associations or private owners. They may be divided into individual plots or tended in a communal fashion and are managed and maintained with the active participation of the gardeners themselves rather than tended only by a professional staff.

The American Community Gardening Association lists several potential benefits from community gardening:

- Produces nutritious food
- Reduces family food budgets
- Improves the quality of life for people in the garden
- Creates opportunity for recreation, exercise, therapy, and education
- Provides a catalyst for neighborhood and community development
- Stimulates social interaction
- Encourages self-reliance
- Beautifies neighborhoods, develops neighborhood pride
- Conserves resources
- Reduces crime
- Preserves green space
- Reduces city heat from streets and parking lots
- Provides opportunities for intergenerational and cross-cultural connections

A literature review examined relevant materials for scientific and epidemiologic evidence related to community gardens and positive impacts upon the public health. The most prominent findings from the articles showed evidence of increased fruit and vegetable consumption and increased physical activity among community gardeners. Other articles pointed out benefits such as community cohesiveness and individual feelings of well-being.

2.3 How the Plan Was Developed

The Community Garden Program Guide was developed by multiple City departments, including Public Works and Utilities, Parks and Community Services and Community Development as well as representatives from community gardening groups and gardening enthusiasts. This group became known as the Community Garden Working Group. A list of members of the Garden Working Group is shown below in Table 1.

Table 1. Community Garden Working Group

Lowell Hurst	Council Member, City of Watsonville
Peter Howley	Gardener
Tony Rubio	Gardener
Ana Rasmussen	Mesa Verde Gardens
Jonathan Pilch	Restoration Director, Watsonville Wetlands Watch
Ana Espinosa	Director, Parks & Community Services, City of Watsonville
Ernest Contreras	Parks Services Manager, City of Watsonville
Bob Geyer	Assistant Director, Public Works/Utilities Department
Michelle Templeton	Environmental Education Coordinator, City of Watsonville
Nancy Lockwood	Environmental Programs Manager, City of Watsonville

The group met regularly beginning in May 2011 and carried out the following activities:

- Conducted a literature review of the nexus of public health benefits of community gardens
- Studied program models for operating community garden programs
- Visited existing and potential garden sites in the City
- Refined lists and maps of potential garden sites on City of Watsonville-owned properties and other privately-owned sites
- Consulted with community garden stakeholders, including representatives from community gardening groups and gardening enthusiasts
- Drafted the Community Garden Program Guide

The group evaluated a total of 37 possible garden locations. This included 19 possible garden locations on City-owned property. They also looked at 18 locations on church and other private properties. After investigating the properties the list was narrowed down to 11 potentially suitable locations for community gardens. (See Appendix A10) The sites that were eliminated were found to be inappropriate for a community garden due to factors such as inadequate size, steep slopes and other factors outlined herein in Section 6, Site Selection Criteria.

Discussions with the Pajaro Valley Unified School District have begun and are continuing, in order to determine if the District would support locating community gardens on school property. It was beyond the scope of this plan development to evaluate every potential site in the City. City-owned land was thoroughly evaluated but it is anticipated that in the future, as interest increases, many more suitable garden sites will be identified on property owned by schools, churches, businesses and private individuals.

The Working Group also identified three existing community gardens in the City that are open to the public and three gardens that are reserved for use by members of a homeowner's association or tenants of apartment complexes.

3.0 Recommendations

The Community Garden Working Group recommends that City of Watsonville take specific initial steps that would immediately promote community gardening on City-owned land. The City should also continue to monitor community gardening efforts in and around City of Watsonville, as well as remain engaged in the on-going developments in community gardening.

In the immediate near-term, The City could launch a community garden program in a way that empowers user groups to establish, manage, and sustain garden sites on City owned land without resulting in significant new publicly-funded capital investments or ongoing maintenance responsibilities. The City Community Garden Program would follow a strategy that would make City-owned land available to interested groups who demonstrate capacity to manage all aspects of day-to-day operation of a community garden.

This model enables established organizations as well as newly-formed gardening groups to access sites on City-owned properties. Under such a model, the City would play a limited role that:

- Identifies City-owned properties with garden potential
- Disseminates information about opportunities for community gardening throughout the City.
- Facilitates partnerships among non-profit organizations, community groups and other agencies
- Assesses and responds to proposals from residents for use of City property for gardens
- Administers use agreements and Garden Plot Agreement /Liability Waivers with approved gardens on City Property and gardeners using these gardens
- Monitors gardens on City property to ensure compliance with the rules contained in the Community Garden Program Guide

4.0 Definitions

- **City** – City of Watsonville or its representative.
- **Communal Plot**–undivided gardening space for cultivating vegetables, fruits and ornamentals by gardeners as a group
- **Ornamental** – plants that are grown for decorative purposes in gardens for cut flowers and specimen display.
- **Community Garden** – a site operated and maintained by committed volunteers where a parcel of land is used for growing produce and/or ornamentals for non-commercial use through individual or shared plots, and demonstration gardening or other instructional programming may be offered, and shared tools and common expenses are covered through the collection of membership fees and/or donations
- **Common Area** – a space within the community garden that is accessible by all gardeners and visitors such a pathways and areas for materials storage
- **Community Garden Plot Agreement and Liability Waiver** – the document signed by each participating gardener on City property that contains rights, rules. Responsibilities of each gardener and contains a release of liability clause
- **Community Garden Site Agreement –** the agreement between the elected Garden Coordinator and the City allowing the use of designated City property for a community garden as per the City's Community Garden Program Guide
- **Disability Access** – barrier-free accommodations for persons with a diversity of abilities.
- **Garden Coordinator** – a community gardener who is elected by the garden members to perform the coordinating role for the management of a specific community garden and who is the primary contact with the City
- **Garden Member** – a regular participant in a community garden who has signed a garden plot agreement specifying conditions for membership (see "Membership")
- **Garden Plot** - allocated gardening spaces for cultivating vegetables, fruits and ornamentals.
- **Hazardous Materials** – any material that, because of its quantity, concentration, or physical or chemical characteristics, poses a significant present or potential hazard to human health and safety or to the environment if released.
- **Irrigation** – the artificial means of supplying water to plants

- **Invasive Species** – plants listed in Appendix A9 may not be planted in City-owned community gardens
- **Maintenance** – the practice of keeping the garden safe for public use and in a usable and aesthetically-pleasing condition.
- **Membership** – the privilege conferred upon an individual to participate in the community garden after signing the Community Garden Plot Agreement.
- **Organic Gardening** – the form of agriculture that relies on techniques such as crop rotation, green manure, compost and biological pest control. Organic gardening uses fertilizers and pesticides but excludes the use of manufactured (synthetic) fertilizers, pesticides (including herbicides, insecticides and fungicides), plant growth regulators, sludge and nanomaterials. To see if a substance is allowed in a community garden on City property, check the USDA National Organic Program National List, Subpart G, 205.601 and 205.602. Also look for the Organics Materials Review Institute (OMRI) seal on product labels before use in a community garden on City property. Labeling such as "Organic" or "Natural" in not adequate for determination of organic designation.
- **Plot** – see "garden plot".
- **Program Manager** – the City's representative who manages its Community Garden Program.
- **Prohibited Plants** – marijuana, including medical marijuana may not be grown in City-owned community gardens
- **Waste Removal** – removal of excessive vegetation and/or solid-waste (organic, inorganic or hazardous) accumulation from a garden.

5.0 Starting a Garden

If community members wish to start a community garden on City-owned property, they need to submit a petition to the City's Community Garden Program Manager requesting use of a specific location to be used for a community garden. The signatures on the petition must represent at least five separate households that wish to participate in the proposed garden location. The petition and proposed site shall be evaluated using the site selection criteria contained herein. If the site is deemed adequate, the Community Garden Program Manager shall arrange for a neighborhood meeting in the area of the proposed garden to solicit public input. Following the neighborhood meeting, the proposed garden location will be presented to the Parks & Recreation Commission for their consideration. The decision of the Parks & Recreation Commission may be appealed to the City Council. Anyone wanting to appeal the Parks & Recreation Commission decision must notify the Garden Program Manager within 7 calendar days of the decision of the Commission. The Garden Program Manager will then place the item on the first available City Council meeting for the Council to consider the appeal.

