REFUGIO CREEK WATERSHED

VISION PLAN

CITY OF HERCULES, CALIFORNIA
SEPTEMBER 2009

Acknowledgements

The Refugio Creek Watershed Vision Plan was produced through a collaborative process led by the City of Hercules and facilitated by Restoration Design Group. Common Sense California, the State Coastal Conservancy, and the City of Hercules funded the project.

The City of Hercules would like to thank the guest speakers who contributed their time and provided their knowledge to the planning process. Speakers included:

Roger Leventhal, FarWest Engineering

Erik Stromberg, Restoration Design Group

Jim Hale, Contra Costa Fish and Wildlife Committee

Juliana Gonzalez, The Watershed Project

Phillip Bachand, Bachand & Associates

The City of Hercules would also like to thank residents and interested parties who volunteered their time and thoughts to participate in the planning process and craft the Refugio Creek Watershed Vision Plan.

The Vision Plan document was prepared for the city of Hercules by the Restoration Design Group.

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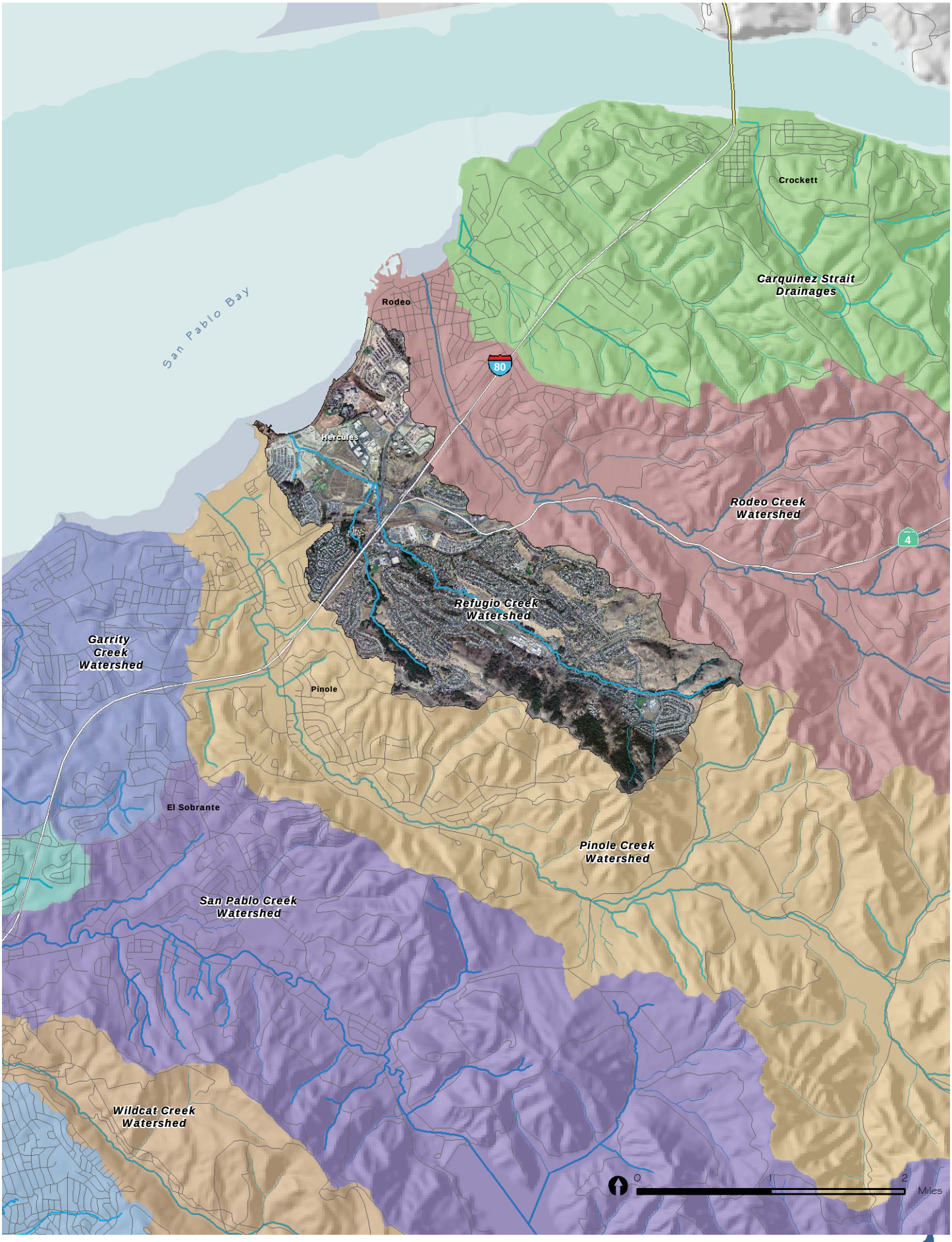
Envision a watershed...

"The Refugio Creek Watershed Vision Plan envisions: a watershed with healthy creeks and ponds that provide habitat for wildlife; trails that unify and celebrate the watershed; and communities that care for, learn about, and understand the watershed."

Contents

The Refugio Creek Watershed is located in Western Contra Costa County and drains into San Pablo Bay.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Introduction

Upper Refugio Creek Watershed as seen from the ridges nearby.

(Photo courtesy of Mike Bowermaster)

Between February and September of 2009, the citizens of the City of Hercules engaged in a vision planning exercise for the Refugio Creek Watershed - the primary watershed in the City. This report documents that process and the resulting findings and vision.

Watershed Vision Plan

A Watershed Vision Plan is a watershed-based planning document that is meant to provide a coherent vision of future projects in the watershed. The Vision Plan is community-based, respectful of private property rights, involves only voluntary actions, and is developed through consensus. The Vision Plan can be used as a fundraising and planning tool and has the added benefit of being a collaborative experience that brings community members together to develop goals and actions to enhance the watershed.

Public Process

The Refugio Creek Watershed Vision Planning Group met during six evening meetings and one field trip between February and September 2009. All events were open to the public. The City of Hercules publicized the process through its website, flyers, email, banners, and a pre-kickoff meeting with key stakeholders.

The visioning process was designed to be open and collaborative and lead to a consensus-seeking vision for the watershed. The meetings and field trip provided an opportunity for community members to learn about the watershed, express their interests and concerns, and formulate goal statements and action items in support of their vision.

The six evening meetings were held at the Hercules Public Library in Hercules, California. The two-hour meetings consisted of an hour of informational presentations by guest speakers, followed by an hour of group discussion. The field trip was held on a Saturday morning and visited multiple sites between the headwaters of the watershed and the mouth of the creek.

Meeting and Field Trip Topics

Meeting #1 – February 25, 2009
Speaker Topics
Overview of Refugio Creek Watershed
(Rich Walkling, Restoration Design Group)

Watershed Vision Plan Defined
(Drew Goetting, Restoration Design Group)

Working Session Topics
Ground Rules, Interests, and Concerns

Meeting #2 – March 11, 2009
Speaker Topics
Creeks 101
(Roger Leventhal, FarWest Engineering)

Working Session Topics
Interests and Concerns

Meeting #3 – April 15, 2009
Speaker Topics
Creeks and Cities: Tools for Designing Your Watershed
(Erik Stromberg, Restoration Design Group)

Working Session Topics
Interests and Concerns Mapping Exercise

Field Trip – April 25, 2009
Site visits to the upper watershed, Hercules Teen Center, Refugio Park, culvert at I-80/BNSF railroad, wetlands adjacent to Bayside, Duck Pond Park, mouth of Refugio Creek Watershed, and the restored area by Tsushima Street bridge.

Meeting #4 – May 13, 2009
Speaker Topics
Wildlife in Refugio Creek Watershed
(Jim Hale, Contra Costa Fish and Wildlife Committee)

Working Session Topics
Draft Goals and Actions

Meeting #5 – June 10, 2009
Speaker Topics
Forming a Watershed Group
(Dr. Juliana Gonzalez, The Watershed Project)

Working Session Topics
Draft Goals and Actions (continued)

Meeting #6 – September 9, 2009
Speaker Topics
Ponds 101
(Dr. Phillip Bachand, Bachand & Associates)

Working Session Topics
Setting Priorities and Review of Draft Watershed Vision Plan

