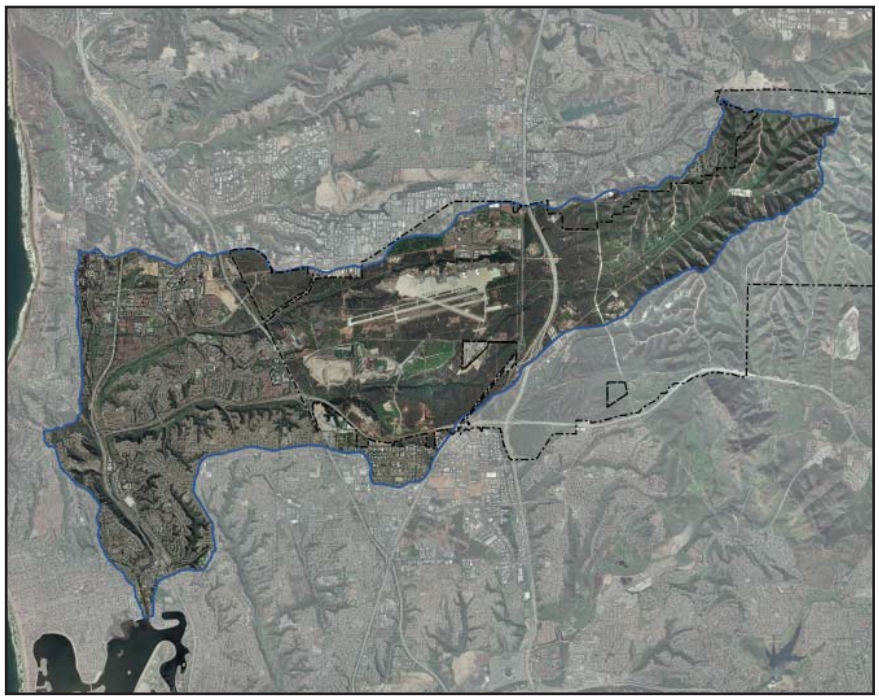
2 Action Recommendations

The Rose Creek Watershed (RCW) suffers from many of the same ailments as many urbanized southern California coastal watersheds. However, the RCW also benefits from two key factors that provide hope and opportunities for future improvements in overall watershed health and function. These factors are: 1) much of the upper watershed is being managed by MCAS Miramar as open space with low impact training ranges; and 2) the City of San Diego owns and manages as open space the majority of Rose and San Clemente Canyons from the western boundary of MCAS Miramar to just below their confluence near the Interstate 5 and State Route 52 interchange. These two factors provide a significant land area within the RCW where natural watershed functions can be maintained, enhanced or even re-created.



The action recommendations described herein are the culmination of a year long process that focused on reviewing existing data and reports, conducting limited field work and assessments, and gaining insight from local stakeholders regarding their concerns and priorities. The actions are adaptive management tools to be used alone or in combination to systematically improve the use and function of the watershed's resources. The recommended actions fall into the following categories: biological resources; cultural resources; public safety; recreational trails; and water resources.

The recommendations center on a few key goals: 1) the issues and solutions within the RCW are linked and should be addressed concurrently; 2) hydrologic improvements (including water quality) are crucial to restoring the natural functions of the streams; 3) creation of a continuous recreational trail and wildlife corridor from Interstate 805 to Mission Bay is a viable and necessary regional amenity; and 4) support for the recommendations will need to be developed through public outreach and education.

Understanding the value of incremental changes via an adaptive management program that considers habitat restoration (Section 2.1), hydrologic improvements (Section 2.5), and public access (Section 2.4) is crucial to the long-term success of these efforts. Adaptive management is the recognition that restoration professionals and scientists as a whole still can not precisely predict the environmental responses to changes introduced by a project, and as such, an set of adaptive steps may be necessary to adjust and manage the project over time to compensate for environmental changes. Some of the recommendations in this assessment take the concept a step further and recommend that large improvement projects be broken into numerous incremental phases to allow adaptations between phases to occur to ensure the overall project meets its intended goal.

In addition, most of the recommendations focus on the western third of the RCW, which falls west of Interstate 805 and completely within the jurisdiction of the City of San Diego. Some of the recommendations due include the portions of the RCW that fall within MCAS Miramar, but are predominantly coordination and cooperation efforts and not on the ground improvement projects. The recommended ongoing coordination with MCAS Miramar may lead to opportunities for cooperative projects.

2.1 Recommendations for Proactive Conservation in the Rose Creek Watershed

- ☑ *Create the Rose Creek Watershed Conservation Bank*
- ☑ *Design the conservation bank to principally serve the broader conservation goals for the watershed outlined in this assessment*
- ☑ *Designate one City department to lead the design, development and implementation of the bank on behalf of the City*
- ☑ *Release for sale to other public or private entities, any mitigation credits created as a result of this assessment in excess of the City's anticipated mitigation needs*
- ☑ *Negotiate a comprehensive programmatic permit with the wildlife agencies for the recommended actions of this assessment*

In the State of California, conservation banking is a resource management tool created in response to the legal requirements for environmental mitigation; the State's experience with mitigation banks; the use of the marketplace to advance conservation; and the need to facilitate and promote more effective regional habitat conservation.

Environmental mitigation is a requirement that a landowner, which includes public agencies such as the City of San Diego, "minimize or mitigate" for activities that are damaging to the environment. For example, under the California Environmental Quality Act (CEQA), if a proposed project will "substantially diminish habitat for fish, wildlife or plants," mitigation is required. Mitigation is also required as a condition to "take" (kill, harm, etc.) a species under the California Endangered Species Act. Mitigation also is required under Federal statutes; for example, under the Federal Endangered Species Act, a habitat conservation plan that is designed to protect and "recover" a threatened or endangered species can require it. The Federal Clean Water Act also requires mitigation for activities that alter or harm existing wetlands.

The City of San Diego, in its role providing regular services such as roads, sewers and flood control (for example, storm drain maintenance), is often required to mitigate for its actions that harm the environment. This is true in the Rose Creek Watershed and other city watersheds. Unfortunately, in addition to mitigation requirements stemming from its day-to-day municipal activities, due to an aging infrastructure and limited maintenance budgets, in recent years the city has been fined for violations of environmental laws such as illegal sewer discharges (Section 3-8). Often those fines include requirements that the city mitigate for the impacts caused by the violations. The mitigation requirements can include permanently preserving or restoring habitat including the creation of "new" habitat. Usually the mitigation requirements are directly tied to the damage created.

For the most part, the city's current approach to a mitigation requirement is reactionary; City departments use both in-house staff and outside consultants to identify and implement possible mitigation sites in response to a particular mitigation need. Most mitigation is carried out in isolation; little if any consideration is given to the overall conservation needs of the particular watershed. Mitigation is piecemeal in reaction to an action already taken (such as a violation of environmental laws) or in anticipation of a future action that will harm the environment (such as constructing a new sewer pipe).

2.1.1 Conservation Banking is Proactive

Conservation banking has evolved from mitigation banking with the goal to take a more pro-active approach. A conservation bank is created, not in reaction to a particular harm (or anticipated harm) to the environment but to preserve, restore, enhance and create new wildlife habitat for the region. It is conservation for conservation sake but with an entrepreneurial twist; the new conserved lands, especially wetlands, can have economic value in "credits" that can later be sold. The proceeds can then be used to support the maintenance of the resource in perpetuity. One goal of conservation banks is to serve to facilitate the creation and/or restoration of wetlands -- in lieu of other degraded or non-functioning wetlands -- thus effectively increasing the net number of permanent protected wetland acres in California.

2.1.2 Conservation Banking in the Rose Creek Watershed

By creating a conservation bank in the Rose Creek Watershed available to all City departments but led by one department, the City will eliminate lengthy project by project regulatory processes and significant costs. A Rose Creek Watershed Conservation Bank will reduce individual City department's mitigation compliance to a single transaction (a purchase of credit from the bank) and create the certainty of having complied with mandated mitigation requirements. By centralizing the bank under the Park and Recreation Department, Open Space Division, the City will assure that the bank is managed by the City department with the greatest expertise concerning environmental laws and natural resource management. Under the Park and Recreation Department's direction, the bank could also be developed and managed consistent with the MSCP, strengthening the City's commitment to the regional habitat plan as new areas in the Rose Creek Watershed could be added to the plan after restoration or creation.

Another added benefit to this more comprehensive approach is by designing the bank to implement the recommendations of this assessment, including improvements to public safety and recreation as well as biology, the City's efforts to create the bank can be leveraged into multiple public improvements. Improvements will extend well beyond the mitigation secured by the current City practice to meet department by department mitigation needs. This holistic watershed approach is more efficient and cost effective as it centralizes the role of designing and implementing the conservation bank in the department with the most relevant experience delivering natural resource protection instead of scattering it across multiple departments as is now the case.

Departments within the city have been generally supportive to the concept of mitigation banking. For example, the City of San Diego has begun to investigate the feasibility of creating a mitigation bank for its ongoing storm drain maintenance needs. City policy since 1987 has been to prohibit the sale of mitigation credits from City lands to private entities, primarily because the City has wanted to retain City credits to fulfill future City mitigation requirements.

Yet, to continue this reactive approach alone is to miss a greater opportunity to stop the current decline in biological value and the deterioration in public safety underway in portions of the watershed, especially in areas of Lower Rose Creek outside the jurisdiction of the Park and Recreation Department, Open Space Division. By taking a proactive approach to create a conservation bank designed to serve the broader public resource -- the City can initiate restoration and public improvements to enhance public lands in the Rose Creek Watershed for public purposes while simultaneously creating economic value (the mitigation credits) that can be used to support and maintain the property in perpetuity.

The conservation bank should also include implementation measures proposed in the Mission Bay Plan for the mouth of Rose Creek, including creation of the proposed wetlands at De Anza Cove. Because coastal wetlands are in very short supply and in high demand, these wetland mitigation credits could be extremely valuable. Creation of the Rose Creek Watershed Conservation Bank must be done in close coordination with the wildlife agencies responsible for authorizing such actions.

1. Create the Rose Creek Watershed Conservation Bank to advance comprehensive proactive restoration of the RCW, including the area where the creek enters Mission Bay, as recommended by this assessment and in the Mission Bay Plan while creating economic value to the primary property owner, the City of San Diego.

2. Design the conservation bank to principally serve the broader conservation goals for the watershed outlined in this assessment and in the Mission Bay Plan and secondarily serve the anticipated mitigation needs of City departments.

3. Designate one City department, Park and Recreation, Open Space Division, to lead the design, development, permitting and implementation of the bank on behalf of the City. Create measurable incentives for City departments to collaborate on the development of the bank and implementation of the assessment.

4. Release for sale to other public or private entities, any mitigation credits created as a result of this assessment in excess of the City's anticipated mitigation needs. The value of those credits, once sold, should return to the bank as part of a non-wasting endowment dedicated to support the maintenance of the improvements in perpetuity. Future City mitigation needs would need to be guaranteed.

5. Negotiate a comprehensive programmatic permit and associated environmental documents with the wildlife agencies to allow for permitting of recommended actions of this assessment and associated recommendations in the Mission Bay Plan in a comprehensive and cost effective manner.

Additional background information on this recommendation is provided in Chapter 4 in Section 4.2 on page 4-2.

2.2 Recommendations for Biological Resources

- ☑ *Retain and enhance MCAS Miramar and land area to the east of the watershed as large blocks of contiguous healthy habitat*
- ☑ *Enhance the biological connection of the RCW to Mission Bay*
- ☑ *Control invasive species throughout the RCW*
- ☑ *Restore and enhance native habitats within the RCW*
- ☑ *Protect and enhance wildlife corridors by eliminating or improving existing barriers and minimizing or eliminating impacts of new barriers*
- ☑ *Establish consistent land management of the focus area lands, including private and public lands in the RCW*

Relatively natural conditions in upper Rose Creek

Moderately impacted conditions in middle Rose Creek

Highly degraded conditions in lower Rose Creek

The RCW has a rich collection of biological resources, including some that are typically no longer found within close proximity to the coast. The value of the undeveloped lands on MCAS Miramar and their contribution to the overall health and diversity of the biological resources within the entire watershed can not be understated. They provide large blocks of habitat that minimize adverse edge affects and provide regional connectivity for immigration and migration of plants and animals. This direct connectivity to large blocks of habitat is unique in southern California as urban development on the coast has restricted or eliminated wildlife movement and habitats. There exists a definite gradient within the RCW as to the health and diversity of the biological resources, from the headwaters that show limited signs of stress to lower Rose Creek that is highly degraded. One goal of this assessment is to halt the decline in biological value in the lower watershed, while protecting the upper watershed from further decline. As such, the action recommendations vary from protection and enhancement within the upper portions of the watershed, to complete restoration and rehabilitation in lower Rose Creek.

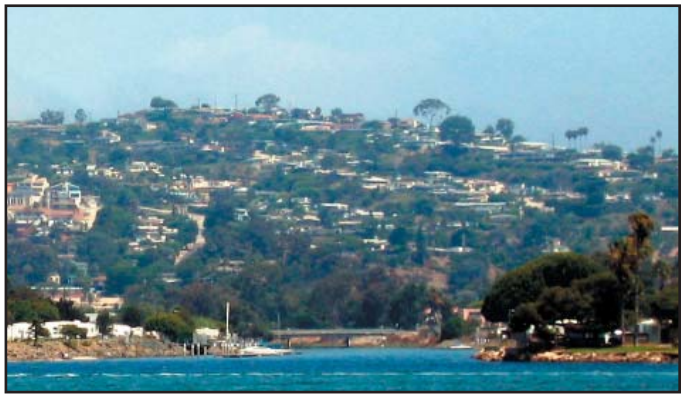
Invasive exotic species, especially plants, pose a serious threat to the health of the native vegetation communities, without which the rich diversity of wildlife will continue its current decline. To be effective long-term, an on-going comprehensive program of invasive species removal in the watershed, including both public and private lands, is recommended. MCAS Miramar leads the way in this stewardship role, having completed significant eradication and control efforts and managing new infestations as they arise.

The restoration of native plant communities (both uplands and wetlands) is recommended in the wake of the invasive plant infestations and stream channel erosion caused by hydrologic modifications associated with land development over the past 50 years. Previous efforts, while well intended, have been undertaken in a piece-meal fashion without full consideration of the natural dynamics associated with watershed and biological processes (e.g. stream channel stability, floodplain dynamics, sensitive animal species and the plant communities they depend upon). This assessment proposes instead a watershed-wide systematic approach more likely to be sustainable.

Education and outreach to individual landowners about how they can help (e.g. reducing pollutants in runoff, reducing runoff, removal of invasive plants, reducing abandonment of unwanted pets) is one of the keys to long-term success, since without changes in individual attitudes and behaviors, all of the other efforts are only temporary fixes.

2.2.1 Recommendations for Enhancing the Connection to Mission Bay

- ☑ *Partner with city to design watershed improvements to benefit the bay*
- ☑ *Assess potential for habitat enhancements for the light-footed Clapper Rail*

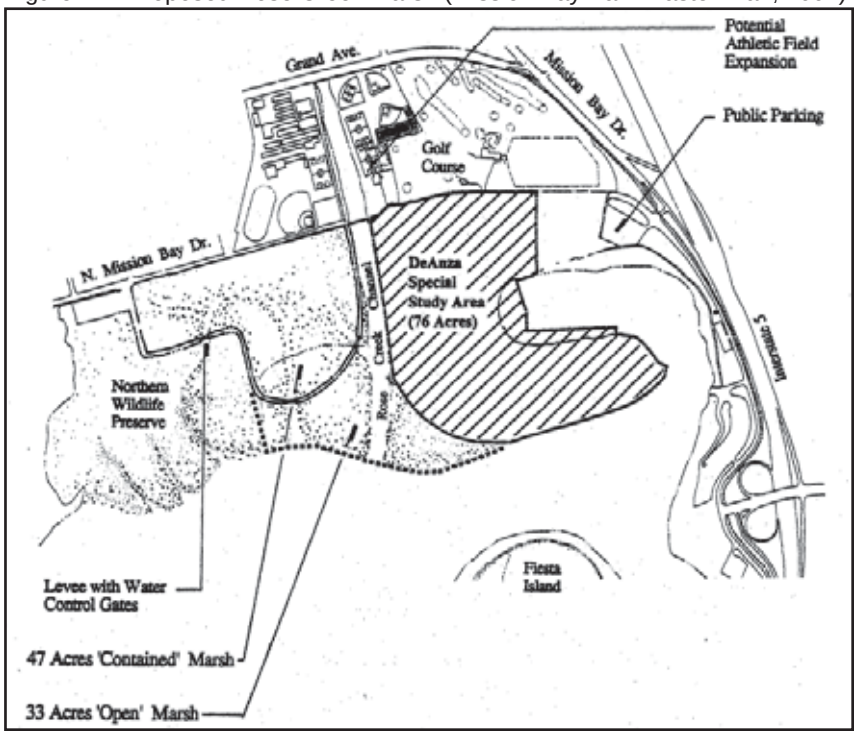


The relationship between the RCW and Mission Bay is both complex and dynamic, as resources within Mission Bay can be both enhanced and degraded by its connection with Rose Creek. Maximizing the enhancements while minimizing the degradation is a primary goal of this assessment, as this not only benefits Mission Bay, but the resources within the RCW as well.

Mission Bay is an important area for biological resources associated with coastal salt marsh, inter-tidal beach, sub-tidal sand, and other coastal fringe habitats. The bay acts as the receiving water for the Rose and Tecolote Creek (located south of Rose Creek) watersheds and is the largest most significant recreational and tourist attraction in San Diego County, with approximately 15 million visitors annually.

Species utilizing the habitats in Mission Bay range from year-round residents to annual migratory visitors. Some of these species, like the light-footed Clapper Rail, could benefit from improved habitat connectivity with the lower portions of Rose Creek where the potential to create viable habitat exists. Other biological benefits associated with improved connectivity with Rose Creek include re-directing nourishing sediments that were historically diverted from the Kendall-Frost Marsh. The Mission Bay Park Master Plan (revised 2002) recommends the development of an 80+/- acre wetland habitat contiguous with the Northern Wildlife Preserve on the west and south of the mouth of Rose Creek (Figure 2-1). The habitat is targeted to include salt marsh, salt panne, and coastal sage scrub plant communities, and would be designed to permit limited public access for hiking, jogging, resting, bird watching, rowing, and canoeing. As part of this recommendation, the Mission Bay Park Master Plan also identifies several upstream controls, including: sediment traps or basins adjacent to the creek outfalls or at suitable upstream locations that can be adequately maintained; and removal of the concrete lining in Rose Creek to slow down flood flows and allow contaminants to be adsorbed

Figure 2-1: Proposed Rose Creek Marsh (Mission Bay Park Master Plan, 2002)



by fresh water marsh and riparian vegetation. Both of these are included as recommendations within this assessment as well. Actions to enhance the connection with Mission Bay include:

1. Kick-start the implementation process for the 80-acre marsh proposed at the mouth of Rose Creek by using the information, data, and modeling tools developed as part of the hydrology assessment (Section 2.6.1) to support the planning, design and refinement of this important element of the Mission Bay Park Master Plan.

2. Assess potential habitat improvements for the benefit of the Light-footed Clapper Rail along the lower portions of Rose Creek by using the information, data, and modeling tools developed as part of the hydrology assessment (Section 2.6.1).

3. Assess the potential for sediment management traps or basins along the lower portions of Rose Creek by using the information, data, and modeling tools developed as part of the hydrology assessment (Section 2.6.1).