Upon approval by the City of the proposed garden site, the interested parties must form a garden group and elect a Garden Coordinator. The City shall, issue and the Garden Coordinator shall sign a Community Garden Site Permit (See Appendix A1) which officially permits the use of the site for a community garden. The Garden Site Permit needs to be renewed on a yearly basis and renewal is contingent on compliance with this Community Garden Program Guide as well as other City considerations and priorities. The City does not guaranty the long term use of this property for a community garden. The City may elect not to renew the permit at the end of the term. The City has

the right to determine the appropriate use of property it owns. At such time as the garden members at this site elect a new Garden Coordinator, the permit is terminated and the new Garden Coordinator must sign a new Garden Site Permit.

5.1 Site Map

Prior to approval for a City owned property to be used as a community garden, community members wishing to start a community garden on City property shall submit to the City a site map which identifies the following features:

- Identifies boundaries of the garden
- identifies how the property will drain during a storm event
- Identifies a simple plan for storm water pollution prevention and run-off prevention which may include but is not limited to buffer plantings, winter cover crops, mulching paths in winter months and erosion control measures such as installation of biodegradable straw waddles, hay bales or siltation fencing.
- Identifies any natural features within the garden or in the vicinity of the garden which should be protected.
- Identifies setbacks from City trails of at least 6 feet, and sufficient space for public right-of-way and maintenance which will be determined on a case by case basis.

5.2 Community Gardens on City-Owned Property

Community members may obtain a list of existing and potential future garden sites by contacting the City's Community Garden Program Manager. Phone and other contact information is included in Appendix A8 and is also found on the City of Watsonville website at www.cityofwatsonville.org

5.3 Access Strategies

Community gardens located on public property must be accessible to all. Individual community gardens may request restricted access based on unique conditions that shall be evaluated on a case-by-case basis, subject to approval by the City. Gardens with restricted access shall prepare a program of scheduled public access that includes one or more opportunities for general public access, subject to approval by the City. Each community garden shall allow for regular hours of public access with a minimum of weekly hours of access. The hours of public access shall be posted in English and Spanish in a location visible to the public. All opportunities for public access shall be posted publicly at the garden at least a week in advance. The Garden Coordinator must provide the City's Community Garden Program Manager with the schedule so it may be posted on the City's website.

The following suggested strategies promote public access to gardens that normally allow access to members only. The use of more than one strategy is encouraged.

Access strategies may include:

- Open the gates to the garden when 2 or more garden members are present.
- Schedule public visits for the first Saturday of each month for 4 hours.
- Participate in a City-wide, "open-garden day" event.
- Annual events inviting neighbors and community at large to the site.

6.0 Site Selection Criteria

The following criteria will be used to evaluate establishing a community garden on City-owned property.

6.1 Location

Community gardens are an acceptable use of land inside City parks, vacant or underused City property, and property owned or formerly owned by the Redevelopment Agency. Community gardens are also acceptable use of private property including but not limited to schools, businesses and churches. Whenever possible, the garden should be located as close as possible to the residences of the community members desiring to start a garden.

6.2 Adequate Space

Each garden plot should be a minimum of 24 square feet per garden participant.

6.3 Sunlight

The garden should have an open south face to maximize the plants access to sun. Vegetables need, at bare minimum, of six hours of sunlight a day.

6.4 Soil

If the site proposed will be an in-ground garden, the City shall have the soil tested for heavy metals and pesticides and determined to be safe for growing vegetables. The City shall also test to determine the best way to amend the soil to encourage the healthiest crops possible. Soil testing is not required for raised bed gardens that will use soil imported to the site from a reputable landscape supply company or similar reliable source.

6.5 Water

City water must be readily available nearby to irrigate the garden.

6.6 Compost Space

Composting is an essential part of gardening. The potential site must have designated space for a compost pile or bins in the garden area.

6.7 Visibility From Neighboring Residences

Easy visual access from the surrounding neighborhood is the best way to prevent crime and vandalism in gardens.

6.8 Accessibility for Mobility Impaired Persons

It is preferable to place gardens in places that can easily be accessed by handicapped and elderly gardeners. Steep slopes and long walks from access points should be avoided.

6.9 Resource Conservation

Each proposed garden location presents a unique set of attributes that will be evaluated by City staff in order to ensure that the garden does not cause negative impacts to its surrounding environment.

- The site may not disturb or destroy existing native natural habitats such as native trees, riparian, wetland or valuable native grassland habitat.

- Gardens shall not result in any water quality impairment and should be located 125 feet or more from the edge of the water of wetlands, creeks, the Pajaro River or other bodies of water.
- The planting surface of gardens should be relatively flat ground with little grade so as to prevent erosion and storm water pollution.

7.0 Community Garden Guidelines and Policies

The intent of the following policies is to provide an approved framework for the City and residents to use in the coordination and management of community gardens on public property. All activities related to community gardening shall be conducted without discrimination against any person on grounds of race, creed, religion, color. sex, age, national origin, disability, marital status, or sexual orientation.

8.0 Garden Components

8.1 Construction and Installation of Garden Elements

Guidelines:

Community gardens on City-owned property are public spaces and should be designed and built with the public's safety in mind. For this reason, structural garden elements which a person may sit on, stand on, walk under, or crawl under shall be constructed in a safe manner and only with prior permission of the City. Infrastructure regulated by municipal codes shall be installed per said codes.

Policies:

- Construction or installation of fences, gates, tool sheds, steps, shade trellis, benches, potting tables, etc. must receive prior approval by the City's Community Garden Coordinator and in some cases shall be required to meet City building codes. Qualifications for the construction or installation of a garden element will be at the City's discretion.
- A qualified contractor proposing to perform work in a community garden must provide proof of the proper license and liability insurance to the City for approval prior to any construction or installation activity.
- Caution must be taken when digging in the garden. The Public Works and Utilities Department must be contacted for location of any existing utilities if gardeners intend to dig deeper than 12" below the existing garden grade.

8.2 Garden Plots

Guidelines:

Garden plots are allocated gardening spaces for cultivating vegetables, fruits and ornamentals. These should be located in areas receiving adequate sunlight. Plots should be uniform and reasonable in size to optimize opportunities for participation.

Policies:

- Plots should be a minimum of 4 x 6 square feet the largest plot shall not be more than two times the size of the smallest plot within the same garden.
- Wheelchair-accessible plots are excluded from the plot size requirements due to their unique design requirements. Plots may be level with the ground or in a raised

container. Wheelchair accessible plots should be designed according to accessibility standards.
- Plots should be visibly defined, such as withstakes or redwood or plastic headers.
- Pressure-treated lumber is prohibited, since the chemical preservative can leach into the soil.
- Non-compliant garden plots are permitted to remain until the plot is reassigned to a new garden member at which time the plot must be modified to conform to these policies.

8.3 Tool Shed and Storage Chests

Guidelines:

A tool shed or storage chest may be installed to store equipment shared by the garden members to accommodate garden tools and supplies. Sheds and chests should be sturdy and lockable to prevent theft and vandalism.

Policies:

- Tool sheds must not exceed 120 square feet in size. Proposed sheds must be approved by the City for aesthetics, size and safety.
- All tools and materials stored within the community garden shall be shared for use by all gardeners and may not be taken out of the community garden.
- Community garden tool and storage sheds may not be used for private storage.

8.4 Compost Bins

Guidelines:

Compost bins and enclosures are used to promote decomposition of organic garden waste. A system of compost bins and/or enclosures should be in place to facilitate stages of decomposition and to minimize the need to haul garden waste to recycling facilities. For residential compost bins and composting instructions, contact the City of Watsonville Public Works and Utilities.

Policies:

- Avoid locating compost bins adjacent to a main pedestrian pathway.
- Gardeners shall manage composting garden waste in a manner that minimizes odor and pests.
- Gardeners should avoid placement of diseased plant material in composting bins or enclosures.
- Pressure-treated lumber is prohibited since chemical preservatives may leach into the decomposing compost.
- No waste from outside the community garden is permitted.

8.5 Pathways

Guidelines:

Pathways determine the circulation into and within the garden. Pathway construction should be low maintenance. The selection of paving materials should allow for wheelchair access where feasible. Not all paths need be designed for wheelchair access. Bark/wood chip mulch on pathways suppresses weedy growth, retains moisture and returns nutrients to the soil through decomposition.

Policies:

- Pathways will be kept clear of weeds, tools and other debris.
- Wheelchair accessible paths must comply with Title 24 of the California Building Code and the Americans with Disabilities Act (ADA) for all new construction and renovations.

8.6 Fences, Gates and Security

Guidelines:

Community gardens on public property are unstaffed public facilities used largely by garden members. As a public facility, the general public is permitted access to community gardens for their enjoyment. Fencing may be required for gardens on City property for safety reasons or to separate the garden from other activities. Installation of fencing with lockable gates may be evaluated on a case-by-case basis.