Background Information

The Watershed

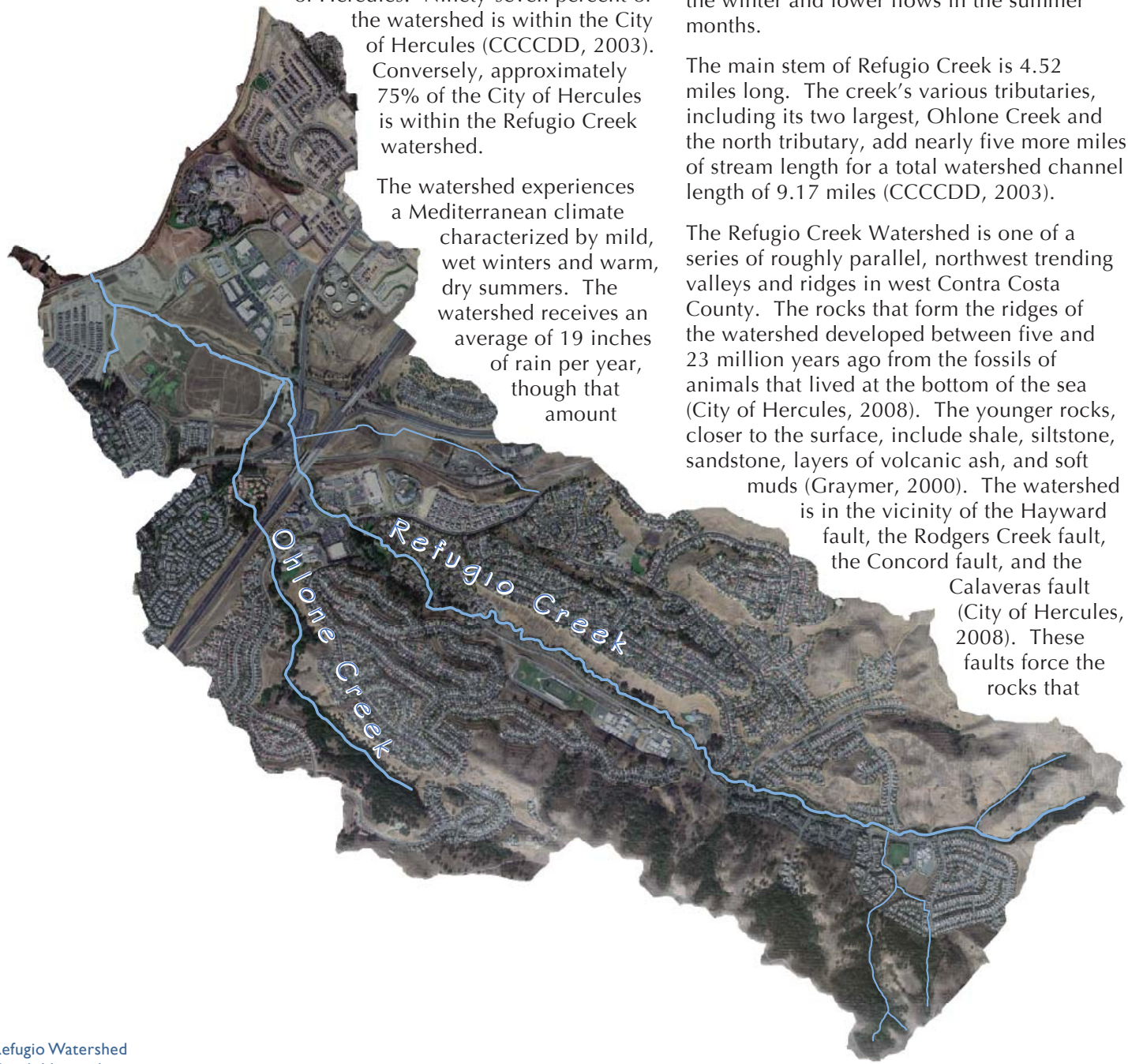
A watershed is any area of land that drains to a specified body of water. The Refugio Creek Watershed drains 4.87 square miles of northwestern Contra Costa County, California into the San Pablo Bay. The watershed includes tree-lined hills, grassy hills and lowlands, and relatively recent urban and suburban development in the City of Hercules. Ninety-seven percent of the watershed is within the City of Hercules (CCCCDD, 2003). Conversely, approximately 75% of the City of Hercules is within the Refugio Creek watershed.

The watershed experiences a Mediterranean climate characterized by mild, wet winters and warm, dry summers. The watershed receives an average of 19 inches of rain per year, though that amount varies significantly from year to year (CCCCDD, 2003).

Precipitation also varies geographically within the watershed. The hills in the upper watershed receive, on average, five inches more rainfall per year than the lowlands near the mouth. Most of the annual rainfall occurs between November and April. Refugio Creek responds in kind with higher flows in the winter and lower flows in the summer months.

The main stem of Refugio Creek is 4.52 miles long. The creek's various tributaries, including its two largest, Ohlone Creek and the north tributary, add nearly five more miles of stream length for a total watershed channel length of 9.17 miles (CCCCDD, 2003).

The Refugio Creek Watershed is one of a series of roughly parallel, northwest trending valleys and ridges in west Contra Costa County. The rocks that form the ridges of the watershed developed between five and 23 million years ago from the fossils of animals that lived at the bottom of the sea (City of Hercules, 2008). The younger rocks, closer to the surface, include shale, siltstone, sandstone, layers of volcanic ash, and soft muds (Graymer, 2000). The watershed is in the vicinity of the Hayward fault, the Rodgers Creek fault, the Concord fault, and the Calaveras fault (City of Hercules, 2008). These faults force the rocks that



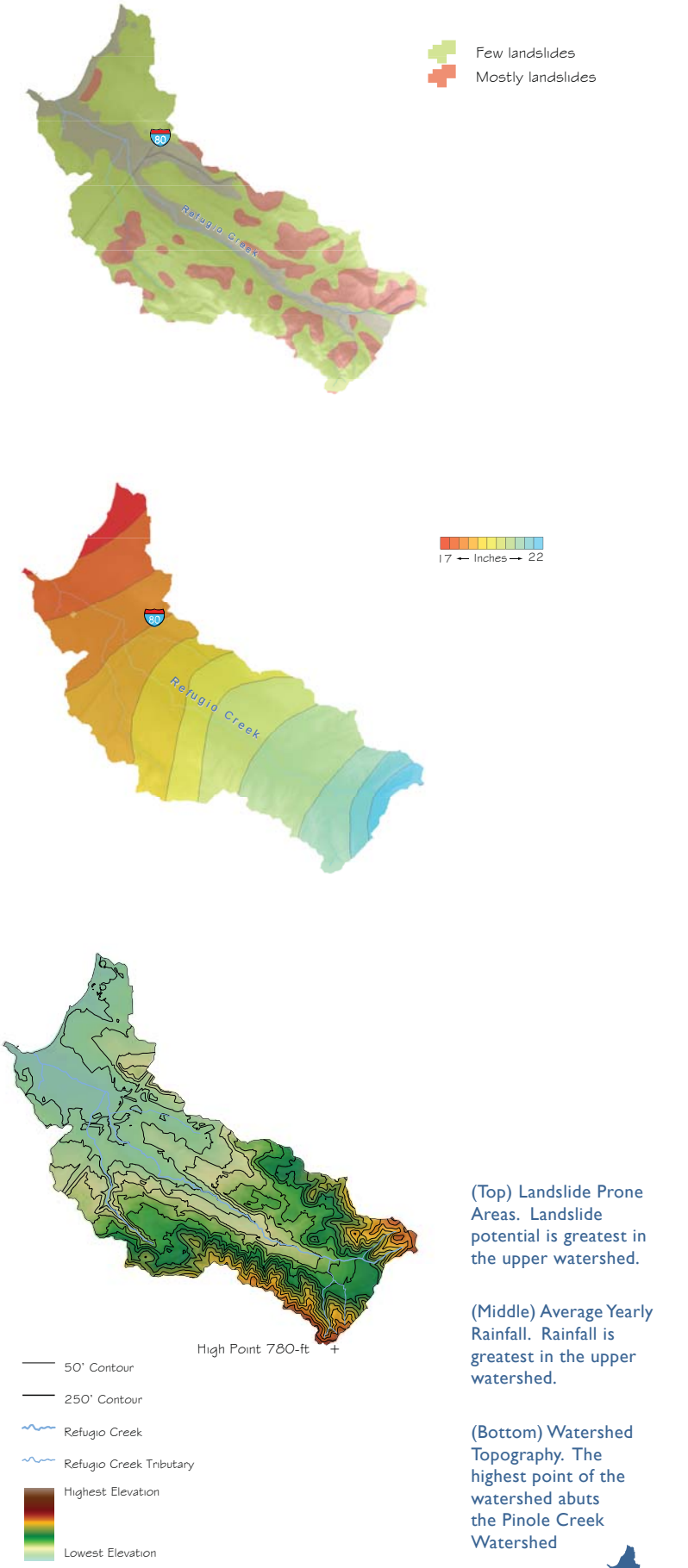
once sat on the sea floor upward at varying angles. The occasional soft layers and the tilting caused by the uplift create frequent slumping and landslides on the hill slopes (Alt and Hyndman, 1975).

The soils in the watershed are primarily clay and clay loams formed by the weathering of rocks near the surface. A loam is a soil that is composed of nearly equal amounts of clay, sand, and silt. The soils in the watershed support oaks and forbs, and the land is suitable for grazing, but they are not typically beneficial soils for intensive or high value crop agriculture (SCS, 1977).

Watershed History

The oak trees, the freshwater in the creek, the fish and oysters in the bay, and other local resources supported the Huichin people who lived in the area prior to European colonization. Their territory extended from near present day Berkeley to somewhere north of Rodeo (Pinole Historical Society, 2009). Contra Costa County had one of the highest concentrations of native people in North America and one of the largest known village sites was just north of Refugio Creek watershed in present-day Crockett (Hale, personal communication). At the time, a broad tidal mud flat stretched from Point Pinole to the Carquinez Strait and a small tidal marsh covered much of the lower watershed near the mouth of the creek (Goals Project, 1999).

In 1823, the Mexican government granted Don Ignacio Martinez 17,000 acres of land that included the Refugio Creek Watershed. By the 1850s, a small town had formed in Pinole, just south of the Refugio Creek Watershed (Pinole Historical Society, 2009). Small farms and ranches dotted the landscape between Pinole and Port Costa (Ryan, 2001). In 1878, the Southern Pacific Railroad traversed the mouth of Refugio Creek, initiating the first major transformation of the watershed (Pinole Historical Society, 2009). The railroad formed a barrier between the tidal marsh near the mouth of the creek and the bay. In 1879, the California Powder Works purchased waterfront land in the



(Top) Landslide Prone Areas. Landslide potential is greatest in the upper watershed.

(Middle) Average Yearly Rainfall. Rainfall is greatest in the upper watershed.

(Bottom) Watershed Topography. The highest point of the watershed abuts the Pinole Creek Watershed

Historical shoreline and Creek Location and Alignment, Circa 1850's.