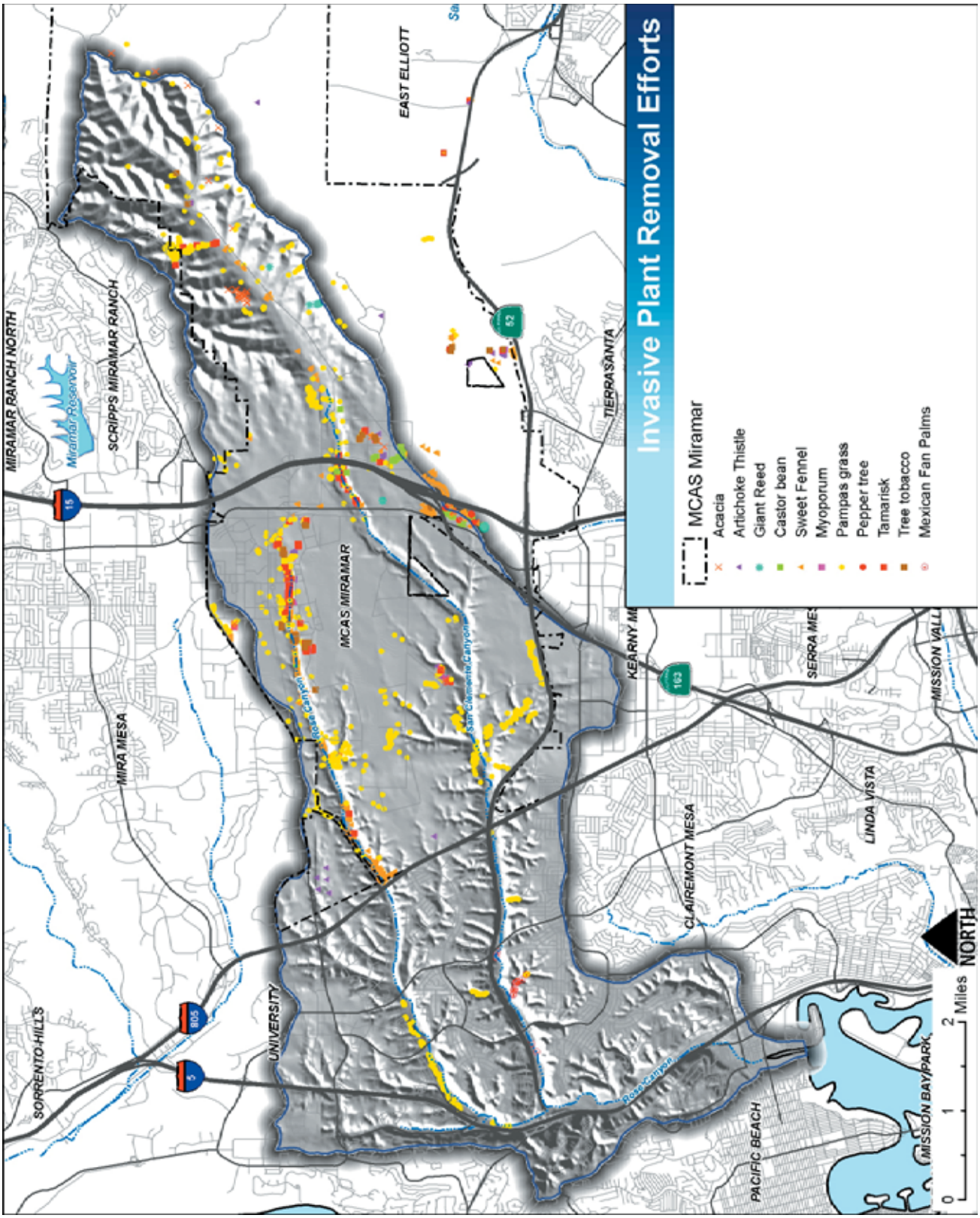
4. Assess the potential of removing the concrete flood control channels along the lower portions of Rose Creek by using the information, data, and modeling tools developed as part of the hydrology assessment (Section 2.6.1).

2.2.2 Recommendations for Controlling Invasive Exotic Species

- ☑ *Manage invasive exotic species via management zones*
- ☑ *Remove exotic animal species from aquatic habitats*
- ☑ *Develop and implement public outreach programs about invasive exotic species*

Invasive exotic plant species have displaced native plant communities within many of the drainages and grassland areas throughout the watershed. Efforts to control and eradicate many of these species have been initiated by MCAS Miramar, the City of San Diego Park and Recreation Department, and several non-profit groups, most notably the Tri-canyon Weed Warriors. These efforts are evidenced by the limited distribution of many targeted invasive exotic species within MCAS Miramar and the City owned Open Space and Natural Parks. MCAS Miramar has documented its removal efforts, while the other groups have not. Figure 2-2 depicts the removal efforts as mapped by MCAS Miramar and as identifiable during field investigations as part of this assessment. Several species have been mapped and targeted for control and eradication as part of this assessment's recommendation. The species of concern include: Pampas Grass (Cortaderia sp.); Salt Cedar (Tamarisk sp.); Giant Reed (Arundo donax); Brazilian Pepper (Schinus terebinthifolia); Iceplant (Carpobrotus sp.); Mexican Fan Palm (Washingtonia robusta); and Nasturtium (Tropaeolum sp.). Other secondary species include: Castor Bean, Olive, Canary Island Palms, Myoporum, Acacia, Shamel Ash, and Artichoke Thistle. In addition to these mapped species, several other species were not mapped, but should be considered for control and eradication whenever possible: Black Mustard, Yellow Star Thistle, Italian Thistle, Tocalote, Fennel, and Periwinkle. A more comprehensive listing of invasive exotic plants is included in Tables 3-4 and 3-5 on page 3-15.

Figure 2-2: Invasive Plant Removal Efforts



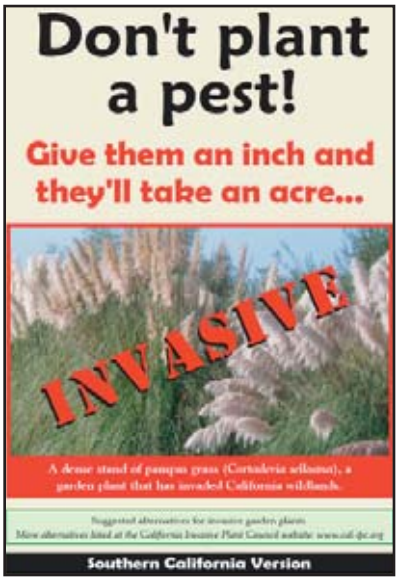
Many of the identified invasive plant species are encroaching from private lands, including backyards, tributary canyons, transportation rights-of-way, and educational campuses. Removal and management of these infestations are critical to the long-term sustainment of native habitats within the RCW. Without a comprehensive and complete program, areas within the watershed will continue to act seed and rhizome sources for continued introduction to downstream portions of the watershed. When reviewing the extents of the mapped invasive plant species compiled as part of this assessment (Figure 3-10), a distinction can be made regarding the extents of invasive plants on private versus public lands, especially within the open space parks where focused efforts have removed nearly all of the invasive plants on public lands.

1. Development of Management Zones

The recommended management approach utilizes a tiered system to determine which portions of the watershed should be targeted first and those that should be left for last. Nine management zones (Figures 2-3 to 2-5) have been developed to guide the eradication and management of invasive plant species. Management zones were delineated based on a variety of criteria, including: 1) land areas acting as chronic sources of infestations, 2) land areas not currently chronic sources, but could become so in the future if left unmanaged, 3) land areas directly impacted by chronic sources, and 4) land ownership or management responsibility divisions. For more detailed descriptions of the nine management zones see Chapter 4, Section 4.3.1 on page 4-4.

The purpose of this top-down approach is to ensure that seed and rhizome sources will be removed and controlled first, which will help reduce the potential for downstream re-infestation after initial management efforts have occurred. This is not to say that volunteer efforts that want to target other management zones to help maintain public visibility and interest should not. However, it is unrealistic to expect to be able to maintain these downstream management areas free of invasive exotic plant species if the upstream management areas have not first been completed. An example of an overriding consideration would be the restoration of the lower portions of Rose Creek prior to completing removal efforts throughout the entire watershed, as the restoration of lower Rose Creek provides a wide variety of public benefits, including enhanced public safety.

One of the key elements of this approach is that all land, even private residential land, highway and railroad rights-of-way, and UCSD land, needs to be targeted for management efforts, as these lands represent significant area within the RCW and are currently acting as chronic sources to downstream public lands.



2. Public Outreach Materials about Invasive Plants

Outreach materials describing the manner in which invasive exotic plant species degrade our native habitats and contribute to other problems, as well as their current extents within the RCW should be developed as an initial step in a source control campaign. The second step could include information about how the invasive exotic species are introduced to our natural open spaces and how a landowners' individual decisions about what plants to have in their yard and how they maintain them can affect the overall eradication and control efforts being undertaken. A third step could focus on providing alternative native, or at least non-invasive, plant species that have similar forms, textures, colors, etc. as the targeted invasive plant species; reinforce appropriate disposal options; and provide information on sources of native plant material. For more information on developing public outreach materials see Chapter 4, Section 4.1 on page 4-1.

Figure 2-3: Invasive Plant Management Zones within Upper Rose Canyon

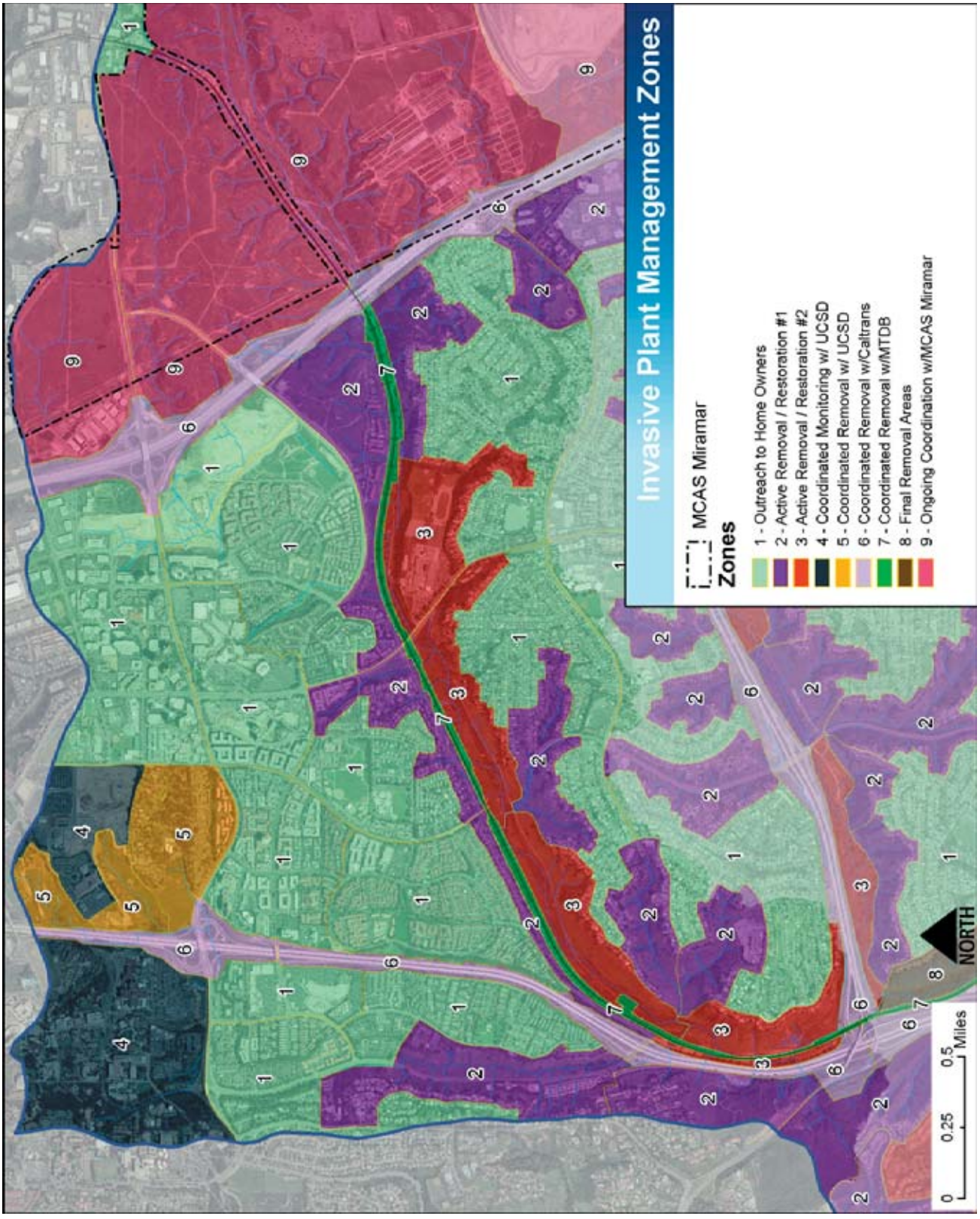


Figure 2-4: Invasive Plant Management Zones within Upper San Clemente Canyon

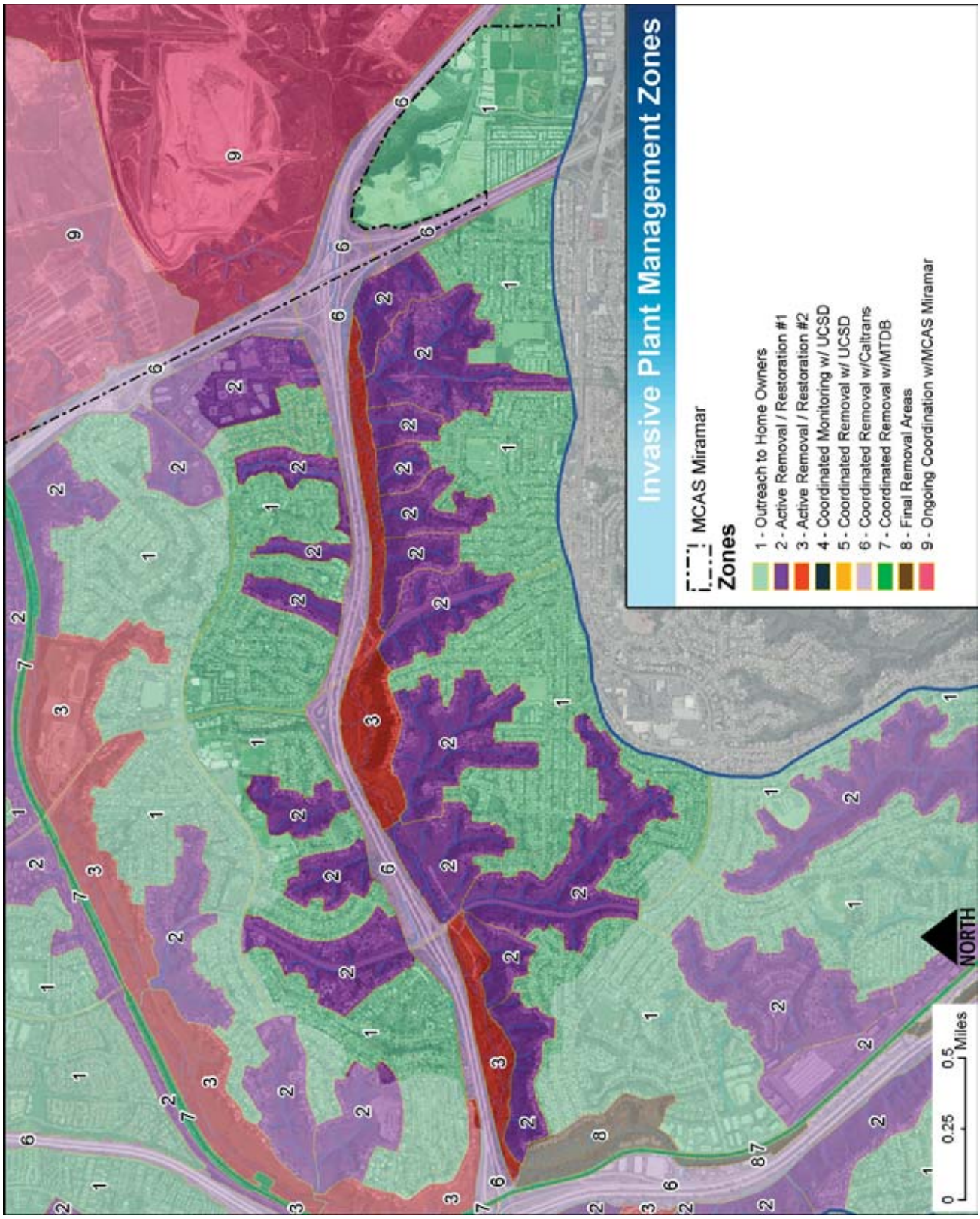
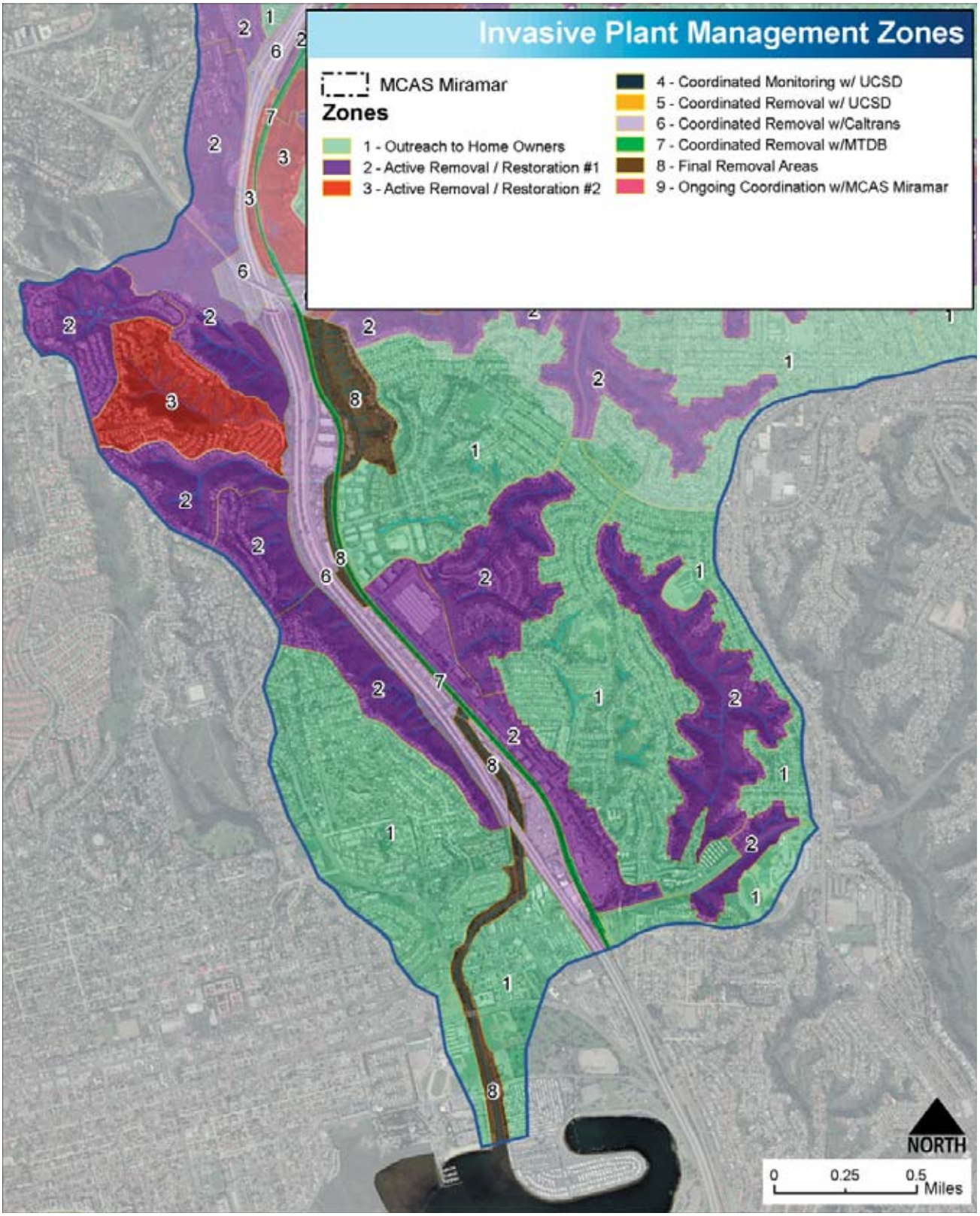


Figure 2-5: Invasive Plant Management Zones within lower Rose Creek



3. Remove Exotic Animal species from Aquatic Habitats

Exotic animal species (including the Bullfrog, African Clawed Frog, and Red-eared Slider) should be targeted for removal from the RCW. These efforts should start from the upstream areas in MCAS Miramar (coordinated through MCAS Miramar environmental staff), down through Rose and San Clemente Canyons, and on through lower Rose Creek to Mission Bay.

4. Public Outreach Materials about Invasive Animals

Outreach materials describing the manner in which the invasive exotic animal species listed in Table 3-6 degrade native habitats and out compete native biota, as well as the their current known extents within the RCW would be an appropriate first step. After this first step, two distinct second steps may be necessary; one to deal with feral or unsupervised pets and the other dealing with how individual land management decisions can promote the invasion of unwanted species (e.g. argentine ants or black rats). The second step addressing exotic pets could include information about how the invasive exotic species are typically introduced to our natural open spaces and why releasing unwanted pets into the natural areas is inappropriate and can affect the overall eradication and control efforts being undertaken. Another step could discuss how individual land management decisions can influence the spread of invasive exotic animals, such as how increased irrigation near natural areas promotes Argentine ant infestation or how un-pruned palm trees are prime homes for black rats. A final step could focus on providing information about what to do if you have an unwanted invasive exotic pet, an infestation of invasive exotic animals, or an interest in changing how you manage your land. For more information on developing public outreach materials see Chapter 4, Section 4.1 on page 4-1.