Policies:

- Fences must meet City building code requirements. Proposed fences must be reviewed by the City for aesthetics, size and safety.
- Should fencing be required or desired, the members of a community garden must provide all materials and labor including any permitting fees that may be required by the City. No pressure treated lumber is to be used for fencing.
- Gardens with restricted access must comply with the Access Strategies contained herein.

8.7 Bulletin and Message Boards

Guidelines:

Bulletin and message boards promote the sense of community through the sharing of information between garden members and with the general public. Bulletin boards should have a portion that is reserved for official garden information only and should be located in a high visibility area.

Policies:

- Gardens on City property shall have a bulletin board that provides the name of the garden and contact information for the garden coordinator or designee.
- General community announcements are permitted. A summary of the garden rules should be posted.
- Any postings that are discriminatory or offensive in nature are not permitted.
- Postings in gardens on City property shall be in both English and Spanish.
- Advertizing is prohibited.

8.8 Signage

Guidelines:

Signage includes identification, informational and way-finding means. Each community garden should be identifiable with standard and recognizable signage. Other signage common to parks and community gardens should be standardized to minimize visual clutter.

Policies:

- Each garden shall have a sign identifying it by name. Garden names on City property must be reviewed and approved by the City prior to any usage.
- Signage visible from a public street shall meet the requirements of the City's sign ordinance.
- Design, content and location of signs that fall under the City's sign ordinance must be reviewed and approved by the City prior to placement.
- Fabrication and installation of signs are the responsibility of the garden members.
- Community gardeners may fabricate their own signs inside the garden area to label garden elements (e.g., "tool shed", "greenhouse" etc.) or standard warnings (e.g., "stay on path", "do not pick the flowers", etc.). These signs shall be visually compatible with the garden environment.

8.9 Maintenance and Repair of Garden and Garden Elements

Guidelines

Proper maintenance of the garden will result in more successful harvests, a more aesthetically-appealing garden site and neighborhood harmony. Maintenance of the garden elements will increase their useful life and result in a more pleasant experience for gardeners and visitors. Certain garden features may need repair from time to time due to normal wear and tear.

Policies

- Each garden member is responsible for the maintenance of his/her assigned plot
- Each garden member shall participate in the ongoing maintenance of common areas within and around the garden site including but not limited to the duties listed in their respective Community Garden Plot Agreement.

9.0 Organizational Structure

9.1 Governance Structure

Guidelines:

There are a several basic organizational needs that must be met on the part of the participants to ensure the overall success of the garden. The three main components necessary for community garden success are:

- **Passion**
  Is the organization or neighborhood supporting the site passionate about gardening? Are the members committed to the mission of growing fresh, healthy, local food?
- **Volunteer Commitment**
  Does the organization have a volunteer base willing to do the garden maintenance work? Do they have a plan for organizing and maintaining volunteer involvement? T
- **Knowledge**
  Is there anyone within the group with experience in gardening or farming? This is not absolutely necessary as many resources exist in the community.

Policies:

- The City will require a designated contact person for each garden located on City-owned property. This contact person will be the Garden Coordinator. The Garden Coordinator's role is one of communication and facilitation.
- The Garden Coordinator is selected by the garden members by a majority vote on an annual basis using direct democracy (one gardener, one vote).
- The duties of the Garden Coordinator include:
    1. Sign the Community Garden Permit.
    2. Collect signed Community Garden Plot Agreements and Waiver of Liability forms from all gardeners and provide a signed copy to the gardener with the Garden Rules.
    3. Forward completed Plot Agreements with original signatures to the City's Community Garden Program Manager.
    4. Assign plots on first come, first serve basis.
    5. Maintain a waiting list of interested gardeners.
    6. Re-assign plots to those on the waiting list in the order they appear on the waiting list .
    7. Orient new gardeners to the space; i.e., explain water use, communal space use, workday expectations, etc.
    8. Post garden rules and other documentation on the bulletin board in the garden.
    9. Maintain a list of all active gardeners.
    10. Notify gardeners using plots that appear to be inactive and contact the gardener regarding the status of the plot.
    11. Coordinate garden workdays to maintain the communal spaces or to work on special projects.
    12. Call garden-wide meetings at least twice a year for the purpose of discussing issues, sharing ideas and goals, holding annual election of the Garden Coordinator position, conducting workdays, etc. Any meeting that provides advance notification to all of its members is considered a "garden-wide meeting".
    13. Collect garden dues from members that may be used for water, supplies, tools, events, or special projects decided upon by the membership.
    14. Communicate with the City as the primary contact for the garden membership.
    15. Facilitate the garden membership in electing or appointing other positions, such as treasurer, secretary, or an events chair to share some of the responsibilities. Other leadership roles for the garden may include: membership & outreach coordination, meeting and workday coordination, and common space coordination.
    16. Operate the garden in a manner free from discrimination against any person on grounds of race, creed, religion, color. sex, age, national origin, disability, marital status, or sexual orientation.
    17. Sign up for water and pay water bill.

- Garden members shall by consensus (general agreement or majority vote):
    1. Create rules for fair and safe on-going operation of the garden, as needed to supplement the rules provided herein by the City.
    2. Designate treasurer who shall collect dues and pay bills for water and any materials or services jointly purchased by the garden members.

3. Institute a means of keeping common areas, the paths between plots, outside of fences that surround the garden, etc. in a safe and tidy condition.
4. Decide on interim use and upkeep for vacant plots until a new garden member is assigned to that plot.
5. Establish a system for informing gardeners when there is information that they need to know or tasks they need to do, making sure that all gardeners have access to this information.

9.2 Community Garden Plot Agreement and Waiver of Liability

Guidelines:

Each garden member is to execute a Plot Agreement and Waiver of Liability as an indication that the member understands his/her rights and responsibilities to the community garden. The required Plot Agreement and Waiver of Liability is included in Appendix A2

Policies:

- Membership to a community garden and the opportunity to garden on City-owned property is open to all City of Watsonville residents.
- Each garden shall submit to the City a *Community Gardener Plot Agreement and Waiver of Liability*, which specify conditions for active membership. Members are required to sign the Agreement indicating their intent to comply.
- It is up to the collective body of gardeners within each garden to establish any dues structure they believe is needed to operate the garden.
- To optimize opportunities for participation, the City is limiting each household to one plot only. More than one person may be assigned the same plot.
- All gardens must maintain an active wait list. Assignment of garden plots must be made from a wait list on a first-come, first serve basis. The updated wait list should be posted at the garden. The waitlist may also be posted on the garden's website if available. (See Appendix A5) for a sample Wait List.
- Membership can be revoked for non-compliance with the Community Gardener Plot Agreement. If active membership conditions are not being met, then the Garden Coordinator may call to find out the status of the plot and the intent of the gardener. If the membership conditions are still not being met, then the Garden Coordinator may proceed with a 30-day written notice to non-performing garden member(s). If the non-performing gardener does not respond within the 30-day period, then that membership is considered revoked and the plot shall be reassigned to the next person on the waiting list. See Appendix A3 for sample letter.

9.3 Waiver of Liability

Guidelines:

By signing the waiver, each participant acknowledges the risks involved by participating in the activity and that the participant is responsible for his/her own actions. This protects both the public's interest and the community gardener.

Policies:

- Each garden member is required to sign the City's liability waiver which is included

in the Community Garden Plot Agreement and Waiver of Liability prior to conducting any gardening activity on City-owned property. The garden coordinator shall collect signed liability waivers from the community garden members and forward them to the City's Community Garden Program Manager.

- All persons invited to share a plot must also sign this Agreement. Garden Coordinator approval is required for adding someone such as a spouse, partner or housemate residing at your address to your plot at any time.
- Garden members shall ensure a safe environment for each other and for visitors to the garden. Visitors to community gardens are not required to sign the City's liability waiver.

9.4 Conflict Resolution

Guidelines:

Internal or external conflicts may arise that cannot be readily addressed and may undermine the function of the garden. Such situations may be resolved through careful adherence to the policies contained herein. Some community gardens may establish a more formal organizational structure, by-laws and additional rules for the garden through a democratic process to resolve and avoid conflict.

Policies:

- Establish ground rules at the start of every meeting to promote respect for each participant. All parties involved must be given an opportunity to provide input at a public forum. If necessary, a neutral person may be invited to conduct the meeting.
- Establish a committee of garden members to enforce rules, alleviating the burden on any one member.
- Utilize mediation resources, such as Santa Cruz County Conflict Resolution Program if conflicts are not resolved.
- If the above strategies do not allow the group to reach resolution, the City is available for support and consultation with garden members, and may intervene when necessary to resolve issues regarding community gardens on City property.