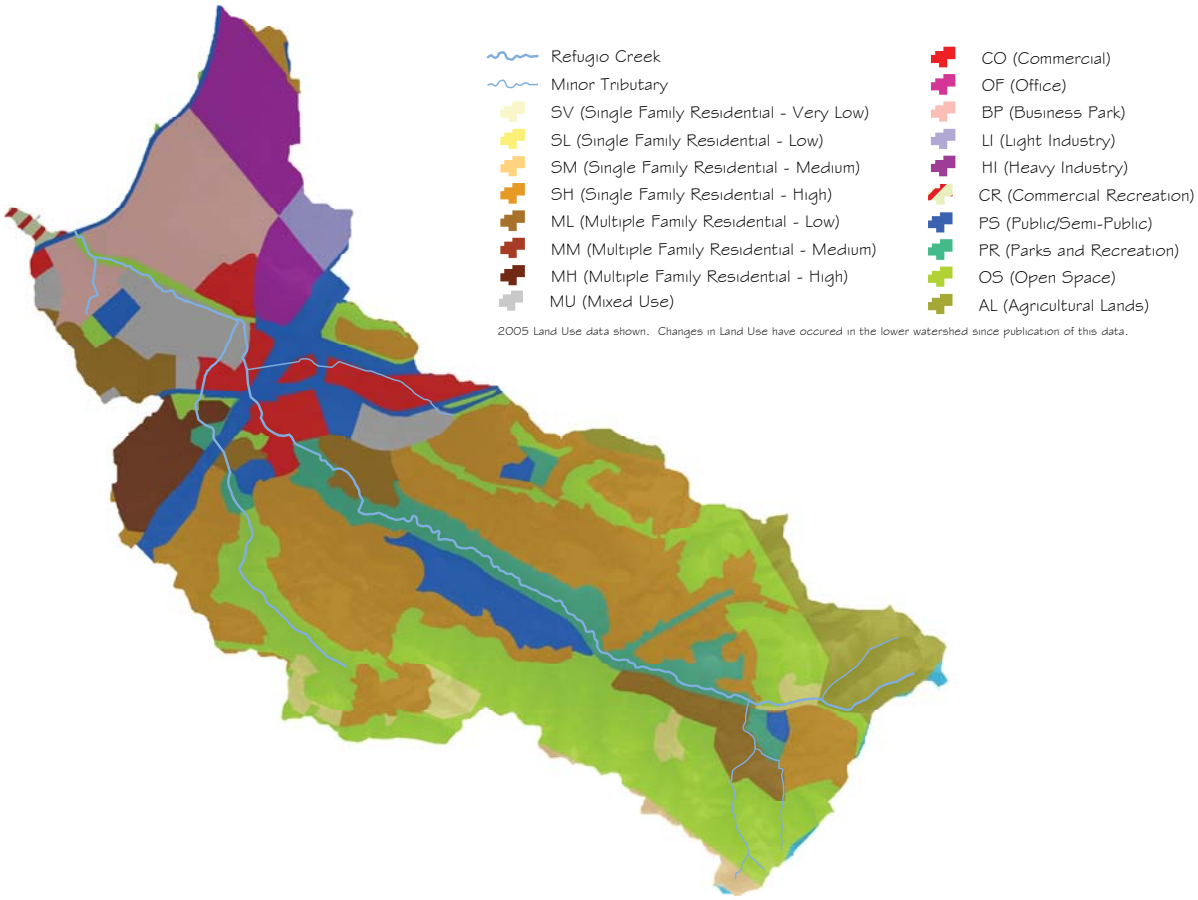
Refugio Creek watershed for its Hercules dynamite plant. The land was in proximity to the town of Pinole, but separated by a protective ridge. The company intentionally constructed its plants in gullies and ravines to buffer against explosions. To prevent the spread of fire resulting from an explosion, the company cleared the land of trees, planted Eucalyptus as barriers against explosions, and grazed sheep on the grasslands (Ryan, 2001).

Over the following century, the dynamite plant grew, as did nearby towns, and a second railroad and a highway traversed the watershed. In the 1960s, the plant ceased its manufacturing operations and began selling its land to developers (Ryan, 2001). In 1974–75, Centex Homes of California built the first large suburban development in Hercules (City of Hercules, 2000). In 1977, the plant closed permanently and Hercules Properties, Ltd. purchased the property with the intent of developing more suburban housing. The 1970s and 1980s were a time of rapid expansion in the watershed when the first traffic lights, shopping centers, and parks arrived (Ryan, 2001). Toward the end of the 1990s the City of Hercules began planning for a centralized downtown near the intersections of San Pablo Avenue, Sycamore Avenue, and Interstate 80. This resulted in the construction of several new neighborhoods in the lower watershed on what had previously been industrial lands (City of Hercules, 2000).

Current Land Use

Land use can indicate a lot about the habitats and the hydrology of a watershed. Urban environments, agricultural lands, and open space all support different types of plants and animals. When rain falls on urban lands, it runs quickly off of buildings, roads, and parking lots to storm drains and creeks. By contrast, when rain falls on a meadow or forest, it seeps into the ground and moves slowly down slope. Some of it is used by plants and some of it will move across the surface of the land into creeks. (For more on storm water, see the storm water side bar.)

In the Refugio Creek Watershed, the two largest land uses are single-family residential (28%) and open space (22%). This land use pattern is evident when driving through the upper watershed. Streets lined with single-



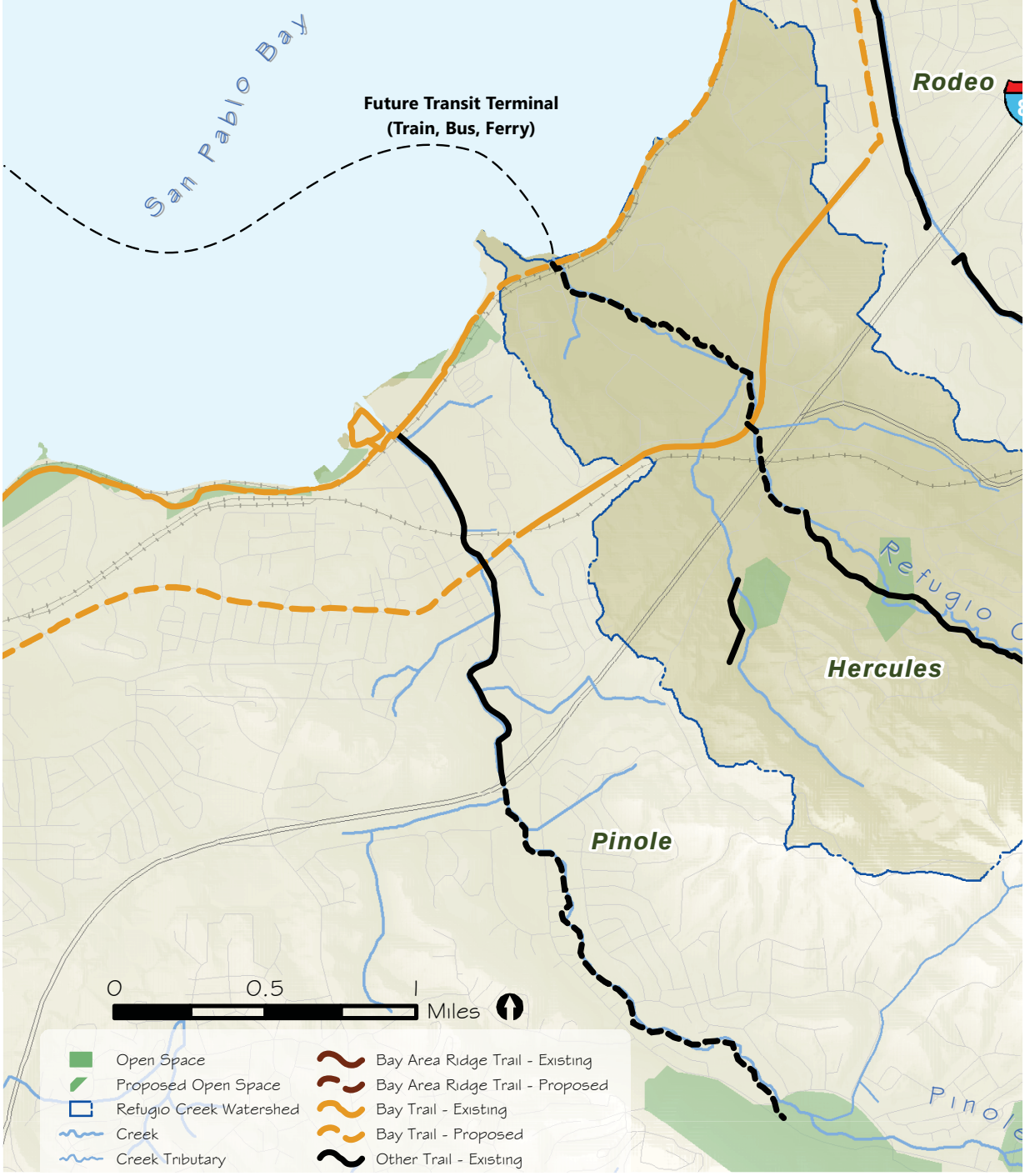
Landuse within the Watershed

family homes branch off the Refugio Valley Road and cover the lower hillsides. The upper hillsides are blanketed with open spaces that reach down like fingers between neighborhoods. Most of the commercial land use is centered in the lower watershed near I-80. Downstream of the planned town center the land use is mixed use, higher-density residential, and business parks. In total, 68% of the land in the watershed is developed and 32% is dedicated to parks, open space, or agricultural land uses (CCCCDD, 2003).