5. Public Outreach Material about Feral Cats

Uncontrolled populations of feral and domestic cats are common problems within open space lands surrounded by urban and residential land uses. These populations can cause significant damage to native animal species through predation and are often the top predator within the area if the open space is disconnected from larger natural areas that would support populations of bobcats and coyotes. Outreach materials should discuss how both feral and domestic cat populations can impact the native animal populations, who to contact about feral cats, and how to appropriately manage domestic cats should be developed. These materials should be distributed via pet stores, animal clinics, and the local SPCA. For more information on developing public outreach materials see Chapter 4, Section 4.1 on page 4-1.

2.2.3 Recommendations for Restoring and Enhancing Native Habitats

- ☑ *Expand wetland and riparian habitats where feasible*
- ☑ *Restore upland habitats wherever degraded or non-native habitats exist*
- ☑ *Enhance wetland and riparian habitats along the stream channels*

The restoration and enhancement of native habitats is integral to the long-term health and stability of the biological resources within the RCW. Without a comprehensive approach to these efforts, the existing biological resources will continue to degrade, resulting in the departure or extirpation of more sensitive species and the proliferation of urban adaptable species, which are often looked upon as nuisances (rats, feral cats). This degradation of the biological resources also diminishes their value to the public, who value them for their educational, interpretive, recreational and aesthetic qualities.

The recommendations of this assessment are designed to accomplish two basic goals: 1) initially stop the current decline in biological value; and 2) enhance and maintain the biological values in sync with the other public values as outlined in the other sections of this assessment. A mix of implementation strategies and partnerships can be leveraged to restore and enhance the biological resources of the RCW. Opportunities were not identified within MCAS Miramar, although ongoing coordination on restoration and enhancement activities is recommended.

It should be noted that while restoring and enhancing the native plant communities and associated wildlife will benefit the watershed's resources, these efforts will not turn back time and return the RCW to 'natural' conditions. The fact that the RCW is an urban watershed needs to be acknowledged to ensure unrealistic expectations are not placed on these restoration and enhancement projects or that necessary management tasks (maintaining flood capacity within the lower stream channel) are not preempted by inappropriately placed biological values. Biological restoration and enhancement needs to be balanced with the practicalities of working within an urban watershed.

1. Wetland Restoration/Creation

Opportunities for wetland restoration/creation exist within the RCW and are contained primarily on City of San Diego or MCAS Miramar owned lands. Opportunities for wetland restoration as a result of proposed concrete channel removal and stream channel improvements are discussed separately in Section 2.6.3. Twenty-one potential restoration/creation sites were identified on the City of San Diego owned lands during the field assessments as shown in Figures 2-6 to 2-8 and account for 26.25 acres of land. It should be noted that these sites may not represent every opportunity within the RCW and it is the intent of this assessment to be supportive of all appropriately sited wetland restoration or creation projects. While restoration/creation sites are not proposed on MCAS Miramar at this time, on-going coordination with the station is recommended to determine their interest to conduct, or allow to be conducted, wetland restoration efforts on station lands.

The twenty-one proposed sites consist of low laying land adjacent to the main drainages of Rose and San Clemente creeks or at the bottom of tributary drainages where limited landform grading could create conditions suitable for the establishment of wetland plant communities. Targeted wetland and riparian vegetation communities should include: Southern Coast Live Oak Riparian Forest, Southern Cottonwood-Willow Riparian Forest, Southern Sycamore-Alder Riparian Woodland, Southern Willow Scrub, Freshwater Marsh, and Mule Fat Scrub. Descriptions of the twenty sites can be found in Chapter 4, Section 4.2.2 on page 4-5.

2. Enhance Wetland and Riparian Habitats along Stream Channels

Opportunities to enhance wetland and riparian habitats exist in many locations along both Rose and San Clemente Creek, as well as their tributaries. However, to implement these enhancements, other streambed or bank improvements will need to be made as discussed in the recommendations in Section 2.6.2 and 2.6.3.

3. Upland Restoration

Opportunities for upland restoration exist throughout the RCW wherever areas of non-native grassland exist, as these areas are typically dominated not only by non-native annual grasses, but also by a variety of invasive exotic plant species as well, including: Black Mustard, Bull Thistle, Italian Thistle, Yellow Star Thistle, Tocalote, Sweet Fennel, Periwinkle, Fountain Grass, Cheeseweed, and Bristly Ox-Tongue. Approximately 182 acres are identified in Figures 2-6 to 2-8 making it impracticable to define individual sites as was done with the wetland restoration/ creation opportunities. Within the identified areas targeted upland vegetation communities should include: Native Grassland, Costal Sage Scrub, Southern Maritime Chaparral, Southern Mixed Chaparral, and Coast Live Oak Woodland.

Figure 2-6: Wetland and Upland Restoration Potential within Upper Rose Canyon

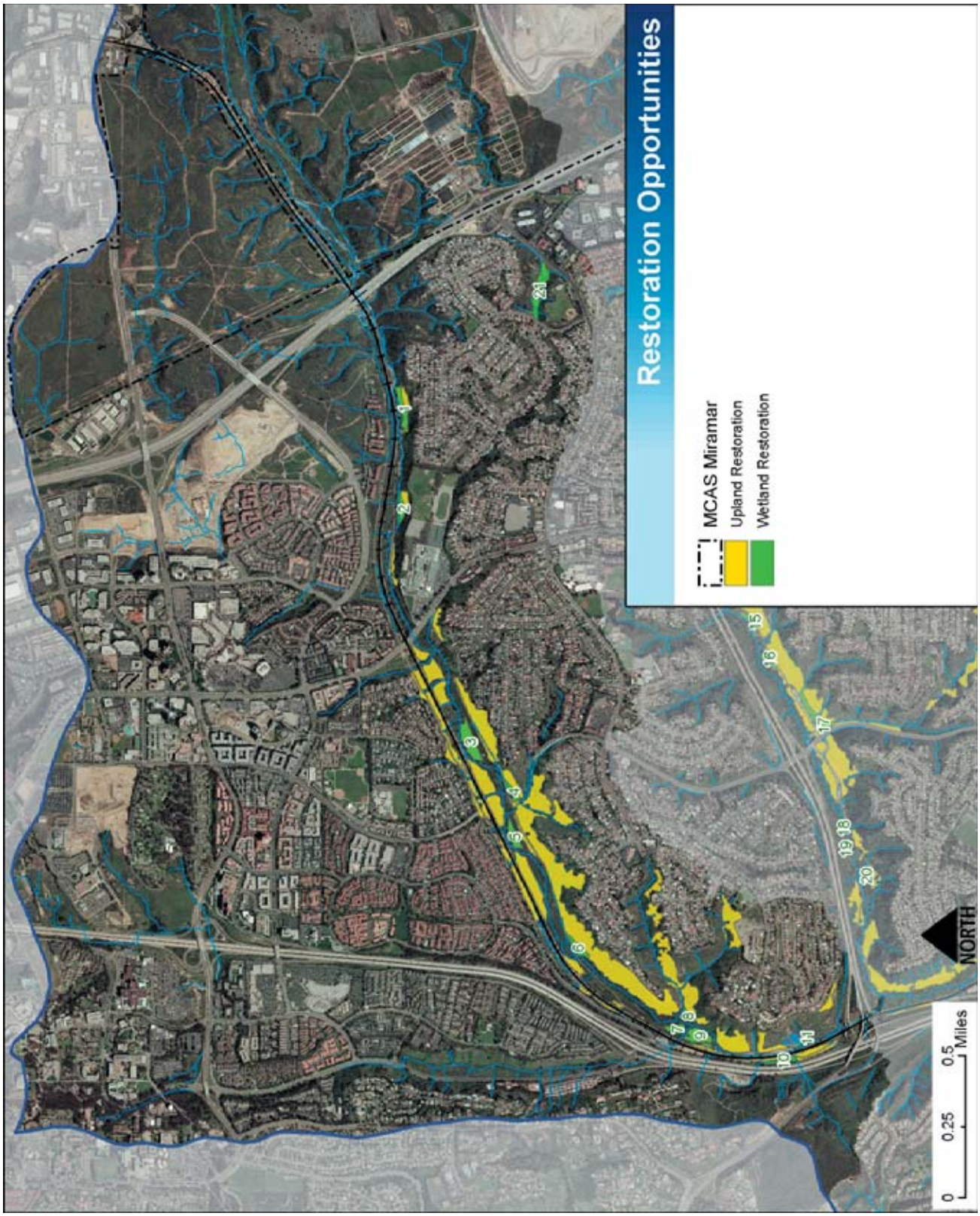


Figure 2-7: Wetland and Upland Restoration Potential within Upper San Clemente Canyon

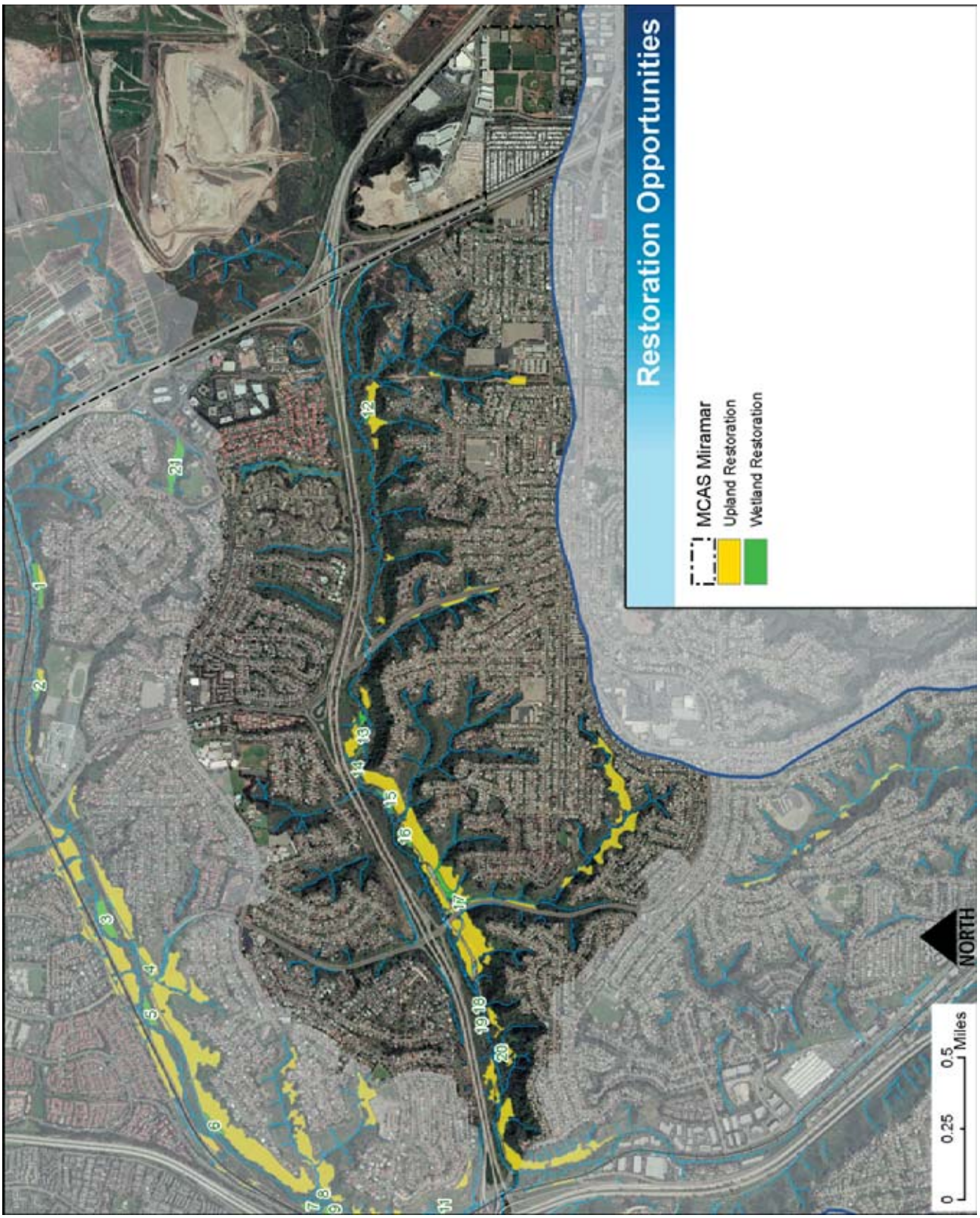
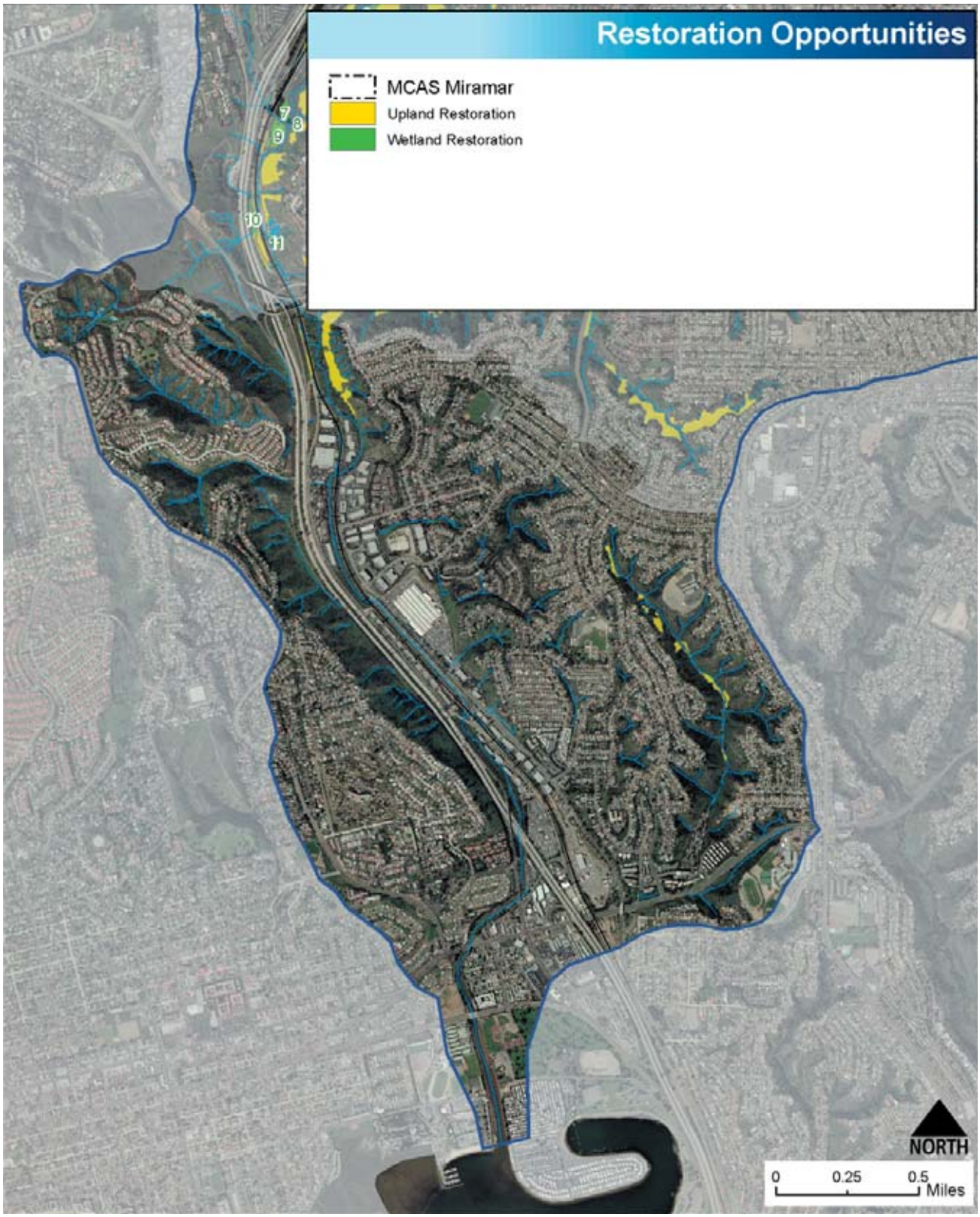


Figure 2-8: Wetland and Upland Restoration Potential within lower Rose Creek



2.2.4 Recommendations for Protecting and Enhancing Wildlife Corridors

- ☑ *Improve vegetative cover and connectivity near current road under-crossings*
- ☑ *Restore concrete flood control channels to vegetated stream corridors*
- ☑ *Reduce wildlife mortality along Miramar Road*

The natural lands within the RCW are linked to varying degrees to each other, as well as to adjacent open space areas outside of the watershed by habitat corridors. The few inter-watershed corridors that do remain are small in size, composed of marginal habitat, contain significant hazards to wildlife, and may be lost to future development (Figures 2-9 to 2-11). The main stems of Rose and San Clemente creeks are utilized as the primary internal wildlife corridors, with some of the tributary drainages acting as connectors and temporary cover. The un-vegetated concrete flood channels and transportation corridors significantly impact the ability of wildlife to move upstream from Mission Bay or downstream from MCAS Miramar lands. Restoration of the un-vegetated concrete channels is discussed Section 2.6.3. The restored environment described within that action would transform those sections into viable wildlife corridors and enhance the ability of wildlife to utilize more of the natural resources throughout the watershed. Road-related wildlife mortality is another common problem that can become a significant source of population declines in some species. Within urban areas that have relatively poor linkages to larger habitat blocks, even the loss of individual animals may result in significant depressions in populations because of poor recruitment of animals back into the vacant territories. In some instances, mortality may be substantial and even greater than on-site recruitment or immigration of replacement individuals. If this is the case for a particular species, local extirpation from the habitat can occur. For non-flying species, functional land connections are critical in order to prevent isolation of populations.

1. Improve vegetative cover and connectivity near road under-crossings

Many of the road under-crossings have been constructed to allow some vegetation to remain along the drainage course that can be used by wildlife as cover as they move through these otherwise human impacted landscapes. Enhancements to the existing vegetative cover should be considered immediately upstream and downstream of all road under-crossings to improve cover for wildlife that may be impacted by transportation-related noise or other human activities occurring within these areas.

Three road under-crossings are significantly more restrictive to wildlife movement than the others and warrant further attention as described below as they effectively divide the RCW into four distinct regions and result in limited species interchange between them.

A. Interstate 15 over San Clemente Creek currently consists of a large 24 foot wide culvert connection 500 feet long that limits its wildlife movement to and from the headwaters of Rose and San Clemente Creeks, as well as Mission Trails Regional Park and other open space areas within the San Diego River and Penasquitos watersheds. Discussions with Caltrans are recommended to identify long-range plans for construction activities along this stretch of Interstate 15 to determine if an opportunity to modify this under-crossing could be incorporated as a project element, or if the modification should be planned and implemented as a stand alone project. Without improvement, populations of mammals, reptiles, and other ground-based species to the west in Interstate 15 will likely decline due in part to this restrictive wildlife connection.