9.5 Fundraising

Guidelines:

Community gardeners may choose to fundraise for their community garden. Proceeds may offset garden expenses to fund unique elements for the garden (such as garden furnishings, bee hives, etc.) or be donated to the City for improvements (such as for the purchase and installation of a bench). In-kind gifts or services may also be donated to a community garden. Fundraising activities on City property, gifts or in-kind donations will require approval or acceptance by the City.

Policies:

- Generally donated garden supplies (hoses, shovels, plants, etc) may be accepted by the community garden without the City's formal approval.
- Permanent fixtures (benches, decorative mosaic tiles, commemorative plaques, etc.) do require City acceptance prior to installation.
- These policies do not apply to the collection of garden dues established by the community garden members.

9.6 Disorderly Conduct

Policy:

- Inappropriate behavior, such as removing fruits or vegetables from garden plots not one's own designated plot, or vandalism in the garden could lead to cancellation of membership in the community garden.
- Gardeners are welcome to bring their children into the garden. Children should be taught the rules of the garden and supervised at all times.

9.7 Neighborhood Involvement and Program Partnerships

Guidelines:

A community garden group may involve schools, neighborhood organizations, service providers, or other non-profits organizations to offer increased access to the garden, enrich programming opportunities and increase resources for maintenance and garden supplies.

Policies:

Partnership opportunities permitted in community gardens include but are not limited to:

- Programs that are integrated with the garden, such as to teach children to garden and then to cook with ingredients that are harvested.
- Programs developed and offered by the community garden in which the community or a partner is educated about an aspect of gardening and best practices, either on- or off-site.
- Occasions on which the public is invited to the garden for celebration, harvest, work or education.
- Outreach to neighbors about the activities and events in the community garden. This can be achieved through mass mailings, flyers delivered door-to-door and public postings.

10.0 Garden Operations

10.1 Active Gardening

Guidelines:

To properly care for the land, active year-round gardening and care of the soil are required. Gardeners are responsible for keeping their plot and the paths surrounding their plot clean and free of weeds. If active gardening is not occurring and the plot is neglected, the Garden Coordinator shall contact the gardener to clarify whether or not they intend to keep gardening or if the plot can be assigned to the next person on the waiting list.

Policies:

- When a plot has been neglected, the Garden Coordinator shall notify non-active gardener with a verbal, telephone or email warning. If active gardening does not resume within 15 days, or the gardener has not responded to messages from the Garden Coordinator, or the garden member is not reachable, then the Garden Coordinator shall issue a written 30-day notice (See Appendix A3) to resume garden activity. If gardening has not resumed by the end of the 30 Day Notice, the member's gardening privileges will be terminated. The plot may be assigned to the next person on the waiting list.

- No garden member may transfer their plot to anyone else.
- In case of illness, pregnancy, travel, etc., gardeners should inform the Garden Coordinator. Either party may find a temporary person to garden during the absence; this person must sign a temporary agreement which will be valid for no more than 90 days.
- Gardens shall either plant crops year-round or plant a cover crop in the winter to prevent erosion and enrich the soil.

10.2 Harvesting

Guidelines:

Gardeners should harvest from their own garden plots. Produce sharing between gardeners is welcome with prior consent of the garden plot holder.

Policies:

- No member may remove from or harvest from any garden plot without permission. The unauthorized taking of produce from another gardener's plot will result in the removal of your gardening privileges.

10.3 Maintenance

Guidelines:

Day-to-day maintenance is the responsibility of the community gardeners. Maintenance should include the ongoing efforts to control weeds, maintain healthy plants and trees, remove dead or diseased growth, keep shared garden resources neat and orderly, preserve natural resources and reduce pests.

Policies:

- The community garden site and surrounding area shall be maintained for safe public use at all times.
- Garden members shall be primarily responsible for their individually assigned plots, unless a temporary maintenance arrangement is made in conformance with the Community Garden Agreement while the individual is on vacation or ill. The Community Garden Plot Agreement includes a provision for a temporary transfer of maintenance responsibilities to another person in order to accommodate periods of illness, pregnancy, travel, etc.
- Common areas are to be the shared responsibility of all garden members.
- Any graffiti shall be removed within 24 hours by the garden members.
- Each gardener shall maintain their assigned plot within its confines without plants encroaching into common areas or other plots. No plants may be higher than 6 feet over soil level in plots except in agreed-upon communal planting areas. Beds may not be raised higher than 3 feet except in cases of access for disabled persons. No altering of the dimensions of a plot or of the surrounding area is allowed.

10.4 Water Service and Other Utilities

Guidelines:

The City will supply a new water meter and backflow prevention device for the garden site. Each garden shall pay for the monthly cost of water used at the garden. Gardeners should avoid damage to water lines and other underground utilities. The land used for a community garden may contain underground utilities, including water, electrical, gas,

telephone, cable and sewer lines. Gardeners must take special care when digging in the garden, particularly at depths exceeding 12".

Policies:

- The City shall bill the Garden Coordinator for the cost of water used by the community garden. The Garden Coordinator shall collect dues from members as needed to cover the cost of water.
- Plants must be hand-watered or irrigated early in the day or late evening to minimize water loss due to evaporation.
- Use of a minimum 2" depth of mulch is recommended (bark, straw, compost, etc.) to prevent soil erosion, minimize evaporation, reduce soil compaction and moderate temperatures for plant roots
- Contact the City Department of Public Works and Utilities to locate underground utilities prior to projects that require digging, particularly at depths exceeding 12".

10.5 Irrigation and Water

Guidelines:

Irrigation is the artificial means of supplying water to plants. In community gardens, irrigation is typically achieved through careful hand watering with a hose or installation of drip irrigation. Hose bibs should be located to permit a hose to reach all plots.

Policies:

- The City shall provide a water service accessible to community gardens on City property. The City shall assess fees for water usage to be paid by the Garden Coordinator on behalf of the community garden.
- Drip irrigation tubing may be installed by the gardeners and is recommended as a water conservation strategy. Any alterations to the irrigation system must be approved by the Garden Coordinator. No major alterations can be made to the irrigation system on Fridays, Saturdays, Sundays, or holidays because of the risk of an damage and the limited availability of City staff during these times. In the event of an irrigation emergency, contact the Garden Coordinator or County Dispatch at 471-1151. Any alterations to the MAIN irrigation line are prohibited.
- Community gardeners must use water in a manner that prevents waste and run-off. Gardeners shall use the minimum water necessary for successful plant growth. Chronic waste of water may result in the water being shut off by the City.
- Be mindful of water usage when planting. Gardens shall be managed for best practices in water conservation (e.g., drip irrigation, time of watering, clustering like plantings in zones). Ornamental plantings should be targeted to drought tolerate species.
- An automatic shutoff nozzle must be used on any hose in the garden.

10.6 Resource Conservation

Guidelines:

Community gardens should exercise best practices for water conservation,watershed protection, erosion prevention, energy efficiency, composting and waste reduction.

Policies:

- Gardens shall be managed for best practices in water conservation (e.g., drip irrigation, watering early or late in the day, clustering like plantings in

zones).Ornamental plantings should be targeted to drought-resistant species.

- Garden waste shall be composted on site or hauled to the City's Waste and Recycling drop off.
- All recyclable materials such as wood, metals, plastic, paper, cardboard, bottles and cans shall be recycled.
- Diseased plant material shall be disposed of in the garbage.
- Best practices for storm water pollution prevention shall be implemented, such as the use of hay bales and straw wattles to prevent runoff from the garden into storm drains or off the site.
- Due to their impact on native habitat, invasive species may not be planted within or around a community garden. An invasive plant list is provided in Appendix A9.
- Because of the uniqueness and importance of the natural habitats of the Pajaro Valley, community gardens should strive to increase the natural habitats of an area and can do so by planting native trees or plants within the garden setting, such as native plant hedgerows, pollinator plantings, or shade trees. Proposals for such plantings require prior approval by the City.

10.7 Invasive and Prohibited Plants

Guidelines:

Invasive species are one of the greatest threats to biodiversity worldwide, second only to habitat destruction. Most of the plants used in gardens and landscaping do not invade or harm wildland areas. But a few vigorous species can — and do — escape into open landscapes and cause a variety of ecological problems. They displace native plants and wildlife, increase wildfire and flood danger and clog valuable waterways. Prevention is the most effective and resource-efficient way to combat the spread of invasive plants.

Policies:

- Invasive species such as blackberry and bamboo are prohibited. For a complete listing of invasive plants (See Appendix A9).
- Marijuana, including medical marijuana, may not be grown on City-owned property.