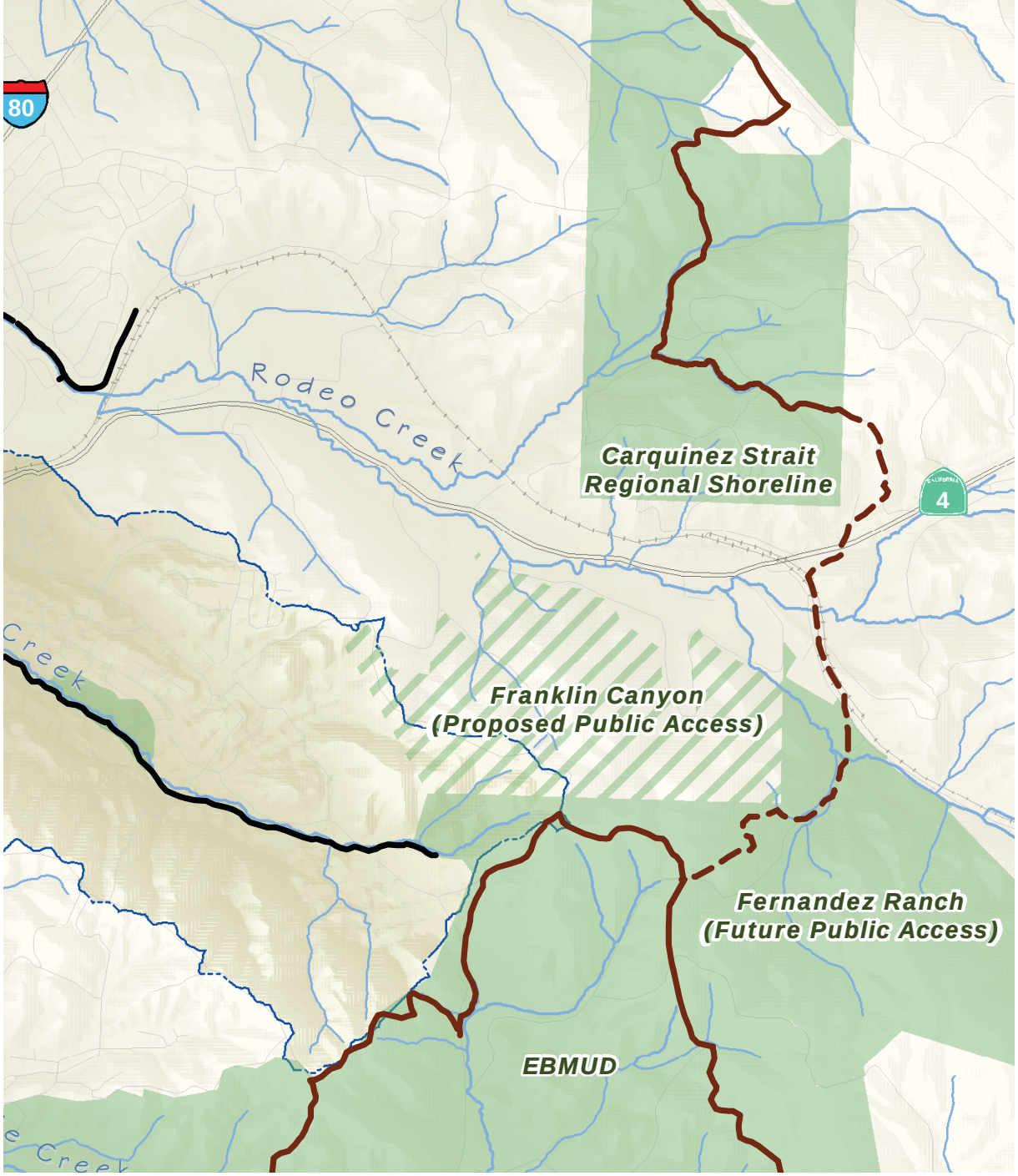
Land Use

Single Family Residential	28%
Open Space	22%
Public/Semi-Public	9%
Multiple Family Residential	15%
Business Parks and Offices	7%
Parks and Recreation	6%
Commercial	5%
Mixed Use	4%
Agricultural Lands	4%
Total	**100%**

Note: The last remaining industrial parcel in Hercules (Hilltown) was recently rezoned to Planned Commercial-Residential.



Existing and Proposed Trail Network. Note the gap between Refugio Creek Path and the Bay Area Ridge Trail.



Connections

The Refugio Creek Watershed is at the nexus of many different existing and planned transportation corridors. The City and the Water Emergency Transportation Authority are planning a ferry terminal that will connect the Hercules waterfront with downtown San Francisco. The Union Pacific Railroad traverses the watershed along the shoreline. An Amtrak Capitol Corridor station is planned near the mouth of the creek congruent with the ferry terminal. San Pablo Avenue, Interstate 80, and the Burlington Northern Santa Fe Railroad all meet in approximately the same location near the middle of the watershed. Refugio Valley Road forms the backbone of the upper watershed. Bus lines, sidewalks, and walking and biking trails surround and traverse the watershed. These provide alternatives to travelling by automobile and, in the case of hiking and biking trails, recreational opportunities that can improve public health and encourage community interactions.

(Left to right) Mixed Oak/Bay Woodland in the watershed.

Annual Grassland in the upper watershed.

Mixed Riparian Forest in the Refugio Creek corridor.

Mixed Riparian Forest at the edge of Refugio Creek

Habitat Types

Northwest Contra Costa County is a region of great biodiversity. It is bordered to the west by the San Pablo Bay and to the north by the Carquinez Strait. These water bodies serve as migratory barriers to terrestrial animals and plants. Contra Costa is also the transition from the generally cool coastal climate to the hot interior climate. These factors and others combine to make Contra Costa County either the northern or southern extent of many species (J. Hale, personal communication). Despite being 68% developed, the upper watershed of Refugio Creek is bordered by large, open space areas including the Muir Heritage Land Trust's Fernandez Ranch, East Bay Municipal Utility District's watershed lands, and open space owned by local homeowners associations. The lower watershed is bordered by the San Pablo Bay. The bay is connected to the upper watershed by the creek corridor. This rich and diverse mixture of habitat types provides food, shelter, and migration corridors for wildlife in the watershed.

The brief descriptions that follow are general summaries of the kinds of habitats that exist in Refugio Creek Watershed. It is the result of a very cursory examination of the watershed and not based on detailed surveys. This is not an exhaustive analysis; it captures only the most prevalent habitat types.

Mixed Oak/Bay Woodland

The upper Refugio Creek watershed supports a mix of oak and bay woodland, primarily on its northerly facing slopes. Oaks are one of California's most iconic trees and the State Woodlands Preservation Act protects all California oak woodlands (Vollmar Consulting, 2006). The dominant tree species here are coast live oaks, valley oaks, and California bay trees. Beneath the trees are shade-tolerant shrubs such as blackberry, creeping snowberry, or toyon. In drier areas in the watershed, the understory may be entirely grasslands (Holland, 2005).

Oaks in California support an enormous diversity of life within their canopy. The 18 species of California oak trees and shrubs support over 5,000 species of insects and hundreds of species of other animals (birds, mammals, reptiles, and amphibians) (Pavlik et al, 1991). Other studies have shown that oak woodlands like those in Refugio Creek Watershed support over 60 species of mammals and 110 species of birds (Holland, 2005). In the Refugio Creek Watershed, these oak woodlands provide food and habitat for deer, quail, turkeys, and other wildlife.

Annual Grasslands

The majority of open space in the watershed is comprised of annual grasslands. These grasslands surround the mixed oak/bay woodland, the riparian forests, and most of the urbanized areas of the watershed. Most of the plant species that dominate the annual grasslands are introduced species. These introduced species may include wild oats, brome, wild barley, soft chess, and foxtail fescue (Kie, 2005). Absent prescribed grazing or other grassland management, these aggressive weeds are able to out-compete native wildflowers, bunchgrasses, and coastal prairie species that would otherwise dominate in grassland areas of the watershed (Vollmar Consulting, 2006).

Annual grasslands are often home to western fence lizards, common garter snakes, black-tailed jackrabbit, California ground squirrel, mule deer, and coyote. Birds found in annual grasslands include burrowing owls, short-eared owls, horned larks, western meadowlarks, turkey vultures, northern harriers, American kestrels, black-shouldered kites, and prairie falcons (Kie, 2005).

Creek Corridor/Mixed Riparian Forest

The area where land meets water tends to be the most biologically rich and diverse land in a watershed. Creek side (or riparian) areas tend to have more species of plants and animals than anywhere else in the watershed (with the possible exception of seasonal or tidal wetlands). Many species of animals are dependent on riparian areas during one or more stages of their life. The health and size of a riparian area can have a significant impact on water quality. Wide riparian buffers can filter out water pollutants before they reach the creek. As a result, woody riparian habitats are protected as sensitive habitats by State Fish and Game Code and county ordinances (Vollmar Consulting, 2006).

For an urbanized watershed, the Refugio Creek Watershed is blessed with a healthy riparian corridor for much of its length. In many other towns in California, buildings encroach into the riparian zone, and trees have been removed to accelerate flood waters. In the most extreme situations, urban creeks have been paved or buried. In the Refugio Creek Watershed, the riparian canopy is as wide as 200 feet in some places. Even along Sycamore Avenue, the most heavily developed area, the creek has a corridor nearly 100 feet wide. In the upper watershed, the dominant species are coast live oak, California bay, various willow species, and California buckeyes. In the lower watershed, newly restored reaches of creek are dominated by willows and shrubby vegetation.

Freshwater Marsh

Like riparian areas, freshwater marshes are biologically productive and diverse areas. Freshwater marshes are flooded frequently and the plants and animals that live there have adapted accordingly. More than 160 species of birds rely on freshwater marshes for food, cover, or water in California (Kramer, 1988).