Figure 2-9: Impaired Wildlife Corridors within Upper Rose Canyon

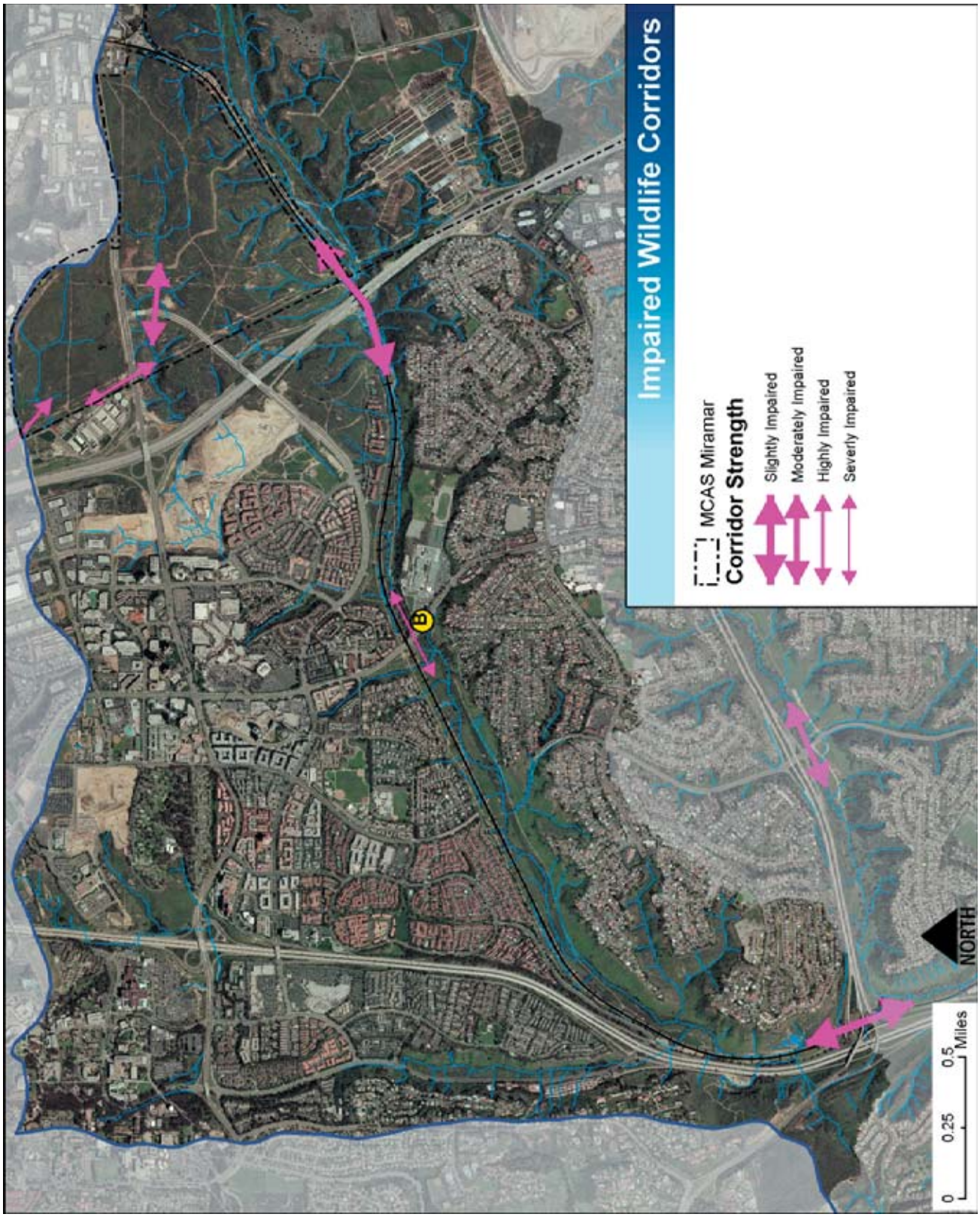


Figure 2-10: Impaired Wildlife Corridors within Upper San Clemente Canyon

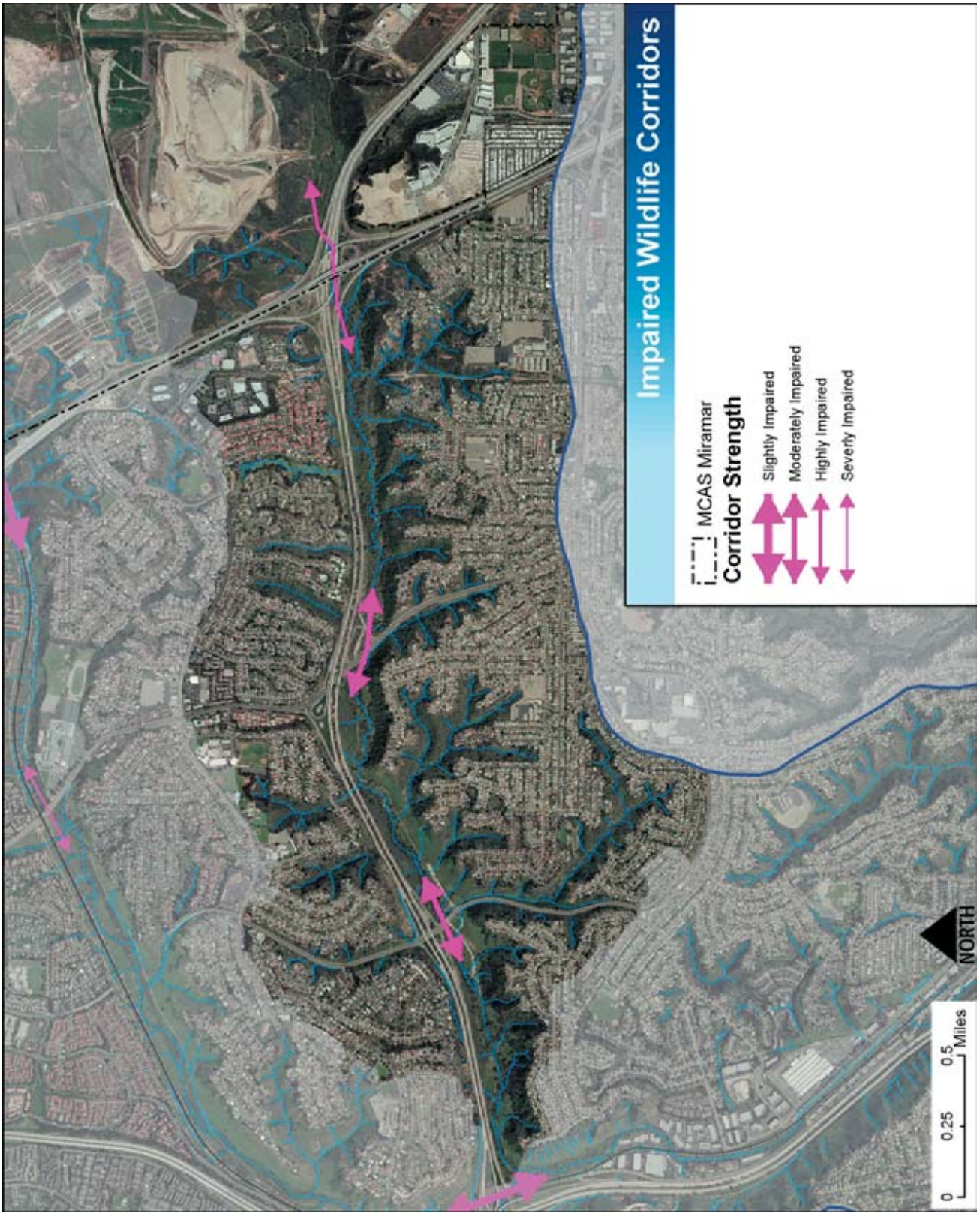
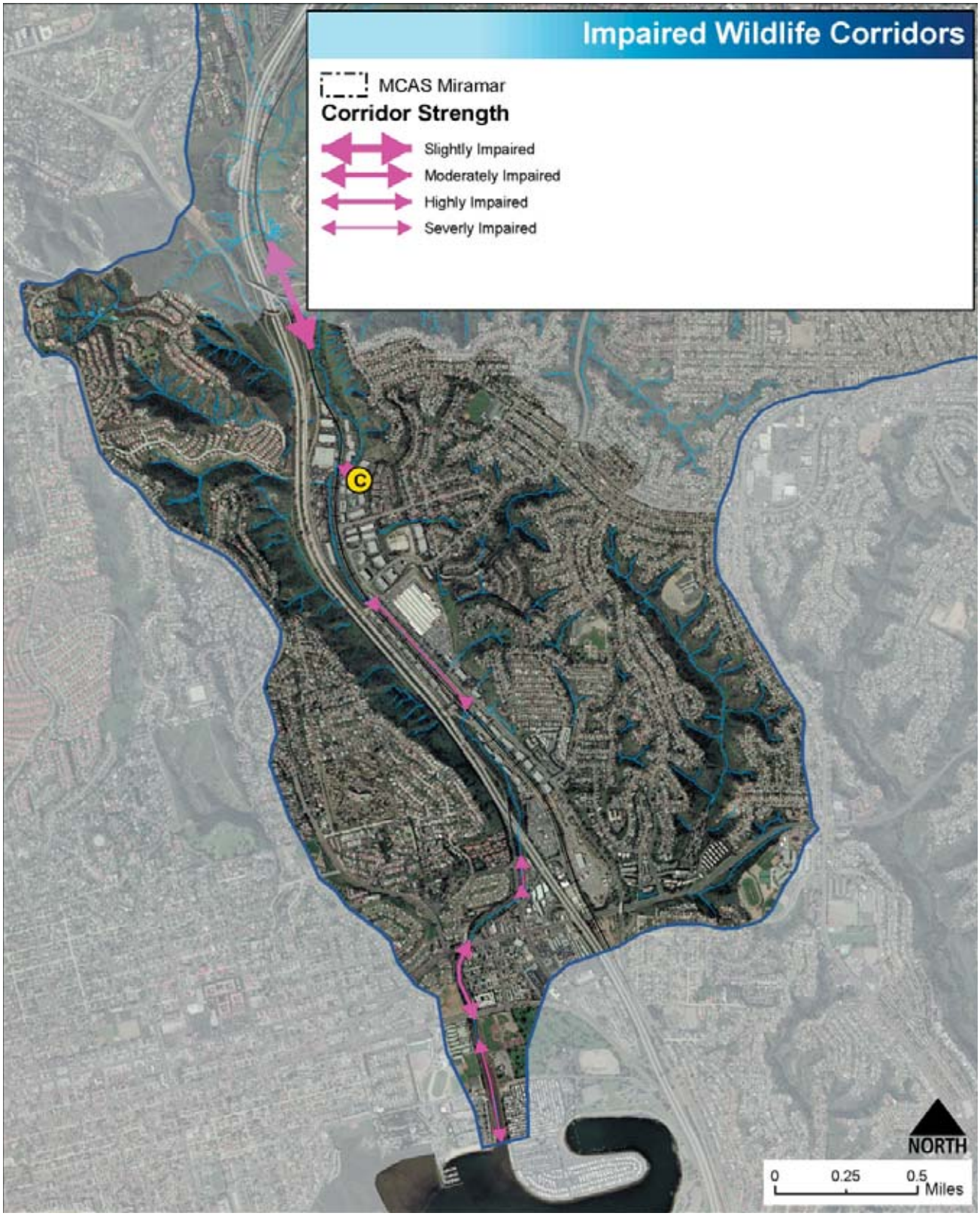


Figure 2-11: Impaired Wildlife Corridors within lower Rose Creek



B. Genesee Avenue over Rose Creek currently consists of three side-by-side eight-foot box culverts that are 200 feet long. These culverts limit wildlife movement to and from the portions Rose and San Clemente Canyons on MCAS Miramar to upper Rose Canyon within the City of San Diego. As plans to widen Genesee Avenue through this area continue to be considered, alternatives that consider replacing the box culverts with a bridge structure should be considered. The bridge should be structured to allow as wide of a vegetated corridor as possible to encourage use by larger mammals, such as bobcat, coyote, and mule deer.

C. The Rose Canyon Business Park private road crossing over lower Rose Creek currently consists of a twelve-foot diameter culvert that is 80 feet long, limiting wildlife movement to and from upper Rose and San Clemente Canyons and lower Rose Creek. Discussions with the landowner should be initiated to determine a willingness to consider replacing the existing culvert with a bridge structure, which would benefit the movement of meso-predators like the bobcat and coyote. This would help keep populations of feral cats, opossums, skunks and other small mammals in check. A bridge structure in this particular location may also provide some hydraulic benefits by eliminating potential backwater conditions during larger storm events that may currently impact the adjacent upstream business development.

2. Restore concrete flood control channels to vegetated stream corridors

The un-vegetated concrete flood channels significantly impact the ability of wildlife to move upstream from Mission Bay or downstream from MCAS Miramar lands. Restoration of the un-vegetated concrete channels to vegetated stream corridors is essential to improving wildlife access along lower Rose Creek and is discussed in Section 2.6.3.

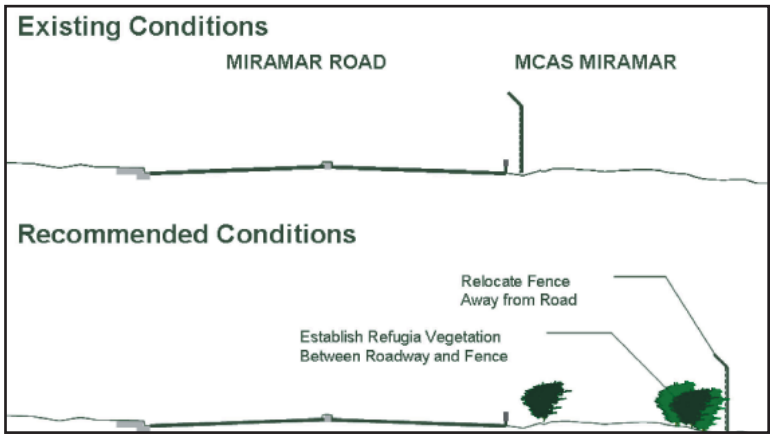
3. Reduce wildlife mortality along Miramar Road

All of the roadway crossings of the canyons pose some degree of danger to wildlife movement. However, one area in particular has been identified as a place of high mammal mortality due to collisions with vehicular traffic. This area is located along Miramar Road in the vicinity of the Nobel Drive intersection. This stretch of Miramar Road is bound by natural habitats to the north and south and provides a tenuous watershed habitat linkage to Carroll Canyon (Figure 2-12). To the north of Miramar Road is a disconnected area of MCAS Miramar bounded by the arch of Eastgate Mall Road and associated development on the east and north and the North City Water Reclamation Plant and I-805 on the west. To the south of Miramar Road are the larger tracts of habitat on MCAS Miramar. M&A biologists have previously noted large numbers of mammal carcasses in this area including deer, coyote, bobcat, skunk, rabbit, and fox.

Figure 2-12: Aerial diagram of Miramar Road Wildlife

The extent of animal losses in this area appear to be out of scale for what might be expected for similar sized roadways in the region. To gain a better understanding of the potential causes of this phenomenon, an examination of the area was undertaken to explore the site conditions and habitat and barrier geometries. The review indicated that a corridor for animal movement exists between the remaining habitats north and south of Miramar Road. Despite its narrow configuration, the corridor connection to the north into Carroll Canyon extends through the MCAS Miramar/Eastgate Mall open space along the existing natural gas and electrical transmission line easement. However, for the most part, the Eastgate Mall open space is a biological cul-de-sac, natural habitat surrounded by non-habitat barriers. In its current state, the Eastgate Mall open space functions as a mortality sink for some mammals because it likely attracts individuals by providing important resources (e.g., food, dispersal opportunities), while also having many significant hazards associated with it. Once an animal is within the Eastgate Mall open space area, additional open space may be visually located immediately to the south across Miramar Road. However, a chain-link fence constructed adjacent to the road surface prevents most animals from accessing the natural lands that may be visible to them. The fence design is a formidable barrier for all animals that do not have the ability to fly (e.g., birds, bats, etc.) or pass through the mesh (e.g., snakes, small mammals). The fence design consists of an 8-foot high chain-link fence topped with three strands of barbed wire affixed to extension arms angled out.

Animals must cross Miramar Road at grade. These crossings typically happen at night. On the south side of the road, animals encounter the chain-link fence and proceed to follow the fence line either east or west in search of breaks in the fencing. As cars approach, startled animals often will run along the fence searching for a gap until the last moment when they will dart back towards the other side of Miramar Road. Because animals are trapped on the roadway surface without cover as vehicles approach, they are susceptible to panic flight behavior that frequently puts them in a collision course with the on-coming traffic.



To address this issue, coordination with MCAS Miramar is recommended to determine the feasibility of re-aligning the chain-link fence away from the edge of Miramar Road to provide a vegetated buffer for wildlife to use as cover when spooked by on-coming vehicles.

2.2.5 Recommendations for Land Management and Ownership

- ☑ *Maintain consistent management of the biological resources throughout the watershed*
- ☑ *Complete key land acquisitions in fee or easement*

The purpose of these recommendations for land management and ownership is to create consistent management practices throughout the watershed that will result in a greater likelihood of long-term sustainability of the resources, as current management practices are insufficient and inadequate.

As previously discussed, primary land ownership within the RCW is largely public, split between MCAS Miramar, the City of San Diego and SANDAG (which owns the rail corridor). Consistent land ownership isn't as crucial to these recommendations as is consistent land management, especially as it pertains to the biological resources.

For example, the City of San Diego currently owns and manages several open space parks within the RCW. The Open Space Division of the Park and Recreation Department manages them in a manner designed to be sensitive to the biological value of the parks and their inclusion in the MSCP. However, the Park and Recreation Department's management responsibility stops with their land ownership, which creates situations where valuable trailheads and trail connections fall into private or quasi-public areas with no defined management. This is

most acute in lower Rose Creek, which is primarily maintained by the City as a flood control channel and utility (sewer) corridor without the same consideration of its biological values (except in reaction to a flood control or sewer maintenance need) and with limited attention paid to public recreation and public safety considerations.

This disjointed management (or lack of management) of the RCW by different City departments for different purposes is separate and distinct from the City's problems associated with limited financial resources. The City's financial limitations are evident everywhere in the RCW. Park rangers and police officers are over-extended, storm drains are eroding, lack of brush management has increased the risk of wildfire, invasive species are outcompeting native species, water quality is degrading, and entire sections of the creek have been lost to public use due to criminal activity. All the resources of the watershed have been affected, including the biological resources. While the City's current financial difficulties will continue to affect the ability to improve and enhance the watershed, there are still improvements that should be made to improve land management and ownership consistent with biological resource protection.

1. Maintain consistent management of the biological resources throughout the watershed.

MCAS Miramar has been actively managing their natural resources, including those within the RCW, for a number of years with good success in maintaining and enhancing sensitive resources. As a result, ongoing coordination with MCAS Miramar environmental staff to ensure existing programs remain in effect is the only recommendation for MCAS Miramar lands. In juxtaposition to MCAS Miramar's successful efforts, the public and private lands west of MCAS Miramar continue to decline, in part due to a lack of consistent coordinated management. Management entities outside of MCAS Miramar should coordinate with MCAS Miramar staff to determine how the non-military natural resource management efforts can be brought more in-line with what MCAS Miramar has successfully implemented, and opportunities for cooperative programs should be sought out.

Within the city-owned lands, the Park and Recreation Department should be empowered to manage all of the lands in a consistent manner, instead of the current piece-meal approach by Park and Recreation, Open Space Division, Streets, Real Estate Assets, and other departments. In this manner, the natural and recreational resources on city-owned land can be consistently, and more efficiently, managed and maintained while public safety is enhanced.