10.8 Organic Garden Methods, Supplies and Materials

Guidelines:

- For the protection of gardeners, visitors and the environment, all materials used for the purpose of gardening on City property must be organic as defined herein.

Policies:

- Non-organic pesticides and fertilizers are prohibited including but not limited to ammonium sulfate, muriate of potash, super-phosphate, highly soluble chemical fertilizers, rotenone, pyrethrum, sevin, malathion, diazinon, nicotine sulfate.
- No herbicides or pesticides may be used, except for organic substances approved by the U.S. Department of Agriculture's National Organic Program or by ORMI. To see if a substance is allowed, check the USDA National Organic Program's National List, Subpart G, 205.601 and 205.602 or look for the Organic Materials Review Institute (OMRI) seal on the label. ORMI is a non-profit that determines which products are allowed for use in organic production and is generally compatible with the USDA organic program. OMRI's website has a user-friendly search feature.

Products simply labeled "Organic" or "Natural" are not allowed unless they meet the USDA or ORMI approval.

- Homemade pest control methods are allowed, including but not limited to soap sprays, sulfur, traps, wood ashes, pepper and onion spray, netting and similar materials.
- Care must be taken to avoid entanglement by birds, snakes and other wildlife in any netting used in the garden.
- Use of wood treated with preservatives in not allowed.
- Organic fertilizers are allowed including but not limited to cottonseed, blood, bone, horn and hoof meals, manure, compost, liquid fish or seaweed and similar materials. To see if a substance is allowed, check the USDA National Organic Program's National List, or look for the OMRI seal on the label even if the label says "Organic" or "Natural".

10.9 Materials Storage

Guidelines:

All materials should be delivered, used and stored in a manner that minimizes impact on the surrounding neighborhood, sidewalks, streets and open spaces.

Policies:

- Any blockage of city streets or any portion of the city sidewalk is strictly prohibited except during the active unloading of materials. Temporary stockpiles of materials such as manure, wood chips and garden debris shall be placed on the garden site in a location and manner that minimizes public visibility.

10.10 Public Access

Guidelines:

Community gardens are located on public property that is intended to be accessible to all. The casual park visitor shall be permitted to share in the community garden environment. The following policy recommendations are intended to facilitate public access, particularly where it may be otherwise restricted.

Policies:

- Gardening and related activities may occur from sunrise to sunset.
- Community gardens located on public property should be made accessible to all. Some individual community gardens may decide to restrict access to the public based on their own unique conditions. Such gardens will set aside certain times for public access and post such times on the gate. Public access shall not be limited in any way without prior approval from the City.
- Special events or gatherings may require a special event permit and could include City fees.
- Gardeners shall not restrict City personnel from access to the garden.

10.11 Trees

Guidelines:

Trees are a vital resource that provide a range of benefits, including cleaner air, erosion

control, greening of public spaces, wildlife habitat and increased property values. Existing trees near or on community garden sites require special management to ensure compatibility with surrounding land uses.

Policy:

- Individuals must contact the Public Works and Utilities Department if a tree needs to be pruned or removed for the benefit of the garden or if gardener wishes to proposed installation of new trees, shrubs, buffer zone plantings, etc.
- Should a community garden group wish to plant trees for the purpose of creating buffer zones, shade, etc., prior City approval is required
- The planting of fruit trees requires prior City approval.

10.12 Waste Removal

Guidelines:

Community gardens may generate a surplus of organic waste beyond the capacity of its compost bins. Visitors to the community gardens may carry in trash, or illegal dumping may occur nearby. The removal of excess materials from community gardens ensures the safety and enjoyment for both the gardener and the general public.

Policies:

- Gardens located in a City park should coordinate with the park gardener to remove small amounts of material.
- Regular trash pick-up is not generally provided at stand-alone garden sites but may be ordered and paid for by the garden members.
- Each garden site shall coordinate removal of non-compostable organic material and garbage.
- The City will provide to each Garden Coordinator a limited number of free passes to the Waste and Recycling Drop-off for the recycling of clean garden waste and disposal of trash and diseased plants.

10.13 Illegal Dumping and Hazardous Materials

Guidelines:

Illegal dumping of garbage and hazardous substances is not uncommon to urban parks and may include hypodermic needles and human and animal feces. The removal of illegal dumping that is toxic or contains toxic components (such as paints, motor oil, computers and monitors) requires special handling to prevent contamination of garden properties for the protection of the public's health.

Policies:

- Contact the Public Works and Utilities Department Customer Service at 768-3133 to remove illegally dumped wastes.

10.14 Animals

Guidelines:

Dogs are permitted in gardens unless, if by consensus, the garden members adopt a rule to prohibit dogs from entering into the community garden. Owners must follow all garden rules as they pertain to dogs. Bees may also be permitted in gardens by consensus of garden members.

Policies:

- Dogs must be on leash and out of garden plots. Pick up pet waste and dispose in garbage.
- If bees are brought on to property, signs must be posted stating bees are kept on the garden property. City approval is required before placing beehives at a garden site.
- Service dogs are allowed in community gardens

11.0 Garden Rules and Regulations

Gardeners and visitors must comply with the following rules and regulations:
Be welcoming, civil and cooperative in regard to other gardeners, neighbors, and the public. Gardeners agree to respect the peace and quiet of the surrounding neighborhood.

AMPLIFIED SOUND: Amplified sound is not permitted in the garden.
CAMPING: Camping in the garden is prohibited.
CHILDREN: Children in the garden must be supervised by a parent or other responsible adult. Parents and caretakers must ensure that children understand and follow the rules and regulations.
CONTROLLED SUBSTANCES: No alcoholic beverages or illegal drugs of any kind are allowed in the Garden.
COVER CROPS: Soil should not be allowed to remain bare in the winter. Cover crops should be planted to enrich the soil and prevent erosion.
DOGS: Keep dogs on leash and out of garden plots unless dogs are prohibited at a specific garden. Pick up pet waste and dispose in garbage.
EROSION: Gardening must be carried out in a manner that prevents soil erosion.
GARBAGE: Unless the garden has arranged for garbage removal, garbage generated at the garden must be taken out of the garden to discard properly at a waste disposal facility or in garden members own personal garbage bins. Discarding of garbage on the ground or in compost or green waste piles is prohibited.
GRAFFITI: Graffiti must be removed by the garden members within 48 hours.
GREEN WASTE: Weeds and plant material should be composted on-site or placed in the green waste collection area(s) to be disposed of properly later. Green waste should not be thrown away in the trash, left in the pathways or improperly dumped.
GUESTS: Guests must follow the Rules of the Garden. Each gardener is responsible for the actions of his/her guests in the garden
HARVESTING: Harvest only from your own plot. Do not take from any garden plot without permission.
INVASIVE SPECIES: plants including but not limited to blackberry, bamboo, and ivy are prohibited
LITTER: No littering. Any litter on the garden site must be removed by garden members.
MOTOR VEHICLES: Motorized vehicles are not allowed in the garden with exception of motorized wheelchairs.
NO SELLING: Produce grown in this community garden may not be sold. Produce from the community garden is primarily for family consumption or donation. Excess food can be preserved for future use, shared with friends or neighbors, traded among your fellow community gardeners or donated to local food banks.
ORGANIC GARDENING: This is an organic garden. Use organic pest control methods

only. No synthetic herbicides, pesticides or non-organic fertilizers are permitted in the garden. To see if a substance is allowed, check the USDA National Organic Program's National List, or look for the Organic Material Review Institute (OMRI) seal on the label even if the label says "Organic" or "Natural".
PLOT: Gardeners must plant and harvest within their assigned plot.
PROHIBITED PLANTS: marijuana, including medical marijuana may not be grown in City-owned community gardens
SMOKING: No smoking is allowed in the garden.
TOOLS: Garden-owned and donated tools are for use in the community garden only and should be cleaned and returned to the tool shed or secure storage area after use. Tools should never be left out in garden plots or pathways, or taken off the garden premises.
UNSAFE CONDITIONS: Report any unsafe condition or suspicious behavior to the Garden Coordinator. In case of emergency, call 911.
WASTING OF WATER: Water waste and run-off is prohibited.

11.1Violations of Community Gardens Program Rules and Regulations

All members are responsible for complying with and enforcing the rules and regulations contained in the Community Garden Program Guide. If infractions are noted, the Garden Coordinator should be notified. The Garden Coordinator has the right to revoke the membership of any member who repeatedly fails to comply with these rules and regulations. A verbal warning will be given for a first offense, a written warning for a second offense and a dismissal from the garden for a third offense.