The largest freshwater marshes in the Refugio Creek Watershed are in the lower watershed. Duck Pond, near Taraya Terrace, is a small body of water drained by a small outlet channel that flows beneath Sycamore Avenue. The pond is surrounded by willows, cattails, and eucalyptus trees. The surface of the pond is often green from duckweed and other aquatic vegetation that grows in the open sunlight. In the Western Preserve, between Bayside's western border and Sycamore Avenue, is a larger, deeper freshwater wetland. This wetland includes broad stands of cattails and open water. Its surface also turns green with vegetation in response to intense sunlight and possibly elevated levels of nutrients entering it from the surrounding lands, a common occurrence in urban watersheds.

Eucalyptus

The Refugio Creek Watershed includes several stands of eucalyptus, including one near the Teen Center on Refugio Valley Road and on the slopes of the lower watershed. Eucalyptus stands are characterized by tall, dense eucalyptus trees that form a closed canopy with little understory. Eucalyptus trees grow quickly even after fires or other disturbances. Eucalyptus trees were introduced to California in 1856 and have come to occupy a diverse range of conditions throughout the state. They were frequently planted as part of industrial activities to buffer against noise, explosions, or other related impacts (Pearson, 1988).

Eucalyptus are allelopathic, meaning they strongly influence what can and cannot grow nearby. Eucalyptus leaves and roots release chemicals that inhibit the growth of other plants in their understory. As a result, diversity in Eucalyptus groves in California are much less than in native forests.

Crows, ravens, barn owls, and some species of hawks commonly make use of eucalyptus for roosting, perching, and nesting. Fallen eucalyptus litter can provide cover for alligator lizards, gopher snakes, and wood rats (Pearson, 1988).

(From left to right) Freshwater Marshes exist in the lower watershed.

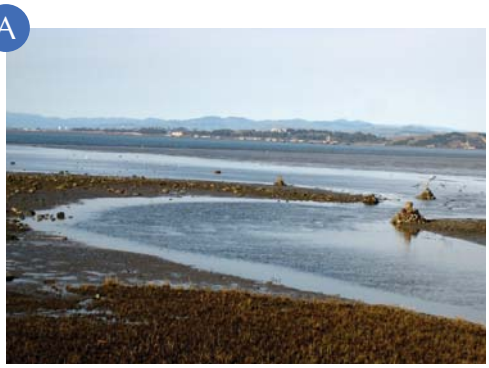
Eucalyptus are not native to California and support less biological diversity than similar native forests.

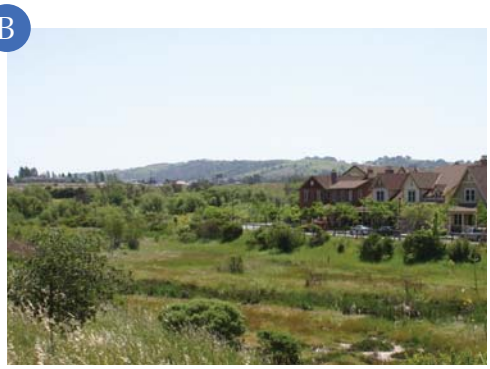
Urban/Suburban neighborhoods provide a different type of habitat for plants and animals.

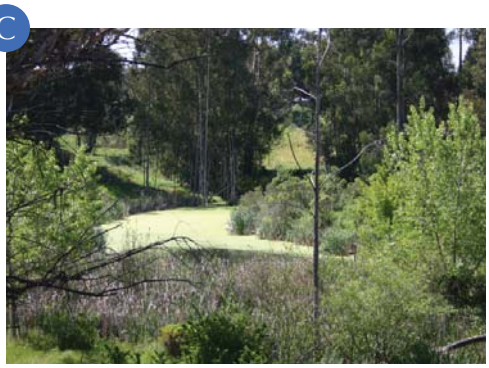
Urban/Suburban

Urban and suburban development is its own form of habitat. Though it is not necessarily intentional, lawns, buildings, street trees, garbage, and other artifacts of urban living provide food and shelter for certain species. Rats, crows, mice, pigeons, coyotes, and many other animals have adapted to urban environments, often thriving along with people.

Pets also contribute to the habitat quality of an urban area. Domestic cats and dogs are effective hunters that have a profound impact on local populations of wild animals. An East Bay Regional Park study found that a study site without house cats had twice as many birds compared to a study site with house cats. The site with cats no longer supported birds from some of the ground-dependant species, such as California quail (Hawkins, 1999). A similar study in San Diego found that cats from residences adjacent to a 50-acre open space study plot killed an estimated 840 rodents, 525 birds, and 595 lizards per year. The local animal population could not sustain itself with this level of predation (Crooks, 1999). These studies demonstrate that humans interact with the surrounding open spaces in many, often subtle ways.







Watershed Tour

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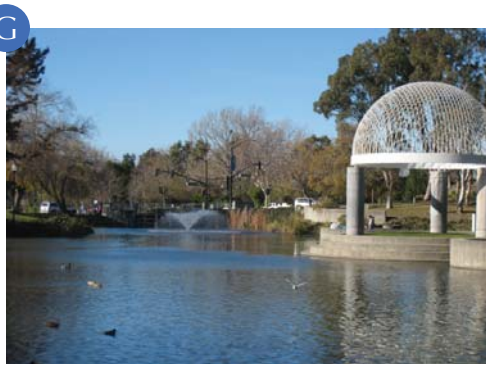

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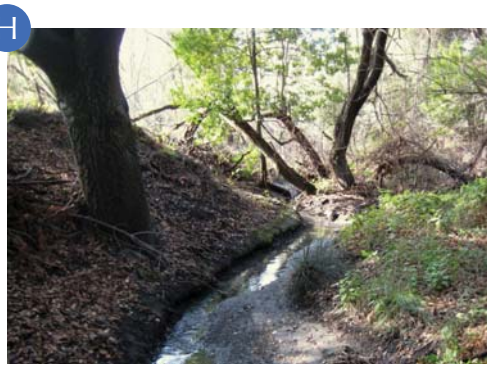

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Photopoint A: Mouth
At its mouth, Refugio Creek flows beneath the Union Pacific Railroad into a broad mudflat and enters San Pablo Bay. Mudflats look featureless, but a single handful can contain 40,000 organisms. These organisms depend on a combination of nutrients provided by the bay and by Refugio Creek and attract feeding shorebirds during low tide.

Photopoint B: Restored Reach
As part of the redevelopment of the lands of the Hercules Powder Company, approximately half a mile of Refugio Creek was restored. A new channel was carved and planted. Today, the restoration is still relatively new. Trees and plants are growing and the channel is adjusting to its new state. More restoration is expected downstream.

Photopoints C and D: Duck Pond and Lower Ponds
The "ponds" in the lower watershed are freshwater wetlands with cattails, snags (dead trees), and other common wetland plants. The ponds are valuable habitat for many birds, amphibians, and other animals, but the naturally occurring green algae and submerged vegetation that proliferate during warm, sunny months can occasionally attract complaints about the smell and appearance during warm months and concerns about mosquitos.

Photopoint E: Ohlone Creek
Refugio Creek's largest tributary is Ohlone Creek, which drains a hilly, mostly residential area of Hercules. Coast live oaks, eucalyptus, and bay trees grow on the steep slopes of upper Ohlone Creek. The creek enters a culvert at Ohlone Park near Ohlone Elementary School and reemerges downstream of Interstate-80. Ohlone Creek meets Refugio Creek near the John Muir Parkway.

Photopoint F: Railroad Culvert
The railroad, Interstate-80, Sycamore Avenue, and Refugio Creek all converge at nearly the same point in the watershed. Refugio Creek flows underground for approximately 800 feet and reemerges north of the intersection at San Pablo and Sycamore Avenues.

Photopoint G: Refugio Valley Park
At Refugio Valley Park, the creek flows into an artificial pond named Refugio Lake. Refugio Lake attracts ducks, geese, and anglers. Prior to recent budget cuts, the California Department of Fish and Game stocked trout in the lake.

Photopoint H: Upper Refugio Creek
Near the top of the watershed, Refugio Creek is just a few feet wide. Willows, oaks, buckeyes, and other trees form a complete canopy, shading the creek and providing food, cover, and habitat for animals.

Photopoint I: Teen Center
The Hercules Teen Center is situated on the banks of Refugio Creek across from Hercules Middle High School. The Teen Center offers before- and after-school programs for youth. Its location and purpose make it an excellent place to educate youth about creek and watershed issues.

Photopoint J: Upper Watershed Hillside Slopes
Oaks and bay trees cover the north and east facing slopes in the upper watershed. Grasslands cover the south and west facing slopes.

The Vision

Overview

Over six meetings and one field trip, residents of the Refugio Creek Watershed and other interested parties learned about the watershed, expressed their interests and concerns, and worked collaboratively to generate goals and propose actions in support of their goals. The articulation of their desires can be summarized by the following vision statement:

The Refugio Creek Watershed Vision Planning Group envisions a watershed with: healthy creeks and ponds that provide habitat for wildlife; trails that unify and celebrate the watershed; and communities that care for, learn about, and understand the watershed.

The vision planning group generated interests and concerns that were then converted to goals. These goals can be categorized in the following six topic areas: access; education and outreach; creeks; ponds; wildlife and nature; and storm water and water quality. The group proposed actions to support these goals that are detailed as follows.

Note that the action items listed below represent ideas generated during the meetings. Other watershed enhancement ideas may arise in the future especially in the Waterfront area which remains under development. The Vision Plan recognizes this and new ideas that are consistent with the spirit of the plan and result in small changes would not necessitate a revision.