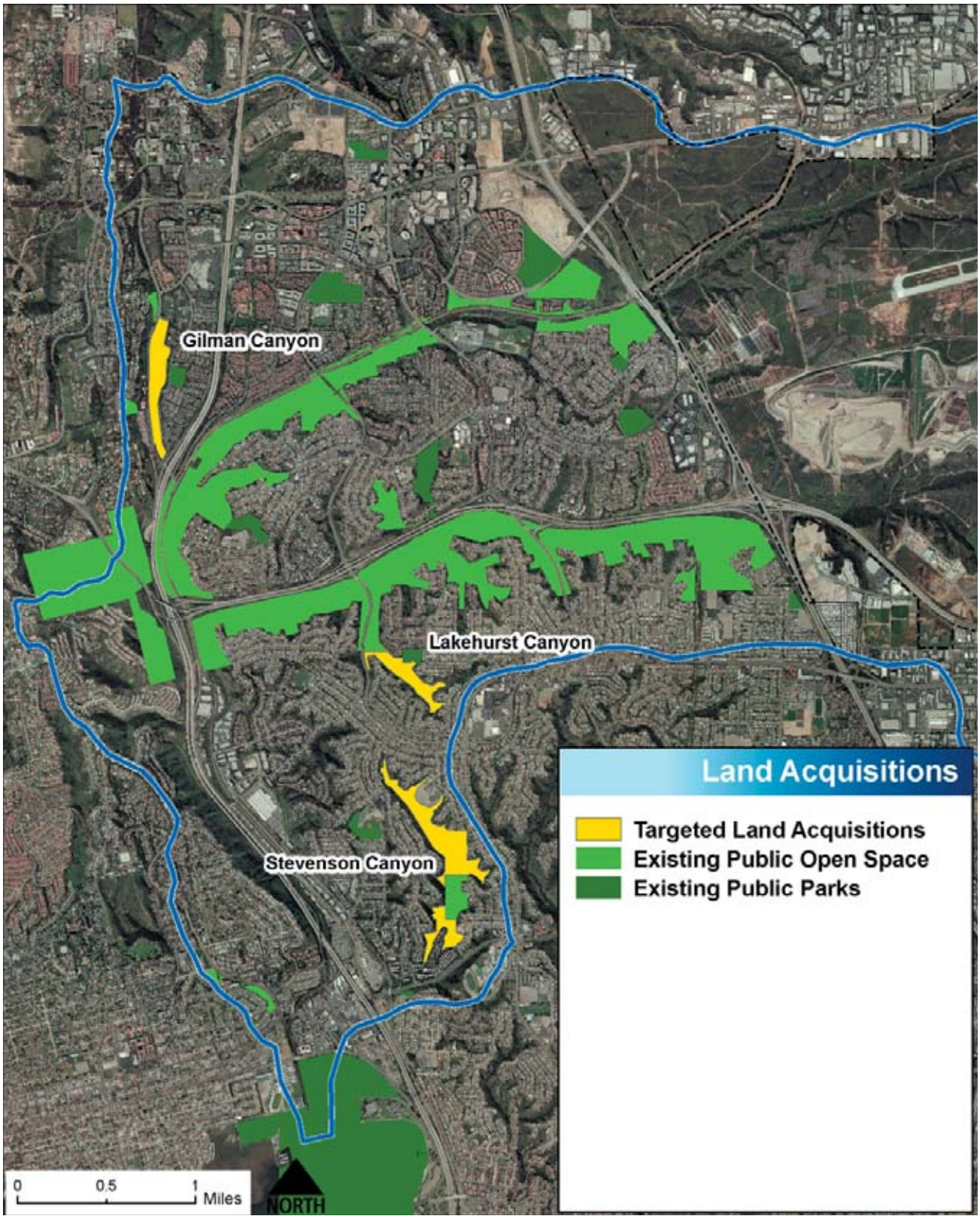
The city should acquire in fee or easement from willing sellers, key private tributary parcels in the RCW to maintain consistent management and public uses. If acquisition cannot be accomplished, management agreements should be negotiated with the property owners to manage these key private lands consistent with the recommendations of this assessment.

2. Complete key land acquisitions in fee or easement

The City of San Diego currently owns and manages most of the natural open space west of MCAS Miramar. However, there are three significant privately owned areas that are recommended for acquisition in fee or easement (Figure 2-13). All three of the areas targeted in this recommendation are privately held properties currently being used to some degree for public purposes. For example, residents of Clairemont are using the trails in Lakehurst Canyon as park trails. The properties are not being managed for public purposes and all are infested with invasive exotic species, thus contributing seeds to infest public lands downstream. Under public ownership, they could be managed for public purposes including biological resources, recreation and public safety. A variety of state funding sources may be applicable to this effort. These potential acquisitions include:

A. The first area targeted for acquisition is the vacant open space area within Stevenson Canyon. This significant natural area (72 acres) is predominantly in private ownership, with only a few owners (16 parcels).

Figure 2-13: Potential Land Acquisitions



B. The second area is the vacant open space area within Lakehurst Canyon (24.5 acres) from the intersection of Lakehurst Avenue and Pocahontas Avenue northwest along the canyon to the boundary of Marian Bear Memorial Natural Park. Ownership is split across 13 owners, with one of the parcels (12 acres) being dedicated open space.

C. The third area is the vacant open space area along Gilman Drive (34.4 acres). Ownership is split across two owners.

2.2.6 Recommendations to Protect and Enhance Native Plants and Animals

☑ *Protect existing natural habitats*
☑ *Conduct comprehensive protocol surveys for all special status species*
☑ *Ensure restoration efforts target animal species and not just vegetative habitats*
☑ *Establish a long-term monitoring program*

Part of the comprehensive plan for managing the biological resources of the RCW includes the identification of species-specific restoration and enhancement opportunities that should be considered either alone or in conjunction with the other recommendations of this assessment. The following sections describe opportunities for entire groups of species. Recommendations pertaining to individual species can be found in Chapter 4, Section 4.2.3 on page 4-8.

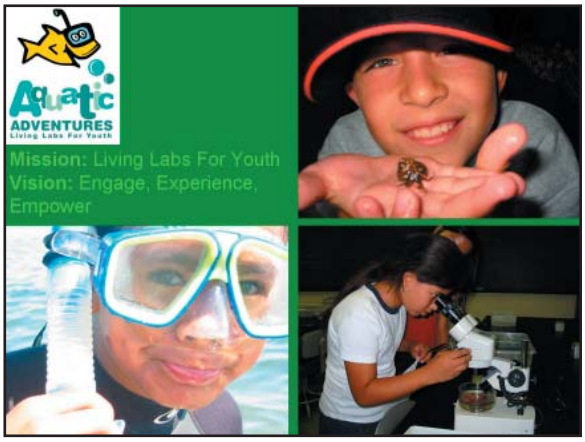
1. Protecting currently available habitats from further degradation is the most important conservation strategy within the RCW, particularly for reptiles and amphibians.
2. Surveys for all special status species are recommended within the natural lands west of Interstate 805. These surveys should follow accepted protocols to ensure their results can be used in the development and/or update of Natural Resource Management Plans, Wetland Management Plans, or Conservation Banks. The purpose of these surveys is to more accurately define where and how various species are utilizing the RCW to help guide appropriate protection or restoration efforts.
3. In areas where restoration activities are recommended, more intense and detailed surveys are recommended prior to restoration to adequately address how the restoration project could potentially impact or enhance species present in the area.
4. Restoration efforts within the stream channels should provide intermittent pools and stream flow suitable for the aquatic natives. These improvements could also allow for the establishment of the Southwestern Pond Turtle; however, colonization of this species into the watershed would have to be human-assisted.
5. Restoration of the riparian areas, grasslands, and uplands would aid the movement of both common and rare mammals throughout the watershed. Effective restoration for mammals should include an emphasis on vegetation, as well as the soils and geologic structure to ensure that appropriate habitats are also available for burrowing animals.
6. A long-term program designed to monitor the abundance and health of native plants and animals, particularly special status species, should be developed for the RCW. This program should meet the requirements of the MSCP program. This monitoring could include other measurements of watershed health including water quality and sediment transport. (Other monitoring recommendations can be found in Section 2.6.2 on page 2-86 and Section 2.6.4 on page 2-88.)

2.2.7 Recommendations for Environmental Education

☑ *Promote Environmental Education in watershed schools*
☑ *Encourage Youth Service Projects throughout the watershed*

Ensuring that today's youth are made aware of environmental issues and solutions is a key aspect to changing attitudes about environmental protection. The evolution of recycling is a great example of how focusing on youth education can have a long-term positive influence on the acceptance of and participation in an activity that benefits the environment. Many of today's youth live in urban environments and have had very little exposure to the natural landscape, and are often unaware of the connection between personal actions and environmental degradation. Developing and supporting programs that provide today's youth with environmental education and exposure is key to the long-term success of environmental stewardship initiatives.

A great example of this type of program is Aquatic Adventures, a non-profit organization whose mission is to provide educational programs that connect underserved youth to science, inspire environmental action, and increase exposure to marine habitats. Their vision is to engage youth in unique experiences that reveal new opportunities and engenders valuable skills, empowering individuals to fulfill their potential. Other resources and programs available include, but are not limited to: the CREEC Network; the San Diego County Water Authority; the San Diego County Project Clean Water; the San Diego Natural History Museum; the State Education and Environment Roundtable (SEER); California Alive; Earth Force; PORTs; and the San Diego Audubon Society.



1. Promote Environmental Education in watershed schools

Opportunities to introduce these programs into the schools within the RCW should be fostered and maintained as an ongoing high priority activity. In particular, the efforts at Spreckels Elementary School in University City to incorporate the Aquatics Adventures program should be supported and the program used as a model for the other schools in the RCW (Figure 2-14).

2. Encourage Youth Service Projects throughout the watershed

Youth service projects, such as for Eagle Scouts and local schools, should be encouraged to support the restoration and enhancement activities outlined in this assessment. Youth organizations are a great resource for implementing a variety of small and moderately sized implementation projects, and provide an opportunity to further the youth's environmental education at the same time.

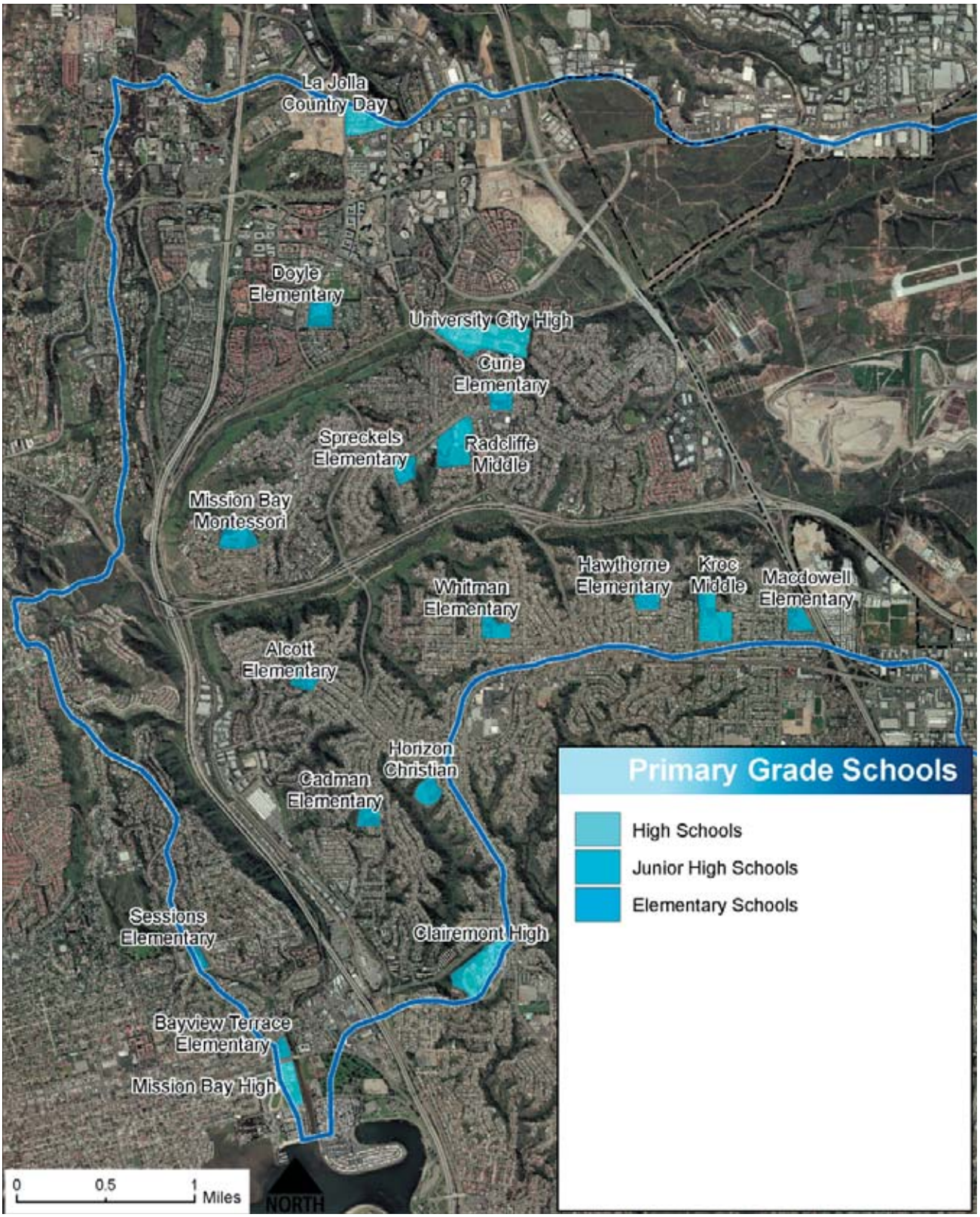
2.3 Recommendations for Cultural Resources

- Document and protect cultural and historic resources
- Assess potential affects of other recommendations
- Develop interpretive panels to increase public awareness

The RCW has long been a popular place for people to live and sustain their lives through hunting, fishing, commerce and industry. The Kumeyaay people relied on the natural resources of the watershed, including Mission Bay and Rose and San Clemente creeks, to sustain their families. Later, the watershed served as the main transportation corridor between the developing city of San Diego and cities to the north. The watershed supported some of San Diego's first industries, including cattle ranching, a tannery and brick factories. In present day, the watershed continues to be a popular place for people to live, work and play. This rich history is part of the legacy of San Diego that should be preserved and protected.

photo San Diego Archaeological Society

Figure 2-14: Schools within the Rose Creek Watershed



2.3 Recommendations for Cultural and Historic Resources

As part of this assessment, a literature review was conducted to determine what portions of the RCW have been surveyed for cultural resources, which areas still need to be surveyed, and what historic resources have been identified (Hector, 2005). In addition, the Native American Heritage Commission and local tribal representatives were contacted to see if any traditional properties or sacred sites are in or near the project area.

Despite development and urban encroachment, there are many prehistoric and historic cultural resources located within the RCW. These resources range from ancient prehistoric Indian sites to evidence of the early railroad and brickyard. Actions to identify and protect these known sites are recommended. In addition, research indicates that while a portion of the project area has been surveyed, some surveys were limited in scope or duration. Additional surveys are recommended as conditions have changed greatly since the original surveys were done. New surveys will likely identify new sites that should also be protected.

Because this assessment includes recommendations that may affect cultural and historic resources, recommendations are included to protect sites during project implementation. This assessment identifies interpretive opportunities to help the residents and visitors "see" the prehistoric and historic culture and history of the watershed through a series of interpretive maps and panels located at key spots throughout the watershed.

2.3.1 Recommendations for Documentation and Protection of Cultural Resources

- ☑ *Conduct cultural resource surveys in both open space parks*
- ☑ *Assess the condition of known cultural resources*
- ☑ *Implement a cultural resource protection program*

Neither Rose nor San Clemente canyons have been completely inventoried for cultural and historic resources. Surveys done by professional archaeologist or historians are crucial to document sites so that they can be protected and, in some cases, restored. The following recommendations will result in better documentation and protection of the cultural and historic resources of the watershed:

1. Conduct a complete cultural resource survey of Rose Canyon, and update the San Clemente Canyon survey since the old survey is inadequate.
2. Conduct condition assessments on the known cultural resources to identify management issues such as physical deterioration (trestle, historic sites), erosion and sedimentation, vandalism, and integrity.
3. Implement a program to stabilize and protect cultural resources. The program should contain the following elements:
   A. Treat historic wood elements with preservative (non-toxic) to slow deterioration.
   B. Restrict public access to cultural resources unless monitored by an archaeologist or trained docent; re-route trails if needed away from resources.
   C. Seed cultural resource site areas that are not adequately vegetated with appropriate species.
   D. Install erosion prevention measures (without impacting the site surface), as needed.
   E. Consider capping sensitive site areas if they cannot be avoided; this process should be conducted by an archaeologist.

4. Prepare site record forms (DPR 523 series) for the following historic features: the original railroad alignment, including the trestle, Selwyn Siding, and Ladrillo Siding; and the Union Brick Company location. Field surveys will be necessary to prepare the forms, identify the boundaries, and elements of the resources.
5. Document and retain historic features, such as any fences, fence posts, and foundations. If fences need to be removed for habitat or biological reasons, have a qualified archaeologist document them first, and retain the posts if they are historic (wire may be removed following documentation).

A. All features associated with the historic location of the railroad should be inventoried, mapped, and recorded with SCIC (see recommendation 4 above). This includes any remaining structures or objects.
B. All features and objects associated with the ranching and dairy activities in Rose Canyon should be inventoried, mapped, and recorded with SCIC. This includes fencing, wire bundles, foundations, and other features or objects.

6. Provide access to interested Native Americans for traditional activities including but not limited to plant gathering.

2.3.2 Recommendations to Assess Potential Effects on Cultural Resources by other actions

- Conduct detailed surveys during the planning of restoration projects
- Conduct detailed surveys and evaluations along existing and proposed trails
- Implement measures to minimize impacts to cultural resources where unavoidable

This assessment includes recommendations to restore and enhance the watershed, including trails and other physical improvements that could potentially impact cultural and historic resources. Consequently, this section includes recommendations on protecting known and unknown resources while implementing the other recommendations. These include:

1. Conduct surveys and evaluations during the planning phase for habitat restoration projects. Habitat restoration projects are proposed in upland and wetland vegetation communities. In a few cases, there are archaeological sites located in or near the proposed habitat restoration areas. Prior to any detailed planning for these projects, the areas should be surveyed for archaeological resources, and the project should then be designed to avoid impacts. It is possible that the project can assist in protecting the sites by covering them with non-disturbing vegetation. Habitat restoration projects should not result in the removal of any historic features, such as fencing or other artifacts associated with the ranching, dairy farms, or railroad uses of the canyons. These features should be adequately documented during the planning stage for habitat restoration projects.
2. Conduct surveys and evaluations for existing and proposed trails and paths. It is not possible to determine if continued public access on existing trails within San Clemente Canyon will result in any adverse impacts since the archaeological survey conducted for this area is inadequate. In the case of Rose Canyon, public access through existing trails and paths can be classified into three categories:
   A. Ad hoc trails. Any ad hoc trails that run through or adjacent to known cultural resources should be closed, and future trail use prohibited. Signage and fencing may be needed to prevent continued trail use into the resource areas.
   B. Proposed trails. The proposed Coastal Rail Trail has the potential to adversely impact several known archaeological sites. Prior to completion of any trail planning efforts, a complete archaeological survey of the proposed trail alignment should be conducted. All trail routes should be designed to avoid identified cultural resources. An adequate buffer of ten to fifteen feet should be maintained between the edge of any cultural resources and the trail edge.
   C. Existing trails and paths. It is likely that existing trails and paths go across or near cultural resources. If possible, these should be re-routed away from the sites, after the sites have been adequately mapped and boundaries determined. If it is not feasible to relocate existing trails and paths, several measures should be taken to manage impacts to the sites:
      - Stabilize the trail surface so that erosion and sedimentation does not further damage the site.
      - Revegetate the site area beyond the trail with nondestructive methods, such as seeding, to provide cover and protect against erosion.
      - Monitor the condition of the site on an annual basis to determine whether continued trail use is damaging the site. If damage is noted, mitigation measures may need to be developed, depending on the nature and extent of the damage
      - Mitigation measures could include closing the trail or conducting data recovery excavations on the portion of the site impacted by trail use

Additional Cultural Resource Management Measures can be found in Chapter 4, Section 4.3.2 on page 4-12.

2.3.3 Recommendations for Cultural Resources Interpretive Opportunities

- ☑ *Develop interpretive panels for cultural resources*
- ☑ *Identify locations for interpretive panels along recreational trails and at access points*

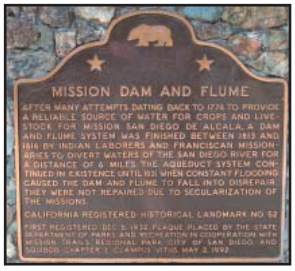
The RCW provides many opportunities to interpret the history of this region. Signage, information and maps developed for this assessment could include cultural and historic interpretation to help visitors understand the prehistoric and historic cultural history of the watershed. A professional graphics and interpretive specialist should be retained to write and design materials presented to the public. Comments and suggestions on the materials should be solicited from organizations like the San Diego Archaeological Society and the new Rose Canyon Historical Society.

1. Cultural Resource Interpretive Panels

The following suggestions for a series of interpretive panels are based on the research conducted for this assessment.

***Theme**- Water and people have moved through this landscape for thousands of years.*

As trail users move through the landscape, sometimes following ancient paths and trails, they can see how use of the watershed has changed over time. By reading the panels in chronological order, visitors will experience the passage of time, water, and people through the canyons. The panels can also be visited out of order, for a snapshot of the way things were long ago in San Diego.



Each panel should be mounted in clear view of passersby. Enamel panels provide the clearest graphics and best color, but the images can be subject to vandalism. Etched metal panels are sturdier, but are best used for simple graphics and text. A third option is replaceable printed-paper or card stock panels bolted between clear plastic sheets. These can be inexpensive to reproduce, and are easily replaced and updated. If a kiosk is available for the panel, it can be located adjacent to the panels to provide further protection. Additional information on the contents of the panels can be found in Chapter 4, Section 4.3 on page 4-11.