The Garden Coordinator is authorized by the City to enforce these Rules and Regulations, and in doing so will take action, including dismissal, against any gardener who is in Violation according to the Due Process described below. When a gardener violates the Program Rules and Regulations, the violation will be reported using the Violation Incident Report (See Appendix A4) which will be issued to the gardener by the Garden Coordinator. Failure to acknowledge the Violation Incident Report by not signing the Report will be an admission of guilt and may result in the forfeiture of your participation in the Program.

11.2 Due Process

- Step 1. Verbal Warning
- Step 2. Written Warning – no more than two per year allow to maintain membership
- Step 3. Garden Coordinator to give dismissal notice
- Step 4. (Optional) Gardener may request for an appeal, in writing (letter or e-mail), within 10 business days of receiving the dismissal notice
- Step 5. Dependent upon garden committee recommendation, Garden Coordinator to give final written notice

11.3 Establishing an Appeals Board

- Every individual community garden will establish a committee to oversee the due process as an Appeal Board.
- The committee does not replace the Garden Coordinator, but helps with difficult decisions.

- The committee must be made up of at least five currently registered gardeners from that garden.
- The committee should reflect the diversity of the garden as much as possible, including, but not limited to ethnic background, age and length of time a gardener has been at the garden.
- The committee will follow the Appeal Board Guidelines as set forth by the Community Gardens Program Manager.

11.4 Violations Warranting Immediate Dismissal

- Theft of tools and equipment
- Theft of produce and plants
- Vandalism of tools, equipment or City property
- The use of alcoholic beverages and illegal drugs of any kind in any area of the City's Community Gardens
- More than two written warnings in a calendar year

Appendices

Appendix A1- Community Garden Permit

Permit Issued May 20, 2012
Permit Expires May 19, 2013

City of Watsonville
COMMUNITY GARDEN PERMIT

This permit is issued to John Doe Community Garden Coordinator (Permitee) for the Gardeners of the community garden located on 123 Main Street and is not transferable to anyone else.

General Information:

The City grants permission to establish and operate a community garden on a portion of a City owned parcel of land APN. 000-000-00 per the City of Watsonville Community Garden Program Guide May 21, 2012.(Guide)

This Permit may not be amended, altered, modified, or extended without the signed written approval of Gardener and City.

Upon the expiration of this permit, the City will review compliance with the conditions of this permit and may renew this permit or issue a new one.

The City may, at its sole and absolute discretion, terminate this Permit upon sixty (60) days written notice to Permitee, and the Gardeners shall have no recourse of any nature whatsoever. City shall have no liability whatsoever by reason of such termination.

The garden members may use the Property for the purpose of performing gardening activities provided they comply with the Guide as specifically authorized by this Permit.

Property Ownership: The City is the owner of the Property. No ownership, leasehold, possessory, or other rights to the Property shall vest with the Permitee or Gardeners by virtue of this permit. Use of this property is on an interim basis, pending the future development or other use of the Property by the City.

Condition of Property: The Gardeners have inspected the property, reviewed soil testing results for the property and are satisfied with the "as is" condition of the Property. City neither makes nor has made any representation or warranty as to the condition of the property.

Garden Expenses: The expenditures for the gardening activities on the property are the sole responsibility of Gardeners, and are not reimbursable by City.

Right of Entry: The City may enter upon the property at any time for any purpose whatsoever, including, but not limited to examining the property to determine whether or not Gardeners are complying with the terms of this Permit.

Permit Conditions:

Gardeners shall design and install a community garden and shall maintain such garden and all plants and structures contained therein (including, but not limited to, all fences, raised plant beds, planters, tables, benches, and other ornamental items) in a safe and orderly condition.

Gardeners shall neither cause nor permit:

- Discrimination against any person on grounds of race, creed, religion, color. sex, age, national origin, disability, marital status, or sexual orientation.
- The use of the Property for any illegal purpose.
- The storage or use of any illuminating oils, oil lamps. turpentine, benzene, naphtha, hazardous materials or similar substances, explosives of any kind are prohibited.
- The use of the Property for any commercial purpose (including, but not limited to, the sale or advertisement of any goods or services).
- Any condition on or near the property including, but not limited to, any health or fire hazard which could constitute a nuisance or could endanger or harm persons, property or the environment,

Upon the violation of any provision of this Permit*, t*he City shall issue a warning notice to Permitee which, shall allow the Gardeners ten (10) days to rectify such default. Failure to remedy such breach within such period shall constitute grounds for immediate termination of this Permit

Gardeners shall not perform any acts upon the Property, including, but not limited to, the making of any improvements or alterations to the Property, except those provided for in the Guide. Gardeners shall not perform any gardening activities which damage or lessen the value of the Property.

Gardener shall notify City. of any damage or accident occurring on the Property within twenty-four (24) hours of any occurrence

By July 1, 2012 waddles made from straw and jute shall be placed and maintained around the perimeter of the entire garden area. No plastic netting is allowed in the waddles due to it's impact on wildlife and potential for it to become pollution.

By November 1st. all exposed soil in the garden shall be mulched with four inches of biodegradable mulch or planted with a standard cover crop mix, such as bell beans, vetch, clover barley, oats, rye, or other quick growing cereal crops.

While year-round gardening is permitted, care should be made to ensure that soil from garden plots do not leave individual plots. Organic and biodegradable mulches, such as straw or leaf mulch, are recommended to avoid impacts from rain on the soil surface and may be required for winter gardening if any soil erosion occurs.

A twenty foot natural buffer area shall be maintained on all sides of the garden. By November 1, 2012 native bunch grass shall be planted in the twenty foot buffer area along the northern side of the garden. By February 1, 2013 a native hedgerow consisting of Coffee Berry, Coyote Brush, Toyon, California Rose and other plants native to the Pajaro Valley, shall be planted three to seven feet on center, depending on the plant species, and maintained with drip irrigation along the north south and west sides of the garden for at least two years of

establishment. Native hedgerow plants shall be replaced in a timely manner in the event of mortality.

Maintain a 3 foot walkway of undisturbed vegetation around the interior perimeter of the garden area.

These conditions shall be evaluated by City staff on an on-going basis to ensure that they are meeting the particular needs and conditions of the site.

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Restoration of Property: Upon the expiration or termination of this Permit, The Gardeners shall promptly remove all equipment and materials from the Property and shall surrender the Property to City in a condition satisfactory to City,

Upon receipt of a Notice of Violation concerning any condition that could pose a threat to life, health, safety, or property, as determined solely by City, City may, upon written or oral notice to the Permitee, of such circumstance, require the Gardeners to immediately vacate the Property without removing any materials or equipment. City shall thereafter afford the Gardeners a reasonable opportunity to remove such materials and equipment. All fences, bulletin boards, signs and other installed improvements to the Property shall become the property of City upon the expiration or other termination of this Permit.

The Garden Coordinator shall:

1. Sign the Community Garden Permit.
2. Collect signed Community Garden Plot Agreements and Waiver of Liability forms.
3. from all gardeners and forward them to the City's Community Garden Program Manager and provide a signed copy to the gardener with the Garden Rules.
4. Assign plots on first come, first serve basis.
5. Maintain a waiting list of interested gardeners.
6. Re-assign available plots to those on the waiting list in the order they appear on the waiting list.
7. Orient new gardeners to the space; i.e., explain water use, communal space use, workday expectations, etc.
8. Post garden rules and other documentation on the bulletin board in the garden.
9. Maintain a list of all active gardeners.
10. Notify gardeners using plots that appear to be inactive and contact the gardener regarding the status of the plot.
11. Coordinate garden workdays to maintain the communal spaces or to work on special projects.
12. Call garden-wide meetings at least twice a year for the purpose of discussing issues, sharing ideas and goals, holding annual election of the Garden Coordinator position, conducting workdays, etc. Any meeting that provides advance notification to all of its members is considered a "garden-wide meeting".
13. Collect garden dues from members that may be used for water, supplies, tools, events, or special projects decided upon by the membership.
14. Communicate with the City as the primary contact for the garden membership.
15. Facilitate the garden membership in electing or appointing other positions, such as treasurer, secretary, or an events chair to share some of the responsibilities. Other

leadership roles for the garden may include: membership & outreach coordination, meeting and workday coordination, and common space coordination.

16. Operate the garden in a manner free from discrimination against any person on grounds of race, creed, religion, color. sex, age, national origin, disability, marital status, or sexual orientation.
17. Signup for water and pay water bill.