Access

Goal: Provide connected biking and pedestrian opportunities throughout the watershed to improve health, provide alternatives to driving, create an appreciation for the watershed, and make central Hercules, on both sides of Interstate 80, feel connected.

Access refers both to access to the creek and access throughout the watershed. Vision planning group members recognized the abundance of planned and existing trails in the watershed. A creek-side hiking and biking trail connects Refugio Valley Park to the headwaters of Refugio Creek two and a half miles upstream. A network of sidewalks connects Refugio Valley Park with the central commercial area and the lower watershed west/northwest of Interstate 80. The San Francisco Bay Trail will traverse the San Pablo Bay shoreline. The Bay Area Ridge Trail will pass near the headwaters of the watershed.

Community Members Participating in the Refugio Creek Vision Plan Watershed Tour

The group identified opportunities to improve access throughout the watershed. Interstate 80 serves as a physical and psychological barrier between the two halves of central Hercules (upstream and downstream). The group proposed ways to improve bike and pedestrian access to encourage walking and highlight the creek experience in central Hercules.

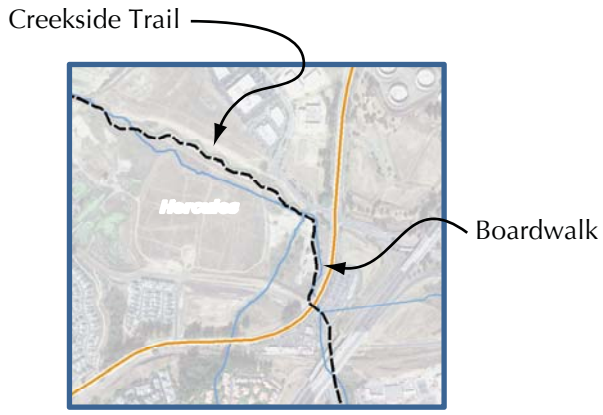
Several recommendations were to improve pedestrian access around the natural areas in the lower watershed. Recommendations include a pedestrian bridge between Bayside and John Muir Parkway and a boardwalk along the west side of San Pablo Avenue that would allow visual access into the natural area and pedestrian connection between John Muir Parkway and Sycamore Avenue.

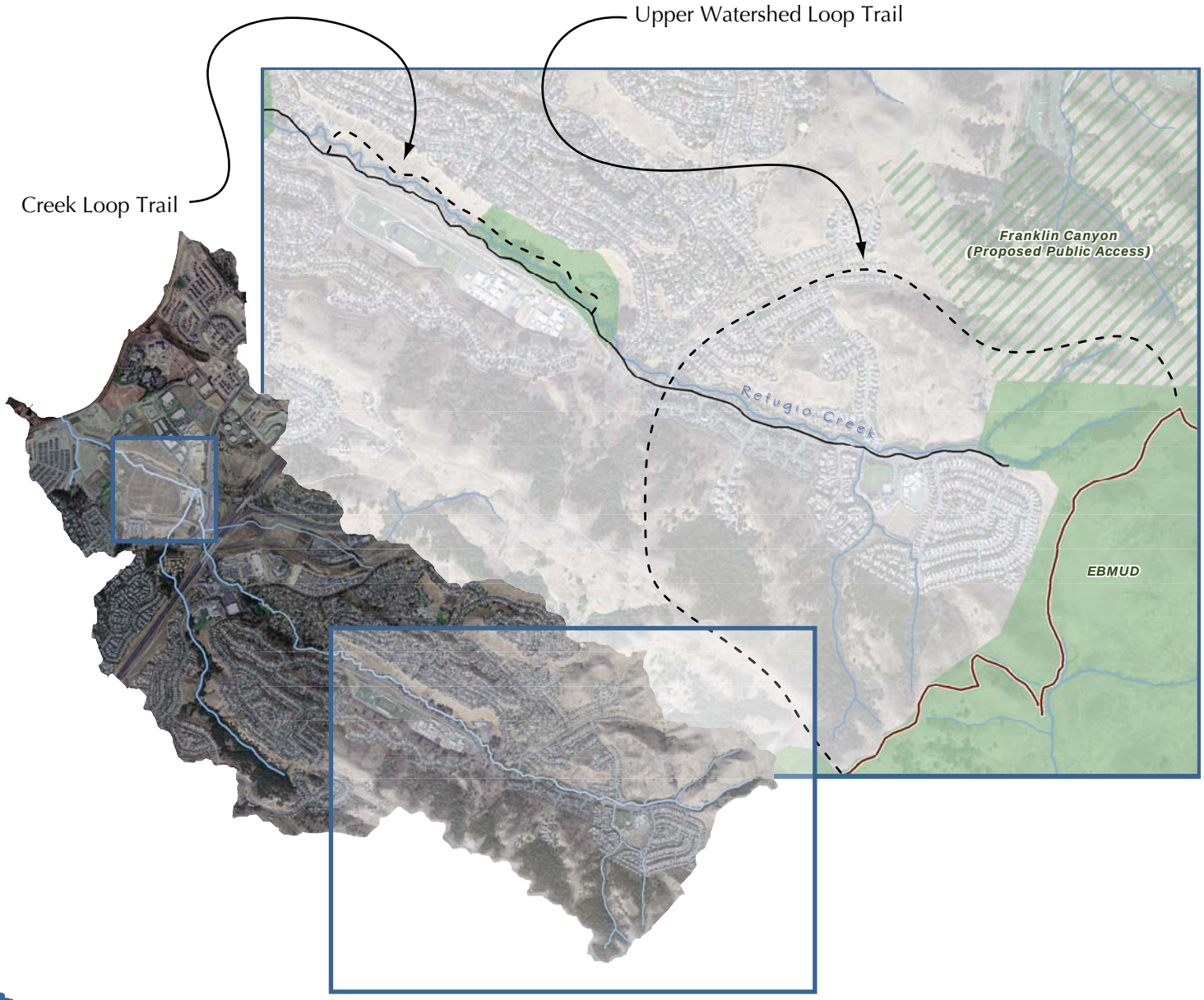
The group recognized that the creek-side trail that travels from Refugio Valley Park to the headwaters could be augmented to create two loops; one along the ridges of the upper watershed and one on either side of the creek between the Teen Center and Refugio Valley Park (See trails side bar on page 18 for more detail).

Proposed Actions:

Watershed Trails

- Create an access point to the Bay Area Ridge Trail and Fernandez Ranch at the top of Refugio Valley Road.
- Create a creek access point at the parking pull out across from Hanna Ranch Elementary School.
- Improve the cross walk (lighting and stop signs) at Refugio Valley Road and Carson Street by Hanna Ranch Elementary School
- Identify and highlight access points to Ohlone Creek trails.
- Maintain the trail across from the lower exit of Hercules Middle High School so that it does not erode into the creek.
- Create a boardwalk near the Bayside community between the John Muir Parkway and Tsushima Avenue and another to the west of San Pablo Avenue to provide pedestrian access between John Muir Parkway and Sycamore Avenue.
- Build a pedestrian bridge from South Front Street in Bayside to John Muir Parkway/Alfred Nobel Drive.
- Complete the creek trails down to the bay and San Francisco Bay Trail.
- Create a loop trail in the middle of the watershed by connecting the existing trail between Refugio Valley Road with an informal trail on other side of creek (connect at Teen Center and upstream of Country Run).
- Connect existing trails (and provide legal access) to create a loop trail along the ridges of the upper watershed starting at Falcon Way and Refugio Valley Road (See sidebar for more detail).


Creekside Trail
Boardwalk


Upper Watershed Loop Trail
Creek Loop Trail
Franklin Canyon
(Proposed Public Access)
Refugio Creek
EBMUD

Trails

The San Francisco Bay Trail will soon traverse the Refugio Creek Watershed along the San Pablo Bay shoreline. The Bay Area Ridge Trail will pass on EBMUD lands very near the head of Refugio Valley. Between the two is the Refugio Valley Trail. The trail currently begins at the upstream end of Refugio Valley Road, just 350 yards short of the planned Bay Area Ridge Trail. In order to connect the trails, access agreements would need to be worked out between the City, EBMUD, and the homeowners' association that owns the land in between Refugio Valley Road and the planned Ridge Trail.

Between the head of Refugio Valley Road and Refugio Valley Park, the trail is a combination hiking and biking trail that runs mostly along Refugio Creek. Between Refugio Valley Park and San Pablo Avenue, the trail is a series of sidewalks and pedestrian crossings that move users under the freeway and railroad overpasses. Downstream of San Pablo Avenue, a trail user can continue toward the Bay via wide sidewalks along Sycamore Avenue or San Pablo Avenue/John Muir Parkway. Planned development in the lower watershed will connect these pathways with the Bay Trail.

The watershed vision planning group identified several other trail opportunities in and around the watershed. The trails for most of these already exist as maintenance roads in the open space that rings the watershed. Much like the Ridge Trail connections, access agreements, liability, and other legal issues would need to be worked out with the landowners and the legal entity that would assume management of the trail.

The planning group identified the potential for an upper watershed trail that began at the traffic circle at Refugio Valley Road, Falcon Way, and Redwood Road. A trail that ascended up to the north and south ridges and traveled along both ridges to the Bay Area Ridge Trail on EBMUD lands would encircle the upper watershed in a 4.5-mile loop. Since the vision planning process did not investigate all the legal issues and the needs of all the landowners that would be involved, the trail is represented on the map conceptually.

From the same traffic circle, the group identified a second potential loop trail that would head downstream to Refugio Valley Park. The trail that currently connects to the park travels between Refugio Valley Road and Refugio Creek on the south side of the creek. An informal trail on city property parallels the existing trail but on the north side of the creek. This trail could be improved and included in the trail network, creating a pleasant loop trail between the middle and upper watershed.