2. Interpretive Panels Topics and Locations

While the theme is human use of the watershed, each panel should also include interpretation of the natural features of the watershed. Proposed panel contents (exact wording to be developed by an interpretive specialist) and suggested locations of the interpretive material include:

Upper Rose Canyon (Figure 2-15)

A: Ancient Settlements - 12,000 to 1,300 years ago
Proposed location: Trail access location at Genesee and Rose Canyon.

B: Late Prehistoric Travelers - 1,300 to 200 years ago
Proposed location: On the south side of Rose Canyon, near end of Regents Road, where there is a vista of the side canyon and valley bottom.

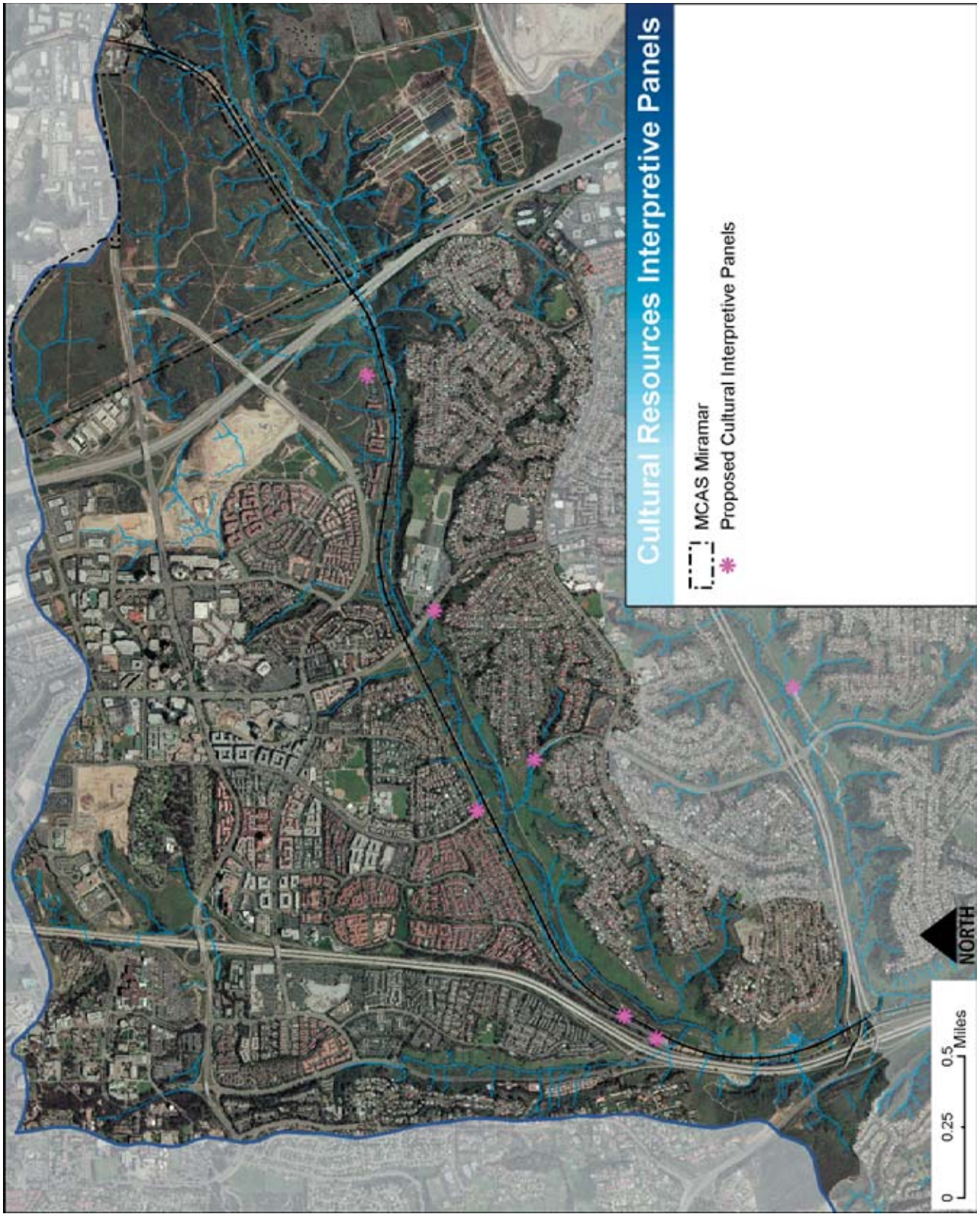
C: Spanish Travelers - 1769
Proposed location: At the west end of Rose Canyon at Interstate 5, below where the canyon turns to the east (this would have been on El Camino Real).

D: Railroad Ties - 1881 to present
Proposed location: The eastern end of Rose Canyon near Interstate 805.

E: Louis Rose and the Dairies - 1856 to 1900
Proposed location: The western end of Rose Canyon near Interstate 5.

F: Growth in the North City 1900-present
Proposed location: On the north side of Rose Canyon, at the end of Regents Road.

Figure 2-15: Proposed Interpretive Panels within Upper Rose Canyon



Upper San Clemente Canyon (Figure 2-16)

A: Traditional Management and Use of the Watershed - 12,000 to 200 years ago
Proposed location: In San Clemente Canyon at the parking area south of State Route 52 on Genesee.

B: Ranching in the Canyons - 1800-1960s
Proposed location: In San Clemente Canyon at the parking area on Regents Road

C: The Watershed Today
Proposed location: In San Clemente Canyon, at the east end at the public access location.

lower Rose Creek (Figure 2-17)

A: The Brickyard - 1912
Proposed location: Near the Santa Fe Drive bridge over Rose Creek.

B: The Village of La Rinconada - 200 years ago
Proposed location: Near the mouth of Rose Creek south of Grand Avenue.

2.4 Recommendations for Public Safety

While a review of public safety was not included as a project task in the original scope of work for the assessment, the project team incorporated public safety as an additional study component after identifying a variety of public safety concerns. The assessment has identified three primary public safety issues of concern in the RCW: fire, landslides and illegal activities.

2.4.1 Recommendations for Fire Prevention and Management

In light of the 2003 wildfires in San Diego, many residents, community leaders and public officials are looking for ways of preventing another round of devastating fires while preserving the natural qualities that we value. Active fire risk management is an important first step, especially in areas like the RCW where substantial areas of natural vegetation occur directly adjacent to urban development. This is especially critical when you consider that if it were not for a slight shift in the wind patterns during the October 2003 Cedar fire, the fire could have continued through MCAS Miramar, across I-805 and down San Clemente Canyon, potentially traveling all the way to the coast (Figure 2-18).

2.4.1.1 City of San Diego Fire Programs

Since the October 2003 fires, much more information is available to the public about how to manage private property for the reduction of fire risk, such as the City of San Diego's new guide to *Fire Safety and Brush Management*, which provides guidelines for brush management in canyon areas. Information on fire resistant plants is available in the city's *Landscape Technical Manual* and from other sources, including the California Native Plant Society. City documents can be found on the City's website at www.sandiego.gov. No city permits are required if you perform brush management on your own property consistent with city guidelines.

The city has also begun a new Community Emergency Response Team (CERT) program. Through CERT, the city offers free training and help setting up team-based emergency response plans staffed by community volunteers. The eight week, four hour per class program is designed to build team readiness in the case of a disaster, including fires, and is taught by fire-rescue personnel to Federal Emergency Management (FEMA) standards. The focus of the CERT program is helping the community better respond to a fire (or other emergency), not prevent fires.

The City of San Diego has a very small fire prevention staff (staffing consists of 1 supervisor, 1 fire prevention inspector, 1 code compliance officer, and 1 clerical) assigned to fire prevention activities associated with open space and natural lands. Their roles include community outreach, fire inspection and code compliance within the 331 square mile city (which comes to over 1,000 linear miles of wildland interface), which is interspersed with natural canyons, creeks and mesa tops. This limited staffing has made it difficult to get the word out to the

Figure 2-16: Proposed Interpretive Panels within Upper San Clemente Canyon

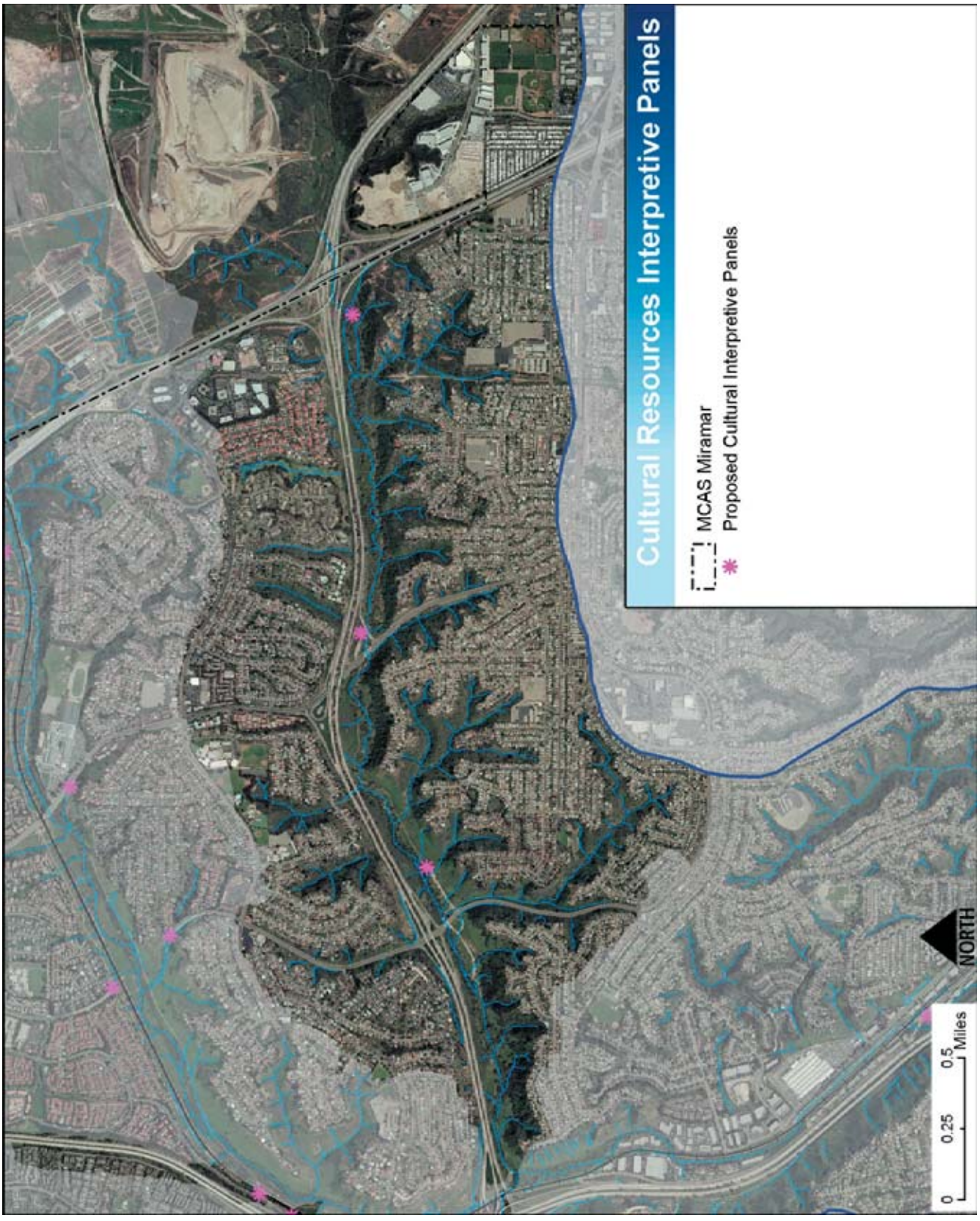


Figure 2-17: Proposed Interpretive Panels within lower Rose Creek

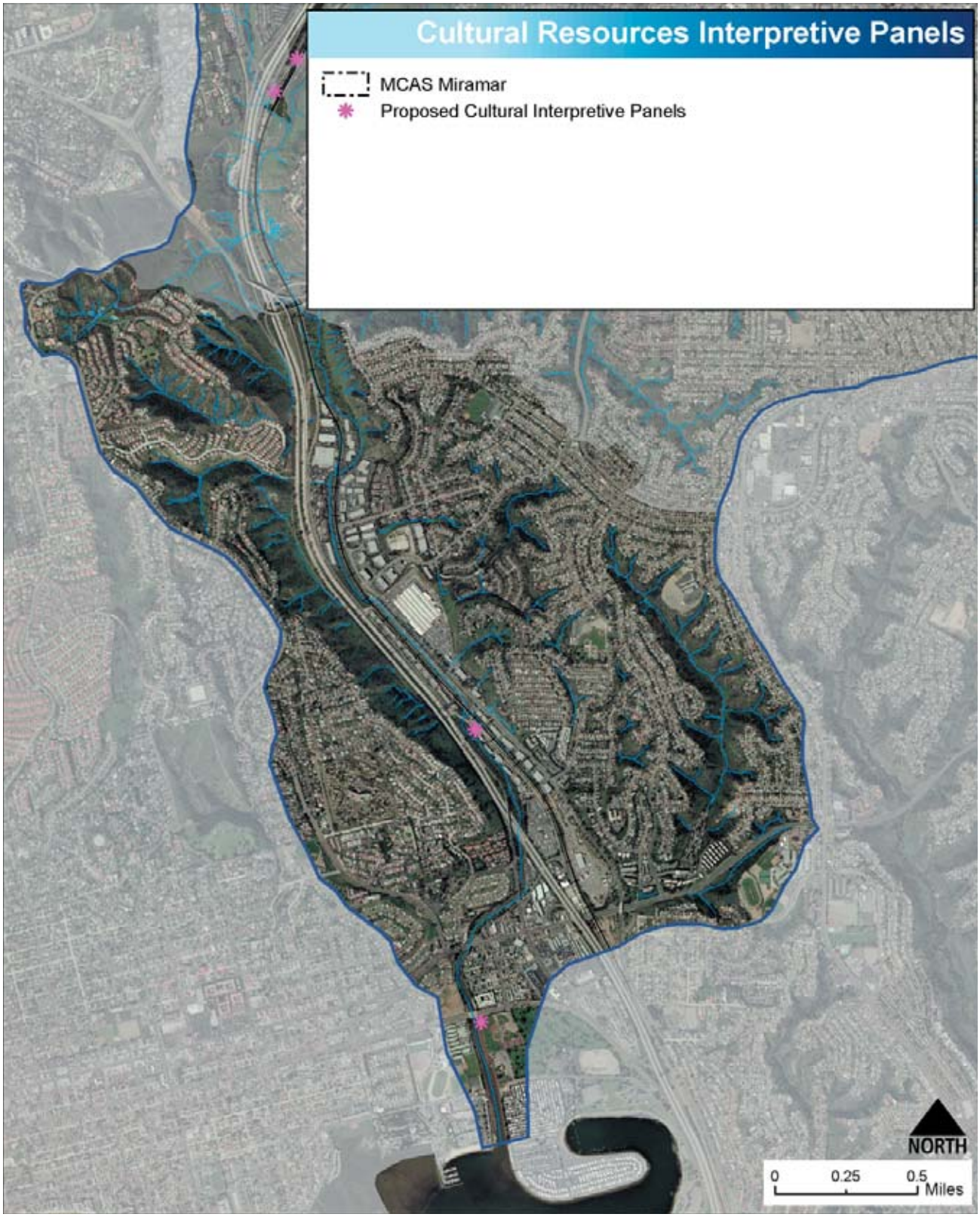
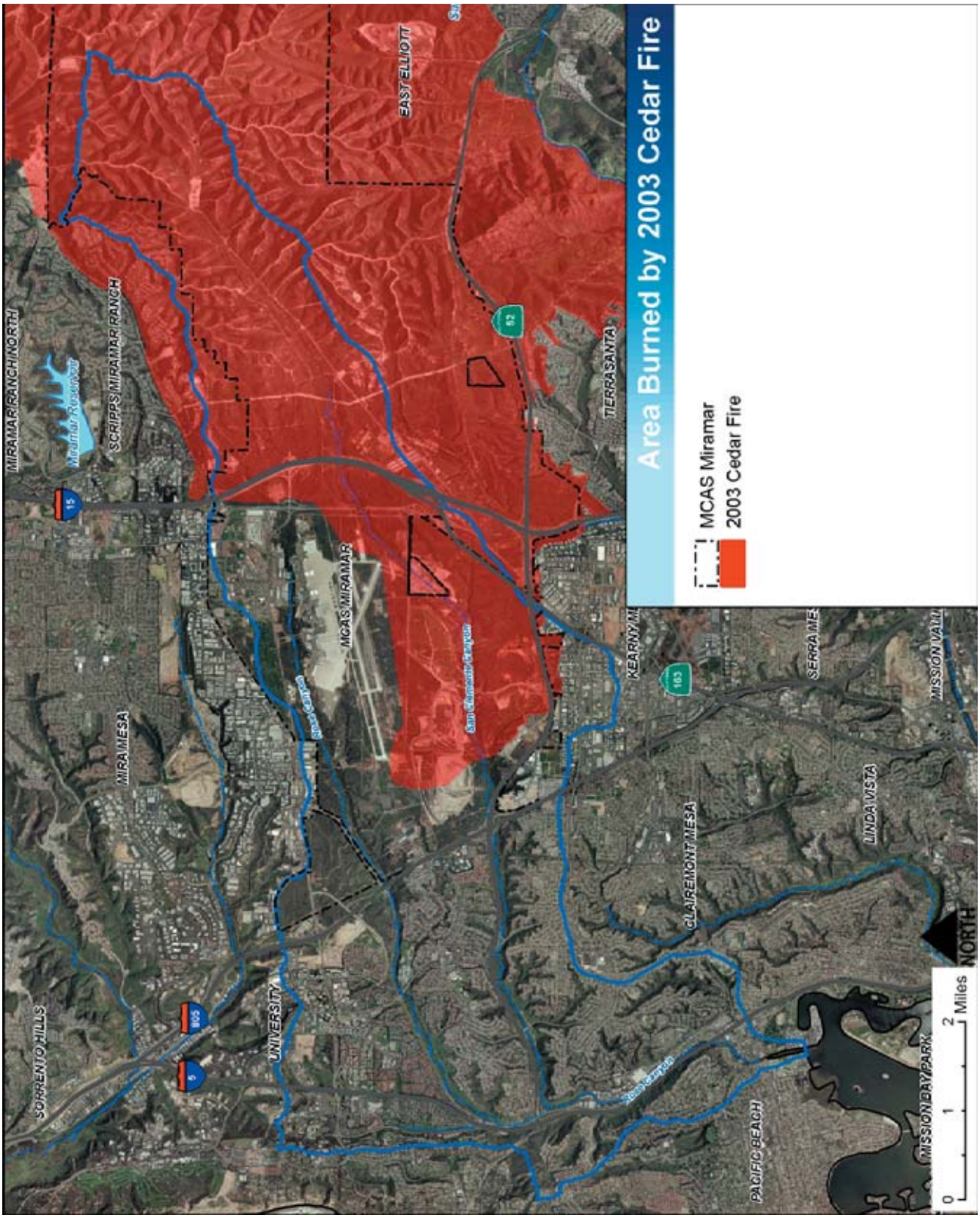


Figure 2-18: Aerial Map showing RC watershed fire line imposed over watershed line



public that fire prevention is everyone's responsibility. For example, the City staffing levels only allow for inspections on a complaint basis. Unfortunately, the public has grown complacent since the 2003 Cedar Fire and very little prevention activity on private land, including land in the RCW, has occurred. This is especially of concern in the RCW as many private properties occur adjacent to natural open space; most of which has not burned or been thinned in many years.

An Environmental Impact Report and Municipal Code changes were recently approved (September 19, 2005) by the City Council for the City's Brush Management Program. The revisions are designed to modify the City's practices based on knowledge gained from the 2003 Cedar Fire and other recent fires. The report included recommendations for new fire prevention activities including additional brush management on city-owned lands. Unfortunately, the City did not approve funds to implement many of the changes recommended in the report; stating "full scale implementation is not being proposed at this time, but instead could be phased in over the next several fiscal years if funding becomes available." Residents living near City-owned open space can seek a Right of Entry Permit to perform brush management on city land. More information on the brush management regulations can be found on the City's website.