Notices: All notices or communications given or required to be sent under this permit shall be in writing and sent by regular mail or email to the following:

CITY
Community Garden Program Manager
Department of Public Works & Utilities
250 Main Street
Watsonville, Calif. 95076
Nancy.lockwood@cityofwatsonville.org

GARDENER
John Doe
Garden Coordinator
123 main Street
Watsonville, Calif. 95076
john.doe@email.com

Permit Issued By:
CITY QF WATSONVILLE

_____
Signature **Date**

Nancy Lockwood
Name
Community Garden Program Manager
Title

Permit Accepted By:
GARDENER

_____
Signature **Date**

John Doe
Name
Garden Coordinator
Title

Appendix A2- Community Garden Plot Agreement and Waiver of Liability

CITY OF WATSONVILLE
COMMUNITY GARDEN PLOT AGREEMENT AND WAIVER OF LIABILITY

Welcome and Purpose

Welcome! Thank you for your interest in community gardening!
This community garden is under the jurisdiction of the City of Watsonville Public Works and Utilities Department. Please be mindful that the operation of this garden is regulated by the City's Community Garden Program Guide, which can be found in the City of Watsonville Urban Greening Plan, on the City's website or obtained from the City's Community Garden Program Manager. In addition, aspects of community gardens are regulated by the Watsonville Municipal Code and the California Uniform Building Code.

The City of Watsonville is truly excited by your interest in becoming a community gardener. You are a part of a growing trend in urban agriculture. This garden provides you the opportunity to create beauty, serenity, and abundance within the urban confines of Watsonville. Whether your interest lies in growing organic produce or creating beautiful landscapes, you are a steward of public land. You are agreeing to share use of land, on which you will garden, with your fellow Watsonville residents. On it you may grow, for your non-commercial use, food, flowers, and herbs that may satisfy your hunger or delight your aesthetics or spirit. Community gardening implies self-sufficiency, including obtaining the materials you need and learning the skills essential to gardening.

By signed this agreement, you are participating in a shared agreement with both rights and responsibilities. You may keep your plot as long as you like, granted you abide by this agreement. Community garden members are welcome to use a plot and share care of the garden with the following understandings:

Your rights as a community gardener

- Automatic renewal is based upon compliance with this Agreement and site specific garden ruless.
- You have the right to basic amenities such as access and water.
- You have the right to equal opportunity and non-discrimination.
- You have the right to a reasonably harmonious environment and to appropriate conflict resolution measures when necessary.
- You have the right to participate in the democratic self-governance of your community garden and annually elect your Garden Coordinator(s).
- You have the right to garden in this space and to the non-commercial use of the bounty your labors provide.
- You have a right to an orientation to your garden by the Garden Coordinator or other assigned garden office-holder.

From rights stem responsibilities. Because you and your fellow gardeners have these rights, you also share a collective responsibility. You agree that these responsibilities include things that are standard in all gardens and others that have been decided by your specific community garden site.

Responsibilities standard in all gardens:

- To care for the land through a year-round active gardening and soil care.

- Gardeners are responsible for keeping their plot and the paths surrounding their plot clean and free of weeds.
- Gardeners shall at no time plant or weed in any other person's plot, except as directed by the Garden Coordinator on garden work days* or by prior agreement with that plot holder. (* Garden Coordinator must provide 7 days of advance notice to the plot holder prior to the garden work day.)
- Maintain your plot within its confines without plants encroaching into common areas or other plots. No plants in your plot may be higher than 6 feet over soil level. Beds may not be raised higher than 3 feet except in cases of access for mobility-impaired persons.
- No altering of the dimensions of a plot or of the surrounding area.
- Keep common areas clear.
- Be welcoming, civil and cooperative in regard to other gardeners, neighbors, and the public.
- Commit to 'Organic Gardening' practices. Abide by City rules regarding organic practices. To see if a substance is allowed, check the USDA National Organic Program's National List Subpart G, 205.601 and 205.602 or look for the Organic Materials Review Institute (OMRI) seal on the label. Labels simply stating "Organic" or "Natural" without the OMRI seal or not included on the USDA National Organic Program list are prohibited.
- Be mindful of water usage. Gardens shall be managed for best practices in water conservation (e.g., drip irrigation, watering early or late in the day, clustering like plantings in zones).
- Water waste and run-off is prohibited. Chronic waste of water could result in water shut-off by the City. Ornamental plantings should be targeted to drought-resistant species.
- Sign the Waiver of Liability section of this agreement.
- Anyone you wish to garden with you in your plot, at the time you sign this agreement, must also sign this agreement.
- Garden Coordinator approval is required for adding someone such as a spouse, partner or housemate residing at your address to your plot at any time. If approved, the new gardener must sign this agreement.
- Plots cannot be given away by you to anyone else.
- In case of illness, pregnancies, travel et al, inform your Garden Coordinator about your situation. Either party may find a temporary person to garden in your stead; this person signs a temporary version of this agreement to end on a date of no longer than a three-month duration.
- Children in the garden must be supervised by a parent or other responsible adult.
- Gardeners agree to respect the peace and quiet of the surrounding neighborhood.
- Children and guests should also be instructed to refrain from walking on garden plots, or damaging or taking plants, or fruits thereof, that do not belong to them.
- Dogs must be leashed and may not walk on garden plots. Pet waste must be picked up and disposed in the garbage.
- Report any unsafe condition or suspicious behavior to the Garden Coordinator. In case of emergency, call 911.
- Reassignment: The Garden Coordinator shall notify non-active gardeners with a verbal, telephone or email warning. If active gardening does not resume within 15 days, or the gardener has not responded to messages from the Garden Coordinator, or the garden member is not reachable, then a written 30-day notice to resume activity shall be issued. Lack of response within 30 days will result in reassignment of the plot.
- The City retains ownership of City-owned property used for community gardens and

does not guarantee the on-going use of the property for gardening in the future.

- You hereby agree to your garden's specific rules, as follows below.

Responsibilities specific to your garden:

You understand that your community garden site will have additional specific arrangements that you agree to as a community gardener including:

- Payment of dues for water and other materials as agreed upon by your garden group
- Storage of tools and equipment.
- Compost and waste guidelines.
- Prevention of water waste and run-off
- Workday and meeting attendance; and any other active gardening requirement as determined by your garden.
- Specific security measures.
- Pathways, common areas, behavior expectations.
- Use of materials and tools; storage.
- Time and work responsibilities.
- Future matters to be decided.

Waiver of liability, release and hold harmless statement:

The undersigned, in consideration of participation in this program, agrees to indemnify and hold the City of Watsonville harmless from any and all liability for any injury, death, loss or harm that occurs by the below mentioned individual arising out of, or in any way connected with, participation in this program. I hereby authorize and give consent to the City of Watsonville, its successors and assigns, to copyright, broadcast, publish and display all photographs and videos taken by them in which I and/or my children appear.

SIGNATURE _____ *Date _____

Name (Print) _____

Address _____

Zip Code_____

Home Phone_____ Cell Phone _____

Email address_____

Garden name and location_____

Garden Coordinator name and contact information _____
_____

Plot # _____Dues paid to_____

* For temporary agreements, add an 'effective dates" line to this section.

Appendix A3– Thirty Day Notice

Thirty-Day Notice

Dear Gardener of Plot # : _____
The gardeners here at (NAME OF COMMUNITY GARDEN) have noticed that you have not maintained or sowed your plot for a long time.
The Community Garden Plot Agreement which you signed states the following:

> REASSIGNMENT: The Garden Coordinator shall notify non-active gardeners with a verbal, telephone or email warning. If active gardening does not resume within 15 days, or the gardener has not responded to messages from the Garden Coordinator, or the garden member is not reachable, then a written 30-day notice to resume activity shall be issued.

If you clean your plot and surrounding area and inform the garden coordinator of your intentions to plant in the near future, we will be pleased to keep you as a member of the garden. However, if you have not done so within thirty days, we will reassign your plot to the next person on our waiting list; or in the absence of a waiting list, to the next person who requests a plot at the garden. We hope you understand our reasons for this action. We simply want everyone in our community to have an opportunity to garden. If you are not actively gardening, please consider giving up your plot to someone else who is interested in harvesting the goods of the earth. In the event that you do lose your plot, feel free to sign up again on the waiting list.

Please contact the Garden Coordinator,
[NAME OF COORDINATOR],
at [TELEPHONE].
Thank you for your cooperation.