Downstream of Refugio Valley Park, the creek, the trail, and Sycamore Avenue all need to fit underneath the Burlington Northern Santa Fe Railroad Bridge. The creek goes underground into a culvert and the trail becomes a sidewalk on the opposite side of Sycamore Avenue. The roads are highly trafficked, and the sidewalk crosses many intersections.

The planning group identified a need to redesign the trail experience through this reach of the watershed. The group expressed a desire to better integrate the creek, the trail, and the stores in the area to create a better, smoother, and more compelling connection between the middle watershed and the lower watershed.

The planning group stated its desire for better pedestrian access in and around the natural areas of the lower watershed to encourage walking, provide nature viewing areas, and foster appreciation for the natural areas. Suggested boardwalks or pedestrian bridges include connections between Bayside and John Muir Parkway, and a boardwalk to the west of San Pablo Avenue.

- Construct a boardwalk through the ponds in the lower watershed to connect the Bayside neighborhood to the future Sycamore Park/school site.
- Consider using boardwalks to access sensitive areas in the creek.
- Use appropriate materials for creek access points (low impact materials such as decomposed granite for trails rather than concrete).
- Plant native, drought-tolerant vegetation, especially trees, along trail. For example, trees grow naturally very well along the creeks and stream beds of the EBMUD land directly east of Hercules. Many of these trees were planted 14 years ago and are thriving to this day without irrigation or maintenance.

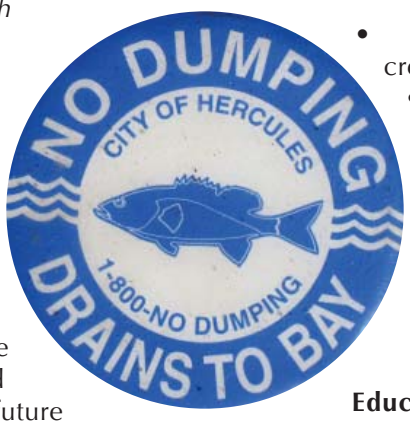
Improving Connections through Central Hercules

- Improve bike and pedestrian access under I-80 and railroad tracks along the culvert to link the upper creek with the lower creek. This "culvert trail" would start at the Creekside Center clock sign, continue under I-80 and the railroad bridge, travel through the future Market Town project (old park & ride lot), cross San Pablo Avenue, and end adjacent to the east side of Bayside. This "culvert trail" should have public art, in the form of paintings, murals, mosaics, stamped concrete, etc., that use thematic water elements along the way to educate the public of the presence of the buried creek. Sidewalks, crosswalks, etc., could have (for example) stamped concrete with creek wildlife, creek plant life, and general water imagery that would visually link (like breadcrumbs of public art) the two ends of the culvert together.
- Beautify and integrate creeks and trails to create a better pedestrian experience when walking between Refugio Valley Park and San Pablo Avenue.
- Town center should use the creek as part of its identity and access.
- Improve visual access on existing path next to creek and on the retail side overlooking creek.

Trail Quality and Trail Experience

- Clean up the trails.
- Plant native, drought tolerant vegetation along trail (especially trees).
- Create interpretive trails near the Bayside neighborhood and the proposed park/school in the lower watershed.
- Provide trash cans and pet litter bags along trails.
- Create an interpretive program along the trails that tells the story of Hercules and the watershed, and highlights the plants, wildlife, and other resources.

Creek Access



- Provide better access to the creek in Refugio Valley Park.
- Better connect the trails with the creek.
- Formalize and limit access points into the creek to protect habitat.
- Include interpretive signs at formal creek access points.

Education and Outreach

Goal: Educate the community to improve water quality and habitat, and create opportunities to interact with the creek and to appreciate the watershed.

Early on, the planning group recognized the value of the watershed and the educational opportunities it offers. Ohlone Elementary School, Hanna Ranch Elementary School, Hercules Middle High School, the Hercules Teen Center, and the potential school between the Baywood and Bayside neighborhoods are all adjacent to or very near creeks. For residents, the creek is a very visible feature throughout much of Hercules. Yet while the creek is always nearby and visible, it may not always be understood or appreciated. The planning group recognized many opportunities to

highlight the creek, work together to improve the creek, and integrate it more fully into the lives of watershed residents. The most detailed of these proposals, providing creek-based programs at the Hercules Teen Center, is explained in a sidebar.

Proposed Actions:

Community Organization

- Create a citizen-based community group to help steward the creek.
- Have a watershed coordinator plan and coordinate creek activities.
- Partner with The Watershed Project, Hercules Community Gardeners, Kadets, the Teen/Youth Council, and Earth Team to educate the community.

Events

- Provide regular watershed tours for the public.
- Establish a "Creek Fest" similar to the Pinole Creek event.
- Hold pollution and debris pickup not just in creeks but in entire watershed on Coastal Cleanup Day and other days.
- Add Coastal Cleanup Day to the list of regular events the City hosts/participates in. This would require close coordination with the City's Special Events Coordinator, Parks and Rec Department and perhaps the Middle High School Environmental Science classes.

Schools

- Identify teachers to be environmental coordinators
- Conduct water quality testing through educational programs with the schools or volunteers
- Create a creek docent program through the schools
- Create creek-stewardship program at Teen Center along with garden, native plantings, improved creek access, and a loop trail (see sidebar)
- Make connections between schools and other groups to share ideas and resources

Educational Materials

- Create summaries of watershed issues.
- Create a self-guided tour using number posts at places along the creek. Tour guides could be available on-line or at places such as the library.
- Establish a clearing house or archive to retain reports, photos, and art pertaining to the watershed.
- Create a Refugio Creek book that would include a list of species with photographs

Despite an abundance of open space, residents of Refugio Creek Watershed do not always have access.

Teen Center

The Hercules Teen Center is at 2007 Refugio Valley Road across the street from Hercules Middle High School. The goal of the Teen Center is to "provide programming that will foster human development, promote health and wellness, and increase cultural unity with life experiences" (City of Hercules, 2009). The Teen Center offers training, tutoring, counseling and other activities intended for teens in Hercules. Refugio Creek runs between the Teen Center and Refugio Valley Road.

One of the ideas that arose from the vision planning process was to initiate a creek stewardship program at the Teen Center. The Teen Center's proximity to the creek and to the middle high school makes it a viable location to support such activities. Teens could learn how creeks function, how to monitor them, and how to maintain them, in part by providing access to the creek canopy and floodplain along "living laboratory" boardwalks located just outside the Teen Center. Teens could be involved in planting native vegetation in the creek near the Teen Center, keeping the creek clean, and could eventually expand their area of stewardship to other parts of the creek.

The group envisioned a mentoring program that would assist the teens in developing interpretive walks. The programming would coordinate with the schools to sponsor and environmental studies program that includes field trips, event such as coastal cleanup day, recycling, and others. A community garden and native planting area at the Teen Center could compliment the creek and generate even more programming. A conceptual design for the Teen Center is shown below.


Hercules Teen Center
Conceptual Design: Integrating the Creek
-20' 0' 20' 40'
Upland Grassland
Loop Trail
Community Garden
Mixed Scrub Habitat Hill
Canopy Boardwalk
Mixed Scrub Habitat Hill
Bioretention at drain inlets
Teen Center
Refugio Valley Road
Refugio Creek
Native Plant Propagation Area
Floodplain Boardwalk
Hercules Community Swim Center
Hercules Middle High School
Teen Center
Refugio Valley Road

of plants and animals found in the watershed.
- Place interpretive signage along John Muir Parkway sidewalk and other reaches near creek restoration area to explain the creek and restoration.
- Create and maintain a website for watershed information both in Hercules and outside of Hercules (include activities, links to other websites, data and information clearinghouse).
- Use interpretive signs to explain the history of sites and areas along the creek.

Creeks

Goal: Improve water quality, increase native habitat, and restore the creeks of the Refugio Creek Watershed to as natural a condition as possible.

As described above, Refugio Creek is in relatively good condition for an urban creek. For most of its length, it is above ground. There is not a lot of infrastructure constricting the creek, and it is well-vegetated with trees and understory plants that shade the creek, supply stabilizing structure, and provide food and cover for animals. The vision planning group did not have access to any survey data that quantified the health of the creek, but visual inspection by the group and professional judgment helped suggest some opportunities. Key among these is using native plants to replace non-native plants, particularly ivy, pampas grass, and eucalyptus in Refugio Valley Park and elsewhere. Replacing these species with native species will increase the habitat value and improve the resiliency of the entire creek system.

Proposed Actions:

- Evaluate fish passage at the Refugio Valley Park drop structure.
- Daylight the creek downstream of the fire station (alongside Refugio Valley Road).
- Investigate the potential to irrigate the community garden with creek water.
- Replace non-native vegetation (e.g., ivy, pampas grass, eucalyptus) with native vegetation.

- Restore Ohlone Creek between San Pablo Ave. and Sycamore Ave. in conjunction with development of the adjacent property.
- Keep Ohlone Creek as open as possible, modeled after the San Luis Obispo creek restoration.
- Manage the creeks as wildlife corridors.
- Ensure that the creek is maintained as planned.
- Manage the creeks primarily for wildlife and habitat while accommodating public access and flood protection.
- Install stream gauges to gather data on stream flow.

Ponds

Goal: Improve water quality, increase native habitat, and reduce the maintenance costs of the ponds in Refugio Creek Watershed.

The vision planning group discussed three ponds in the Refugio Creek Watershed: Refugio Lake, Duck Pond, and the lower ponds near the Bayside and Baywood neighborhoods. Each pond is unique in character and presents distinct challenges.