2.4.1.2 MCAS Miramar Fire Programs

MCAS Miramar has a significantly different approach to fire prevention. One fire captain is assigned as the wildland fire and fuels management program manager to reduce the wildfire risk on the 25,000-acre base. This individual can assign firefighters of the 38-member fire department to help with ongoing wildland fire and fuels management activities. These projects include prescribed burns, tree and vegetation thinning, creation and maintenance of fire roads and fuel breaks, and roadside brush clearing. In 2005 alone, eight prescribed burns were conducted and another 97 acres of grass and chaparral were mechanically treated on MCAS Miramar. Fifty of these acres were community protection fuel breaks for Tierrasanta and Scripps Ranch. The base also utilizes the services of the engineering department of the Navy for fire prevention support. Fire prevention activities take place under the guidance of the Miramar Fire Departments' *Wildland Fire Management Plan* at the direction of the Department of Defense and the National Fire Plan, which includes guidelines for fire fighting and prevention in natural areas, with specific concerns for the protection of sensitive or endangered species. Public outreach and education programs are developed and coordinated by the base Fire Prevention Bureau.

2.4.1.3 Fire Risk Within the Watershed

The RCW includes many small tributary canyons, as well as the two main canyons of Rose and San Clemente. During the 2003 Cedar Fire, 35% of the watershed was burned – most of that area was on MCAS Miramar. The remaining unburned area currently remains at a very high risk of wildfire (Figures 2-19 to 2-21).

2.4.1.4 Recommendations to Manage Fire Risk

- ☑ *Conduct a Fire Risk Management study*
- ☑ *Create Fire Safe Neighborhood Councils*
- ☑ *Promote landscaping with fire-safe native plants*
- ☑ *Augment staff resources dedicated to brush management and fire prevention*

Fire will always be a concern in hot and dry southern California. Fire prevention is not a one-time event, but an ongoing activity that must be continued to be useful and effective. After the 2003 Cedar fire, common sense would tell you that residents in the unburned urban wildland interface would be taking aggressive steps to make their properties and communities more fire safe. This is especially of concern in the RCW where private property ownership makes up the second largest ownership within the watershed, the first being MCAS Miramar. Unfortunately, that has not been the case.

Figure 2-19: Preliminary Physical Fire Risk within Upper Rose Canyon

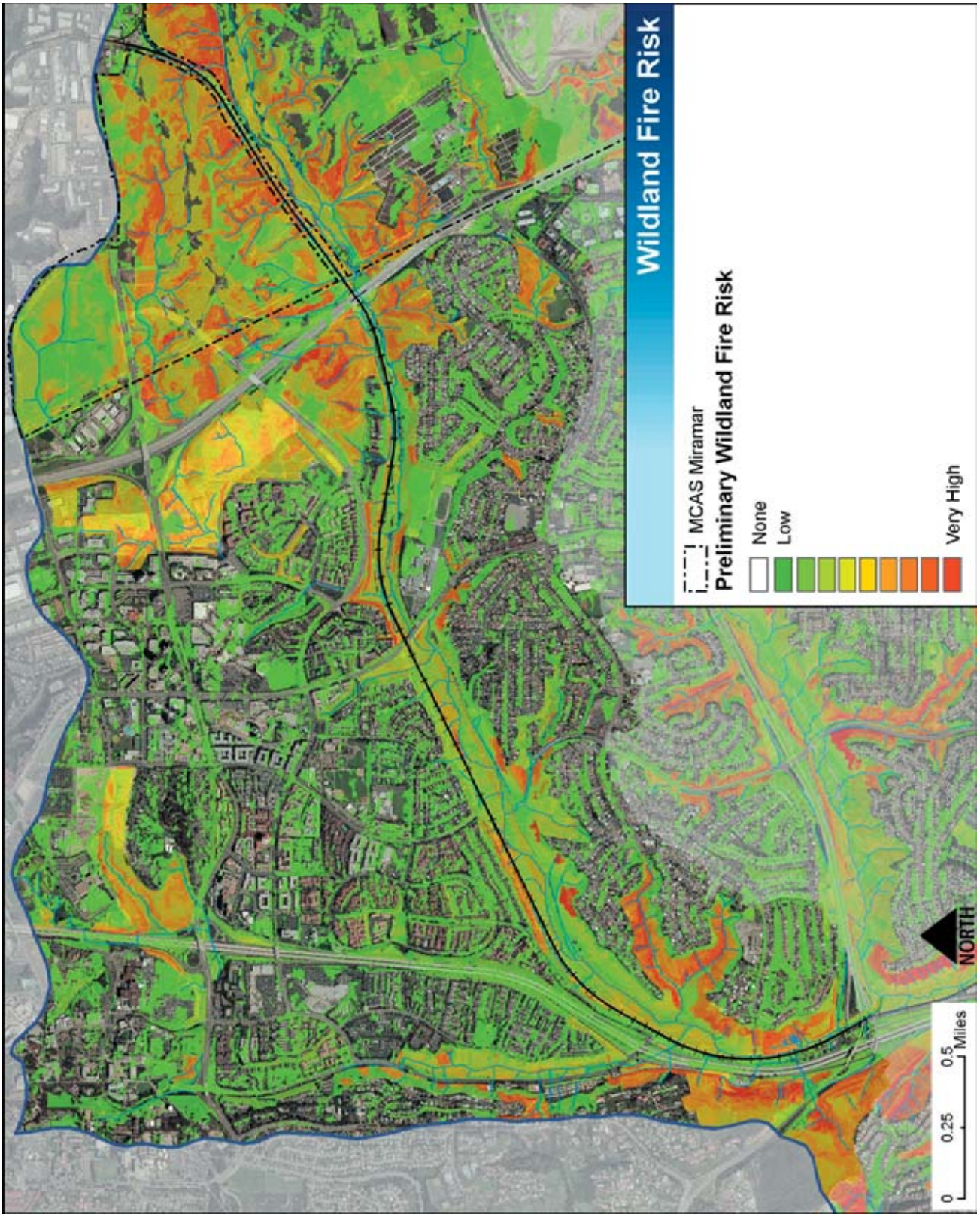


Figure 2-20: Preliminary Physical Fire Risk within Upper San Clemente Canyon

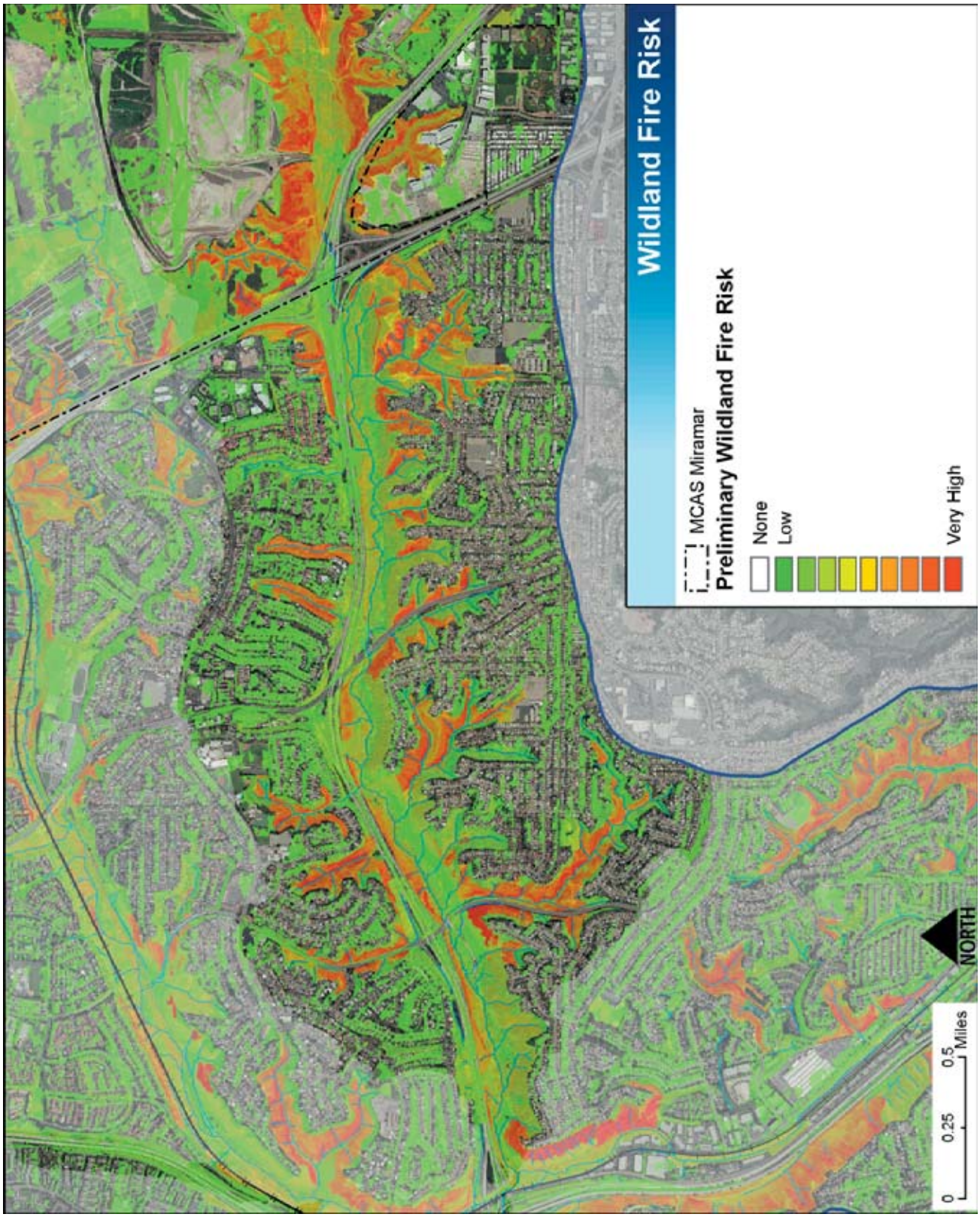
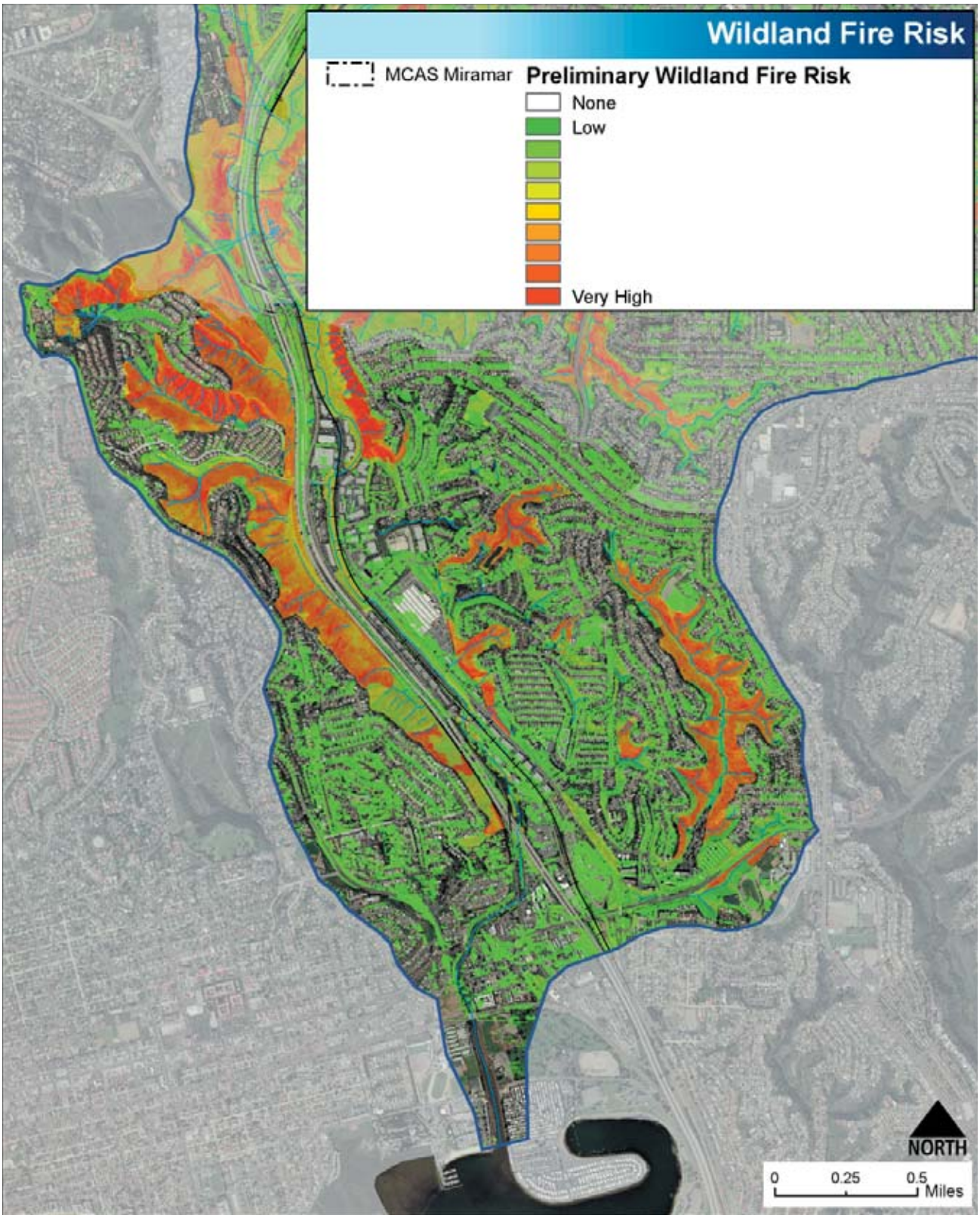


Figure 2-21: Preliminary Physical Fire Risk within lower Rose Creek



Fire prevention activities can be made consistent with protection and enhancement of natural resources, including the protection of sensitive and endangered species. Good planning and proactive steps will make San Diego as a whole more fire safe, both for people and nature. These fire safety recommendations, in addition to those recommended in the City's Fire Safety and Brush Management Guidelines and Landscape Technical Manual, if implemented, will help make the RCW more fire safe:

1. Conduct a Fire Risk Management Study for the Watershed

The proposed study should map and model fire risk within the RCW in an effort to understand potential ignition sources and likely fire behavior under a variety of weather conditions. The study should be developed in at least five integrated phases: GIS data development; Risk assessment modeling; Fire Simulation modeling; Action Plan development and Community Outreach. Much of the underlying data developed for this assessment can be used in the proposed Fire Risk Management study, thus making this a more cost-effective analysis than could have been done otherwise. The results would be available to more effectively plan fire prevention strategies in the watershed, such as targeting invasive species removal activities, including brush clearing, and to prioritize efforts in areas of the watershed with the highest fire risk.

2. Create Fire Safe Neighborhood Councils Throughout the Watershed

Residents of the RCW cherish their access and views to the wildland canyon system. As evidence of that, homes with canyon views are likely to be of much higher value than those without views. Because of the topography of the RCW, which includes many small tributary canyons adjacent to public open space, many residents live on dead-ends where streets end at a canyon edge. Many of these tributary canyons are 100% privately owned. Often residents have backyards that include steep canyons that fall behind their homes. Maintenance of these slopes can be daunting, so they are frequently left unmanaged. Vegetation (much of it non-native) has built up in these canyons over the years, the risk of fire is heightened, as is the threat to firefighters who cannot easily access the properties during a fire.

Model programs called *Fire Safety Councils* have been created to help residents ban together to prevent fires and enhance emergency response in their own neighborhoods. Similar to neighborhood watch, the fire safe council model creates a way for neighbors to be proactive about fire prevention, to address brush management, to identify resources in a community that could be used to help fight a fire, and to know which neighbors might need special help in an emergency.

The data developed for this assessment and the results from recommendation 1 above could be available to help residents establish fire safety councils throughout the watershed. Implementation of other recommendations included in this assessment, such as the removal of invasive exotic species, could also be targeted in the highest fire risk areas.

3. Landscaping with Fire-safe Native Plants

In addition to thinning brush around your home, homeowners can take steps to reduce the threat of fire by replacing flammable landscape materials with plant materials shown to be fire safe. Homeowners interested in fire prevention that will enhance the natural values of the Rose Creek Watershed have many wonderful native plant varieties from which to choose.

The California Invasive Plant Council (www.calipc.org) and the California Native Plant Society have recently collaborated on a brochure entitled "Don't Plant a Pest" that provides examples of replacement plant materials for both fire hazard reduction and invasive exotics. There is additional information about fire safe natives on the Rose Creek Watershed Alliance Website, http://www.rosecreekwatershed.org/firesafe_plants.

4. Enhance Brush Management and Fire Prevention Resources

While both City Park and Recreation, Open Space Division , staff and Fire Department staff have demonstrated strong personal commitment to fire prevention, lack of financial resources have prevented City staff from undertaking a comprehensive fire prevention program in the Rose Creek Watershed, or other city watersheds. City staff respond largely on a complaint basis.

The Rose Creek Watershed is extremely vulnerable to wildfire; more so now in 2005 after the heavy rains of the 2004-2005 season. Recent fires (2005) in the Los Angeles area have shown how effective brush management can be in saving structures and lives. A relatively small upfront investment in prevention could result in significant savings in the Rose Creek Watershed as well. The City's recent action to approve changes in brush management rules resulting from the Cedar Fire is a good but incomplete first step. The City's own report (N31245) outlines the financial shortfall in the program but does not recommend full scale implementation rather, suggesting that implementation should be phased in as funds are available. To continue this approach is to risk a much large loss of structures, and potentially lives.

2.4.2 Recommendations to Reduce Landslides

- ☑ *Reduce runoff on steep slopes*
- ☑ *Remove slide-prone vegetation and re-vegetate*

Landslides are a naturally occurring event that can be triggered by human actions. Within the RCW, the natural geology, overlying soils and topography combine to create many areas with elevated risk for natural landslides (see Figure 3-3 in Section 3). The geologic layer-cake of marine sedimentary (ocean floor) and fluvial (stream sediment) deposits is often loosely consolidated (not hard bedrock) and highly erodible if exposed to the forces of wind and rain. The vast majority of the soils are also highly erodible when exposed and are characterized by slow infiltration rates (speed at which water soaks into the soil) that generate higher runoff volumes, which in turn increases the natural rate of erosion. Add to this the effects of the Rose Canyon Fault lifting the western edge of the watershed and the results are natural landforms that reflect the erodible nature of the geology and soils, in that Rose and San Clemente canyons start off as deeply incised canyons in the coastal mesa with high steep side slopes and graduate to shallow canyons with gentler side slopes.

Human activities can increase this risk. The conversion of natural land to impervious surfaces (roof tops, patios, driveways, streets, etc) increases the runoff from a storm. Some private lands (typically those along a canyon rim) do not drain all of the storm water runoff to the City's storm drain system, but instead direct the runoff to the natural slopes which typically results in increased erosion and can destabilize the slope causing a landslide to occur. Additionally, the way homeowners manage the natural slopes (grading and landscaping) can create conditions that can lead to landslides as well. A prime example is the use of iceplant (Carpobrotus sp.) as landscaping on steep slopes. This practice is widespread and often implemented for fire protection purposes. However, when heavy rains saturate the soils and engorge the iceplant stems and leaves, the added weight of the iceplant in combination with its shallow root system can cause localized landslides as were prevalent during the storms of spring 2005. Any plant that has its root zone at a shallow level with no other plants that are deeper rooted in the same area can have a similar affect. Figures 2-22 to 2-24 show those areas with steep slopes (>25%) that are currently vegetated with iceplant.

Landslide prevention activities can be made consistent with protection and enhancement of natural resources, including the protection of sensitive and endangered species. These recommendations, if implemented, will help reduce landslides within the RCW to more natural frequencies:

1. Reduce storm water flows down the steep slopes

Private homeowners along the canyon rims should re-direct or detain storm water, preventing it from discharging down the steep slopes in a concentrated flow. This can be accomplished through re-grading portions of the site to direct flow away from the canyon rim or through the installation of storm water infiltration Best Management Practices (BMPs) that capture storm water and allows it to soak into the soil over time. These BMPs are also discussed later within the Storm Water Reduction (Section 2.6.4) in the Water Resources actions.