Violation of Rules Incident Report

Date: _____

Time: _____

Community garden name and location: _____

Name of Gardener

Name (first/last):

Plot #:

Description of Violation (Brief description – if needed, continue on back of page)

Reference; Community Gardens Program Rules & Regulations

Page Section Paragraph Line

Witnesses (if applicable)

First Name: Last Name: Plot #:

First Name: Last Name: Plot #:

Action Taken

1. First Warning Verbal Written

2. Second/Final Warning Written Reported to City Staff

Appendix A5 - Sample Wait List

Sample WAIT LIST

All gardens must maintain an active wait list. Interested members of the public may request to be put on the wait list when a plot is not available. Annually post an updated wait list of **names only** at the garden. The wait list of **names only** may also be posted on the garden's website. The wait list may be kept up-to-date with one or more of the following practices:

- Contact each person on the wait list annually by phone or e-mail to reconfirm her interest.
- Require each person on the wait list contact the garden annually by phone or e-mail to reconfirm his interest and guarantee their wait list spot.

DATE, NAME, ADDRESS*, CONTACT*

1. 3-12-12 Jane Rose 123 Main Street (e-mail address)
2. 4-8-12 Jeffrey Root 456 Ash Avenue (e-mail address)
3. 4-22-12 Mary Compost 789 Sunny Street #8 (831) 555-1212

* Addresses or contact information should not be made public without consent.

Garden plots will be made available on a first-come, first-served basis.
The garden coordinator may suggest other nearby community gardens to any person on the wait list. However, doing so does not exclude that person from being placed on the wait list. Persons on the wait list have priority to fill in for garden member who will not be able to garden for up to 90 days due to travel, vacation or illness.

Appendix A6 - Tips for Safety and Awareness

The following recommendations are intended to increase awareness and minimize future risks to all garden visitors.

- Trust your instincts. If something doesn't feel right, do not hesitate to leave the garden.
- Be visible -don't let plants and shrubs block your view into the garden.
- Don't have "hidden gardens" where you cannot be seen.
- Know your gardening partners and the garden's neighbors.
- Avoid keeping a public trash receptacle in the garden.
- Where appropriate, secure the community garden with a gate and lock.
- Keep supplies locked.
- Block or eliminate areas where people can sleep or camp.
- Work with the Watsonville Police Department on how to keep the area safe.
- Request assistance from Public Works/Utilities Department 768-3133 for disposal of illegally dumped material, shopping carts, needles and other unsafe materials.
- In an emergency, call 911. For non-emergency Police assistance 471-1151
- Alert fellow garden members and the Garden Coordinator if unsafe conditions occur.
- Remove graffiti within 48 hours.

Appendix A7 -Sign Sample With Standard Rules

Welcome to Sunshine Community Garden
For the Enjoyment of All Gardeners and Visitors, Please Obey the
Following Regulations:

AMPLIFIED SOUND: Amplified sound is not permitted in the garden.
CAMPING: Camping in the garden is prohibited.
CHILDREN: Children in the garden must be supervised by a parent or other responsible adult. Parents and caretakers must ensure that children understand and follow the rules and regulations.
CONTROLLED SUBSTANCES: No alcoholic beverages or illegal drugs of any kind are allowed in the Garden.
DOGS: Keep Dogs on Leash and out of garden plots. Pick up pet waste and dispose in garbage.
GARBAGE: Take any garbage you generate with you to discard properly at a waste disposal facility or in your personal garbage bins. Discarding of garbage on the ground or in compost or green waste piles is prohibited. Diseased plants should be disposed in the garbage
GREEN WASTE: Weeds and plant material should be composted on-site or placed in the green waste collection area(s) to be disposed of properly later. Green waste should not be thrown away in the trash, left in the pathways or improperly dumped.
GUESTS: Your guests must follow the Rules of the Garden. You are responsible for the actions of your guests in the garden
HARVESTING: Harvest only from your own plot. Do not take from any garden plot without permission.
LITTER: No littering. Pick up any litter found in the garden.
MOTOR VEHICLES: Motorized vehicles are not allowed in the garden with exception of motorized wheelchairs.
NO SELLING: Produce grown in this community garden may not be sold.
ORGANIC GARDENING: This is an organic garden. Use organic pest control methods only. No non-organic herbicides, pesticides or fertilizers are permitted in the garden.
SMOKING: No smoking is allowed in the garden.
TOOLS: Garden-owned tools are for use in the Community Garden only and should be cleaned and returned to the tool shed after use. Tools must be kept locked in the tool shed overnight and should never be left out in garden plots or pathways, or taken off the garden premises.
UNSAFE CONDITIONS: Report any unsafe condition or suspicious behavior to the Garden Coordinator. In case of emergency, call 911.
WASTING OF WATER: Water waste and run-off is prohibited.

Appendix A8 - Resources and Contact Information

Resources and Contact Information

- For City's Community Garden Program Manager 768-3103
- For compost bins and instructions – Public Works/Utilities Customer Service 768-3133
- For use of Waste and Recycling Drop-off – Public Works/Utilities Customer Service 768-3133
- To report illegal dumping – Public Works/Utilities Customer Service 768-3133
- To request a permit for gatherings of 25 or more persons – Parks and Community Services 768-6084
- To report emergencies – 911
- For non-emergency assistance from Watsonville Police Department 471-1151
- For Watsonville Municipal Code – www.cityofwatsonville.org or City Clerk 768-3040

Appendix A9 - Invasive Plant Species

Note: The California Invasive Plant Council is continually updating its list of invasive plant of State-wide priority and this should be monitored and cross-referenced with the list below over time.

Acacia	*Acacia dealbata*
Bamboo	*Bambusoideae ssp.*
Bermuda buttercup	*Oxalis pes-capre*
Big Perriwinkle	*Vinca major*
Bull Thistle	*Circium vulgare*
Bridal veil broom	*Retama monosperma*
Cala Lilly	*Zantedseschia aethiopica*
Cape Ivy	*Delairea odorata*
Common Velvet Grass	*Holcus lanatus*
Curly Dock	*Rumex crispus*
English Ivy	*Hedera helix*
Erect Velt Grass	*Erharta erecta*
Eucalyptus	*Eucalptus globulus, other ssp.*
Fennel	*Foeniculum vulgarea*
French Broom	*Genista monspenssulana*
Fullers Teasel	*Dipsacus sativus*
Green fountain grass	*Pennisetum setaceum*
Harding Grass	*Phalaris aquatica*
Himalaya blackberry	*Rubis discolor*
Hoary Cress	*Cardaria draba*
Jubata and Pampas Grass	*Cortaderia Jubata/Cortaderia selloana*
Kikuyu Grass	*Pennesitum clandestinum*
Orchard Grass	*Dactylis glomerata*
Palm tree ssp.	*Palmae ssp.*
Perrenial pepperweed	*Lepidium latifolium*
Poison Hemlock	*Conium maculatum*
Purple Star Thistle	*Centauria calcetrapa*
Rabbits Foot Grass	*Polypogon monspeliensis*
Russian olive	*Elaeagnus angustifolia*
Scotch Broom	*Cytusys scoparius*
Smilo grass	*Piptatherum miliaceum*
Spanish broom	*Spartium junceum*
Striated broom	*Cytisus striatus*
Tall Fescue	*Festuca arundinacea*
Tallow Tree	*Sapium sebiferum*
Tocolote, Malta Star Thistle	*Centauria melitensis*
Yellow Star Thistle	*Centauria solstitialis*

Appendix A10 – Potential Community Garden Sites

City-Owned Properties

1. APN. 018-372-47
   Loma Vista Drive – off Ohlone Parkway
   Undeveloped parcel

2. APN. 017-561-11
   101 Main Street/W. Front Street
   Unused parking lot next to the Housing Authority apartments and Muzio Park.

3. California Street/Palm Avenue Alley
   Between Lincoln and Jefferson
   Formerly used as neighborhood garden

4. APN. 014-101-105
   37 Davis Street
   Davis Park, – off Freedom Blvd. current Neighborhood Services location

5. Main and Longview – City-owned, unused property

6. APN. 017-551-10
   795 Vista Montana
   Franich Park
   Unused plot behind ball field, next to path leading to Marcela Way

7. APN. 015-052-16
   297 Herman Ave.
   Hazelwood Park

8. APN. 015-151-04
   195 Airport Blvd (access on Roache Rd.
   Vacant parcel

9. APN 016-161-29
   52 Ninth Street
   Vacant lot off of Main Street

County Property

APN. 019-911-02
1125 Madison
Formerly used for emergency housing after the earthquake, some currently used as garden by the UC Extension Office

Private Property

APN. 015-111-69
65 Nielson
Watsonville Community Hospital/Pajaro Valley Health Trust Land next to PVHT building on hospital grounds