Refugio Lake is in Refugio Valley Park. It is an artificial lake constructed as part of the park several decades ago. Refugio Creek flows into the lake and exits through a drop structure under Sycamore Avenue. The lake is a significant feature in a very popular park. The lake attracts geese and ducks. In the past, it has been stocked with fish and is still occasionally used by recreational anglers.

When Refugio Creek enters into Refugio Lake, the water slows. When it slows, it drops much of the sediment it carries and the sediment deposits in the lake. The City of Hercules has had to dredge the pond in the past to remove this sediment.

Aquatic vegetation and algae grow well in shallow ponds that are exposed to direct sunlight. The lake has three aerators that spray the lake water into the air like fountains to keep the water flowing and full of oxygen. This helps combat the unsightly growth of unwanted aquatic vegetation and algae. Despite these efforts, vision planning group

Native Vegetation

Native plants are plants that existed in California prior to European contact. They evolved simultaneously with native California animals, fungi, and microbes. Together, they created a complex network of supporting organisms. When Europeans arrived in California, and ever since, they brought with them plants from elsewhere. In some cases, the new plants are fairly harmless. In other cases, the plants take over certain habitats and prevent native plants from growing. The new plants are able to out-compete the native plants because the pests, weather conditions, or other factors that kept them in check in their home countries are not present in California. The loss of native plants can be harmful to the animals that evolved to depend on them for food and shelter (CNPS, 2009).

Creeks in Contra Costa County have many non-native plants that can out-compete native plants. Eucalyptus, Himalayan blackberry, giant reed, pampas grass, Algerian ivy, periwinkle, and other non-native plants can dramatically change the character of a creek and its ability to support native wildlife. A key feature of creek restoration is removing non-native plants and replacing them with native plants. Native plant restoration is extremely valuable to the health of the creek and it can be accomplished by volunteers.

Some common native plants in and near Refugio Creek are coast live oak, valley oak, California bay, Fremont cottonwood, California buckeye, arroyo willow, Pacific willow, elderberry, California rose, and California blackberry.

members mentioned the presence of "pond scum" in the lake during summer months.

Duck Pond and the lower ponds are in the lower watershed and all feed into Refugio Creek. These ponds have more natural looking features than Refugio Lake. Vision planning group members frequently commented on both the sight and smell of the ponds in the summer months when they filled with algae and aquatic vegetation such as duck weed. Nearby residents also expressed concern over possibly providing mosquito habitat in the ponds.

In all three ponds, the problems and solutions are complex and require further study beyond the scope of the Vision Plan. The vision planning group identified the problems associated with the quality of the ponds (and perhaps maintenance costs related to dredging of Refugio Lake) and recommended further study.

Proposed Actions:

- Improve the water quality (pond scum) at Refugio Lake.
- Evaluate ways to improve the water quality in lower watershed ponds.
- Evaluate improving the drainage out of Duck Pond by shading the outlet channel with native riparian trees and adjusting the outlet elevation.
- Investigate the costs and benefits of maintaining Refugio Lake.
- Consider increasing water flow in and out of the lower watershed ponds to naturally eliminate mosquito habitat.
- Establish a permanent stewardship and governance for the larger wetland preserves.

Wildlife and Nature

Goal: Provide, protect, and improve habitat for desired wildlife in the Refugio Creek Watershed.

With nearly a third of the watershed as open space and being adjacent to large open spaces in the Rodeo and Pinole Creek watersheds, the Refugio Creek Watershed still supports wildlife. Several planning group members expressed their delight, upon moving into the watershed from elsewhere, at the quantity of wildlife near their homes.

Designing specific strategies to manage the wildlife is beyond the scope of the vision planning group. However, actions the group proposed reflect an appreciation for the wildlife with which they share the watershed.

Proposed Actions:

- Manage the creeks as wildlife corridors.
- Identify sites for mitigation (for threatened and endangered species).
- Create wildlife enhancement projects that are ready for funding in order to access mitigation funds.
- Reduce impacts of feral cats, wild turkeys, and other non-native species.
- Manage the creeks primarily for wildlife and habitat while accommodating public access and flood protection.

Storm Water and Water Quality

Goal: Reduce flood risk and improve water quality in Refugio Creek Watershed.

Though the planning group did not have any data quantifying flooding or water quality in Refugio Creek Watershed, it did come to appreciate the value of green storm water treatment and improving water quality. Water that is allowed to seep into the ground moves slowly to the creeks and along the way it is cleansed of pollutants and impurities. Water that flows off of buildings, roads, and parking lots into storm drains flows quickly to the creek, carrying pollutants and causing higher flows in the creek. These higher flows and erosion can sometimes lead to flooding.

Based on a general understanding of storm water and water quality, the vision planning group recommended several actions that will help improve creek health.

Proposed Actions:

- Place "Drains to Bay" signage at all storm

drains.

- Evaluate opportunities to filter trash, grease, and pollutants from storm water at pipe outfalls and storm drain inflows.
- Use BMPs (best management practices) to keep trash and pollutants out of creek.
- Consider alternatives to storm drains. (swales, rain gardens).
- Investigate the capacity for on-site water retention.
- Organize and expand creek clean-ups.
- Conduct water quality testing through educational programs with the schools or volunteers.
- Use more pavers and pervious surfaces
- Install permanent BMPs on storm drains with a permanent funding source to maintain it.
- Improve retention of storm water runoff.
- Future dog parks should treat water quality issues associated with dog waste.

Storm Water Treatment

When rain falls on a forest or open field, the water soaks into the ground and slowly moves downhill. As it does, it is cleansed of impurities. When water falls on the roof of a building, it drains quickly into gutters, across pavement, into storm drains, and into the creek, along with the pollutants it encounters along the way. When much of the watershed is covered in buildings and pavement, this can have a profound impact on the creek. When it rains, the creek quickly rises as water rushing off of pavement is delivered rapidly into the creek. It can cause unexpected flooding, and the pollutants it carries can be harmful to the plants and animals in the creek.

Cities all over the west coast are beginning to realize the benefit of green storm water treatments. Green storm water treatments are strategies and techniques to slow water down, spread it out, and allow it to infiltrate into the ground, much as it would in a more natural setting.

Living roofs retain rain water in roof top gardens that have the added benefit of insulating the buildings beneath them. Swales substitute for concrete drains and allow water to move more slowly and cleanse itself before entering the creek. Bio-retention cells, similar to those at the Hercules Public Library, retain water and use it to grow plants rather than pass it on into storm drains. Rain gardens do much the same thing on a larger scale. Permeable paving substitutes for asphalt where cars need to drive or park. The permeable paving provides a strong surface to support vehicles, but allow water to infiltrate the ground below.

Continuous Deflective Separation (CDS) systems can trap debris, sediment, and oil and grease from storm water runoff. CDS systems are installed at key outfalls and use screens to remove these pollutants from storm water before it enters the creek. Green storm water treatments can be initially expensive and often require more room than traditional storm water treatments. However, many cities are beginning to realize that the long term benefits to the creek and the community outweigh the initial costs.

Next Steps

The Refugio Creek Watershed Vision Planning Group has articulated a vision, identified supporting goals, and proposed actions for the Refugio Creek Watershed. While this document captures the group's vision, it is not an end in and of itself. The value of a vision and a Vision Plan is in the actions that follow. The challenge is to maintain the momentum generated by the vision planning process and translate that into results.

The Vision Plan lists many exciting actions to begin to fulfill the vision. The question remains which action to take first. In a watershed like Refugio Creek, where there are not urgent flooding, water quality, or endangered species issues, the choice may not be obvious.

Priorities

At the final community meeting, the vision planning group participated in a priority setting exercise and discussion. The exercise and ensuing conversation identified generally where the group's priorities lay. Of the six subject areas, Access, Outreach and Education, and Ponds scored highest, reflecting the group's interest in trails, community outreach, and addressing the issues in the lower watershed ponds.

The group also identified specific actions that it thought were most important. In the Access category, the group was most interested in connecting the Refugio Creek Trail with the Bay Area Ridge Trail, and creating a loop trail along the ridges of the upper watershed. In the Outreach and Education category, developing the watershed program at the Teen Center and creating a 'friends' group to work on the creek were the two highest priorities.

In the Creeks category, removing invasive plants and replacing them with native plants was the group's highest priority. The group identified improving water quality in the lower watershed ponds as its highest priority in the Ponds category. Creating wildlife enhancement projects and evaluating opportunities to filter trash and pollutants were the highest priorities in their respective categories.

Community Organizing

The vision planning group suggested forming a community-based creek group to study, steward, and care for the creek. Commonly referred to as 'friends' groups (e.g., Friends of Refugio Creek Watershed), these watershed groups are abundant in Contra Costa County. Friends of Pinole Creek have been active in their watershed for many years. Friends groups typically set an agenda to improve the creek through creek clean ups, monitoring, partnering with schools and engaging with local governments. A few dedicated individuals working together in a friends group can have a profound impact on the health of the creek and the character of a city. Support is available from local non-profits such as The Watershed Project, and from the County through its Contra Costa Watershed Forum.

Several of the priorities the vision planning group identified are well suited to a 'friends' group. These include the Teen Center creek program, native plantings, and advocacy for trail planning.

Conclusion

The Refugio Creek Watershed is a major feature of the City of Hercules. As one vision planning member stated, "Refugio Creek is our Main Street." The vision articulated in this document is a reflection of the cultural values of the residents and the current conditions of the watershed. As conditions change, new residents arrive in Hercules, and cultural values evolve, this vision may change. At such time, the Vision Plan may need revising or updating. Until then, The Refugio Creek Watershed Vision Plan will serve as a reference guide for future actions, recommending activities that the community is likely to support, and informing decisions that relate to the watershed.

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