Figure 2-22: Steep slopes with Iceplant within Upper Rose Canyon

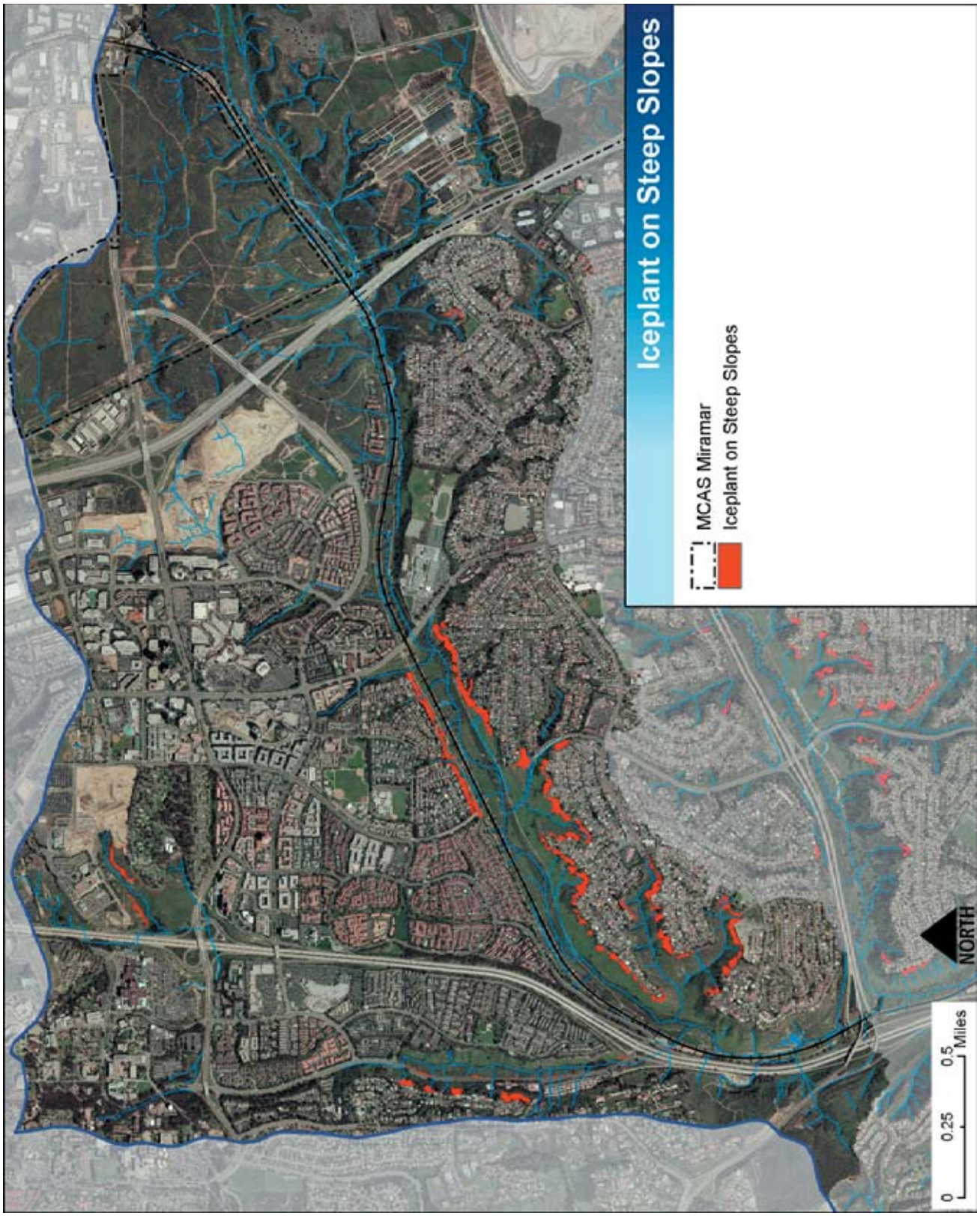


Figure 2-23: Steep slopes with Iceplant within Upper San Clemente Canyon

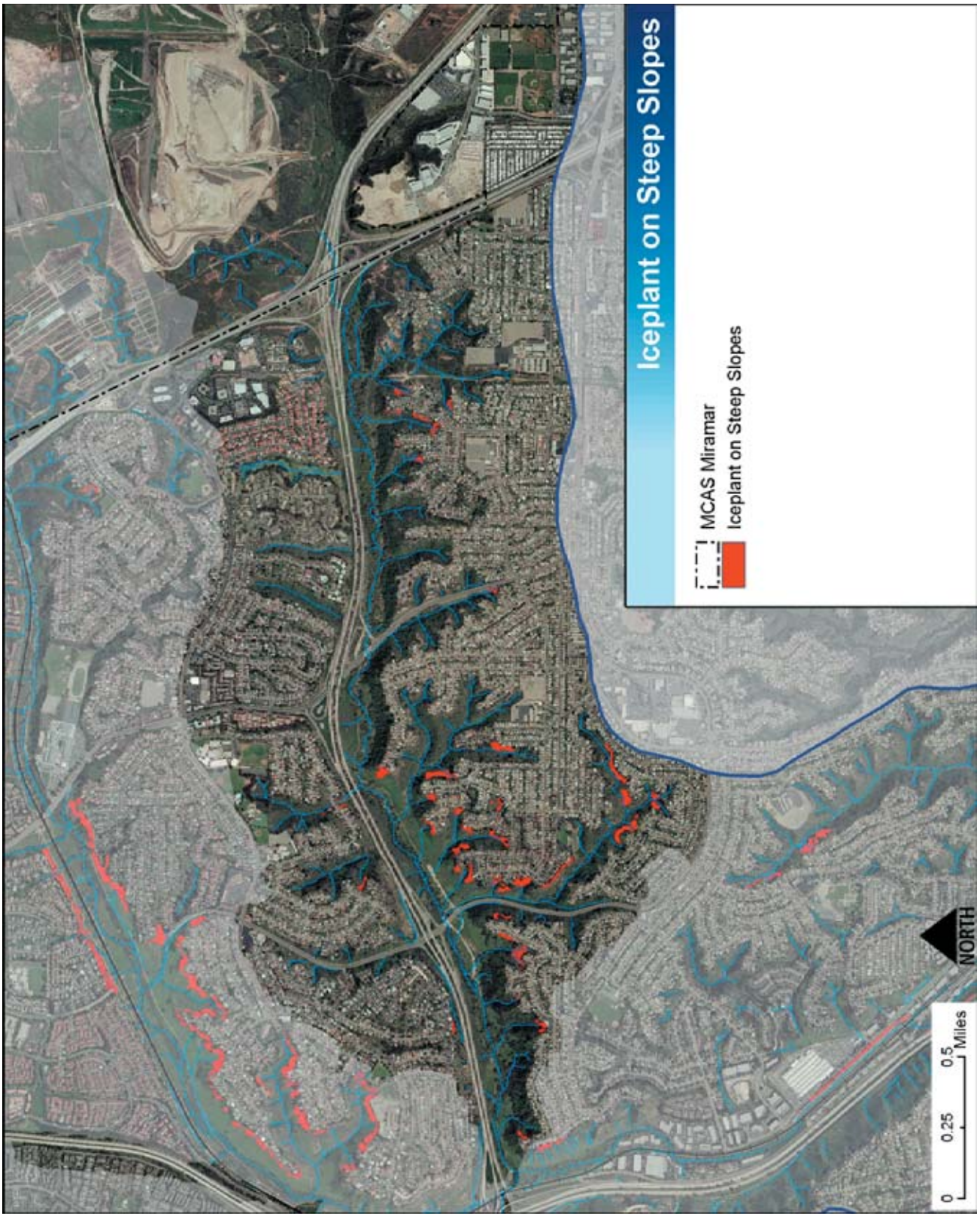


Figure 2-24: Steep slopes with Iceplant within lower Rose Creek

2. Remove Iceplant and revegetating with non-invasive and less slide prone plant material

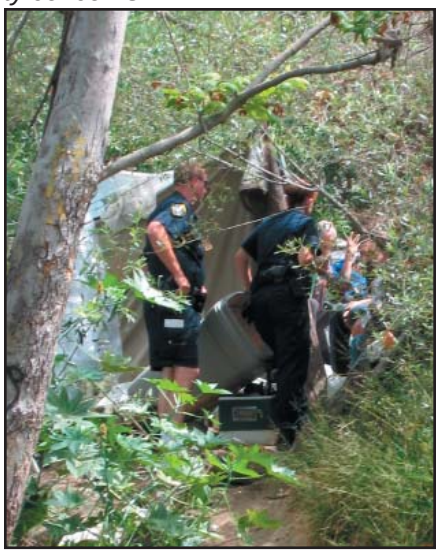
Private homeowners along the canyon rims should remove iceplant from the natural slopes and revegetate with other plant materials that are fire safe, but do not pose the same risk for landslides. Native plants are recommended, but other non-invasive landscape plants could be used as well. Consultation with a landscape architect, landscape designer, or native plant specialist may be necessary to determine an appropriate solution for a given site. The California Invasive Plant Council (CalIPC) (www.calipc.org) and the California Native Plant Society have recently collaborated on a brochure entitled "Don't Plant a Pest" that provides examples of replacement plant materials for both fire hazard reduction and invasive exotics. Many of the recommended replacements would be appropriate for this purpose as well. The brochure is available through the CalIPC website (http://groups.ucanr.org/ceppc/Landscaping_Alternatives/). The website has a variety of other useful informational bulletins and brochures as well. At a minimum, the addition of some deeper rooted container plants intermixed throughout the iceplant covered slope would reduce landslide potential as well, but would not provide the added benefits of removing an invasive plant species and providing native habitat for local wildlife.

2.4.3 Recommendations to Reduce Illegal Activities on Open Space Lands

- ☑ *Incorporate public safety improvements into enhancement projects*
- ☑ *Inform public of appropriate action when witnessing an illegal or suspicious activity*
- ☑ *Develop a long-term program for addressing chronic illegal activities*
- ☑ *Enhance Police Department staffing to better address public safety concerns.*

Policing a natural area surrounded by an urban environment presents unique challenges. If the area offers isolation due to its location and/or due to an overgrowth of vegetation, and if general public access is limited, problems can arise. If minor problems are not permanently resolved, they can become more serious. Natural areas can become centers of illegal activity, to the detriment of the general public and of the plants and animals that reside there.

While public safety in the RCW is generally on par with the rest of the City of San Diego, (See 2003-2005 Crime Statistics in Chapter 4, Section 4.4 on page 4-14) lower Rose Creek in eastern Pacific Beach has unfortunately developed as a base for criminal activity due in part to dense vegetation (including exotic invasives). Dense vegetation provides concealment for illegal activity, including illegal lodging and it limits accessibility to police. While illegal activity is more frequent in lower Rose Creek, other open space areas in the watershed have also been subject to illegal activity, most of which has been addressed by the City Park Rangers who work in Rose and San Clemente canyons.



Police inspecting an illegal lodging in lower Rose Creek for suspected drug use

The creek is not a self-supporting environment- those living in the creek must come out to the surrounding community. Police officers know from their observations and experience that the main problem in the creek is centered on the illegal lodging activity; trespassers are using the creek as a base for criminal activity. Crimes and arrests range from assaults, theft, and drug violations to simple illegal lodging. Officers acknowledge that arrests and police sweeps are not providing a long-term solution to the problem. Police officers assigned to work this area know of the chronic problems that are taking place in the creek; it's just that periodic police sweeps and clean-up efforts, absent a comprehensive integrated policing strategy, result in at best, short term success.

The presence of illegal activity and dense exotic invasive plants in lower Rose Creek have combined to create the worst of all environments – it is unsafe and unhealthy for the general public and for the native plants and animals that depend on the creek, and the rest of the watershed, for their survival.

An Illegal BMX track eroding after spring rains

Long term, the solution may lie in addressing the inter-related core public safety issues; concealment, accessibility and location, concurrent with other recommendations in this assessment. This section includes recommendations that target public safety:

1. Incorporate Public Safety Improvements into Watershed Enhancements

This assessment includes recommendations to restore and enhance the watershed to promote its natural and recreational values. These recommendations include construction of new public access to lower Rose Creek to provide continuous public recreational trail “off road” (not shared with autos) from the upper watershed to Mission Bay. In planning and implementing all the improvements recommended in this assessment, public safety considerations should be researched and incorporated wherever possible.

Same Illegal BMX track showing its adjacency to residential development

Restorations and enhancements should be designed to manage the vegetative canopy to allow both visitors and public safety personnel to see through the canopy, wherever possible. In riparian enhancement areas near storm drains, an added benefit to this approach will be to allow for freer movement of storm water through the watershed, thus reducing storm drain maintenance costs.

Trails and/or trail access should be designed to support public safety patrols. Law enforcement patrol presence is required to ensure public safety and resource protection, including emergency response.

2. Public Education – Reporting Illegal or Suspicious Activity

Throughout the investigations for this assessment, members of the public raised concerns about illegal activity in the watershed, especially in lower Rose Creek. Often the public would raise a concern over an illegal activity they had witnessed but when questioned whether they had reported it to the police, they indicated they had not. This was at times based on a perception that “nothing would happen” or a fear of retaliation.

Because the City's financial resources are limited, and allocation of public safety resources is based on need -- and need is determined based primarily on reported crimes - it is critical that the public report illegal and suspicious activity in the watershed. All violence and crimes in progress should be reported at once via 911. All suspicious activity should be reported to the Police Department by calling (619)531-2000. It is important that people know that the police will take appropriate action on all reported incidents. Calls coming into the Police are categorized based on the information given by the caller. Suspicious activity would include drug use, unusual behavior and suspected stolen property. Citizens seeing what they believe to be drug use or sales should safely leave the area without confrontation and call the Police Department at (619) 531-2000 with a description of the suspects.

Illegal BMX/Motorcycle track hidden in tributary canyon

An education program should be developed to help the public know when the Police should be called and to better coordinate public safety activities in the watershed. Through the implementation of this assessment, there may be another method set-up to report campsites and dump sites. However, this would not take the place of calling the Police to report dangerous activity.

3. Develop a long-term program for addressing chronic illegal activities

The Police Department has periodically completed sweeps through lower Rose Creek to eliminate illegal encampments. Unfortunately, the camps often return as the issues that made the creek amenable to such activity remain. With implementation of the recommendations in this assessment, the creek will be less likely to be used as a base for criminal activity. However, to make improvements sustainable, it will require a coordinated and on-going program that includes active public participation to put "eyes on the creek", such as through reporting of suspicious activity and these recommendations:

Illegal dumping of construction and landscape waste

Create a consistent process for the public to report encampments in the RCW to enable the police and other members of the San Diego Police Department's Homeless Outreach Team (HOT) to eliminate the encampments while providing services and outreach to the homeless. Enforcement without camp elimination will not be effective.

Provide regular visits to the RCW by the San Diego Police Department's Homeless Outreach Team so that the team's specially trained officers and clinicians can offer services to the homeless. This effort should also include a regular census of people found living in the creek that will establish a better measure of the issues and identify problem sites.

Interpretive nature trail in San Clemente Canyon at western most end of Regents Road parking lot

Work with the City Attorney Neighborhood Prosecution Unit for proper follow-up to criminal activity. This would include prosecution with a focus on the needs of the community and offender-rehabilitative sentencing that may include conditions requiring substance abuse treatment for offender and geographic probation that would encourage the offender to stay away from the area.

Interpretive nature trail in Rose Canyon at west end of Governor Drive

Provide quarterly analysis of criminal activity in the watershed so that trends can be identified and addressed proactively. A preliminary crime analysis is shown in Chapter 4, Section 4.4 on page 4-14.

4. Augment Police Department Staffing
Due to staffing limitations, officers working in the Rose Creek Watershed have very little time available to concentrate on prevention. Almost all daily operations are associated with responding to illegal or suspicious activities, not preventing crime. Staffing limitations, combined with the physical constraints in the watershed (dense vegetation, no access) have combined to create a haven in lower Rose Creek for illegal activities. As the recommendations in this assessment for restoration are implemented and public access improves in the area, public safety will improve as well. However, to maintain and enhance the value of those improvements, additional officers with time to focus on prevention are recommended.

Interpretive nature trail in Rose Canyon near Genesee Avenue

2.5 Recommendations for Recreational Trails

- ☑ Improve access to the open space system
- ☑ Improve access within and between open space areas
- ☑ Create regional recreational connections and loops
- ☑ Create safe and legal railroad crossings

The RCW offers a multitude of recreational opportunities for local residents and visitors. Two large natural open space parks and the gateway to San Diego's world-renowned Mission Bay Park are accessible to residents and visitors. There are hiking, bicycling and jogging trails, and many opportunities to observe nature including three interpretive nature trails. Active parks for soccer and other team sports are found throughout the watershed. The watershed also includes dog parks and a golf course.


Interpretive nature trail in Rose Canyon at the end of Governor

Visitors to the RCW enjoy generally good automobile access to two of the City of San Diego's open space parks in Rose and San Clemente canyons. Automobile access is also readily available to Mission Bay Park.

What is not consistently available in the watershed is pedestrian and bicycle friendly access to the public recreation spaces within the watershed. Also lacking is pedestrian and bicycle friendly access between the public recreation spaces including the canyons, creeks and Mission Bay Park. This is consistent with 1960s and 1970s-era land use planning that gave birth to University City and Clairemont; land use planning that favored the automobile over pedestrians and cyclists and all but ignored the connectivity of natural systems. While the distances to travel within the watershed are easily walkable and were certainly walked by Native Americans, today there are obstructions that make it inconvenient in places, illegal at times, often unpleasant and potentially unsafe.

For example, today a cyclist can ride from the upper watershed, University City or Clairemont to Mission Bay – but with some difficulty. The ride within Rose Canyon Open Space Park or Marian Bear Memorial Natural Park is on a dirt path, limiting access to mountain bikes only. From the west end of Marian Bear Memorial Natural Park, a rider will make awkward and potentially unsafe creek crossings before illegally crossing the railroad tracks from either park (there are no legal crossings) to join the existing Rose Canyon Bike Path which drops onto Santa Fe Street adjacent to lower Rose Creek. From that point, the rider is on a public street directly paralleling Interstate 5 until joining the Rose Canyon Bike Path again at Mission Bay Drive.

At this point, the bike path is directly adjacent to Rose Creek through a section of Pacific Beach that suffers (according to police officers working the area) from high crime problems including drug sales, vagrancy and vandalism. That section of the trail later enters Mission Bay Park via a narrow path with a high chain link fence on both sides, turning a few times before opening back up to a section of North Mission Bay Drive that provides access to the Mission Bay Golf Course and De Anza Cove to the east. In the near future, a bicycle/pedestrian bridge will connect North Mission Bay Drive with Pacific Beach Drive that travels to Mission Bay via Campland by the Bay. If the cyclist knew that the Campland by the Bay lease requires that the public be allowed access to Mission Bay, they would enter Campland, riding through to the mouth of Rose Creek and to Mission Bay.

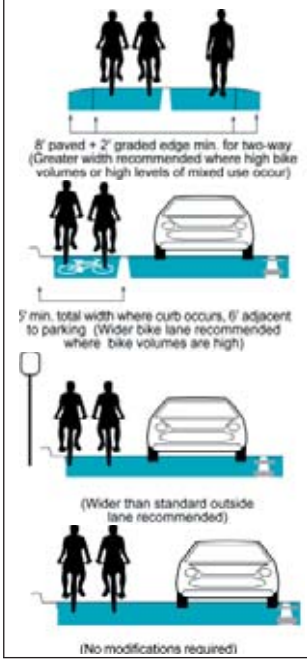
Historic street design in the watershed has created some unfriendly environments for pedestrians and cyclists. While there are sidewalks along Genesee Avenue and Regents Road, the main streets providing access to the canyon parks, the sidewalks are largely directly adjacent to the public streets. The streets carry high levels of traffic at high speeds; in some cases, such as the off ramp from State Route 52 west at Genesee Avenue, a pedestrian is required to dash across the State Route 52 ramp while cars are exiting towards them downhill on a curve at freeway speeds. The cyclist is faced with the same challenge, but at that point is cycling uphill, making the crossing daunting for all but the strongest cyclists. It is frightening at best and dangerous at worst. For this reason, even though the canyon parks are directly accessible and within walking or cycling distance to residents of Clairemont and University City, many visitors still arrive by car.

For those visitors that do walk from Clairemont or University City, there is neighborhood trail access in a few places. Unfortunately, that access is not generally well marked and thus the first time trail user has no way of knowing just where the trail might lead.

Parking is also an issue. Both Marian Bear Memorial Natural Park and the Rose Canyon Open Space Park are easily accessible by car from Regents Road and Genesee Avenue. Yet, not all parking locations are clearly defined. For example, the parking area to enter Rose Canyon Open Space Park near Genesee Avenue is located at University City High School, but there is no signage to direct potential park visitors into the lot.

Fortunately, in recent years the City of San Diego has placed a higher priority on public trails and is creating a city-wide trails master plan. While there are always general constraints that may affect implementation of new trails such as property ownership, sustainability and maintainability as well as the potential to conflict with other public utilities such as sewer lines and rail lines, the Rose Creek Watershed offers many opportunities to provide new and improved public access.

The recommendations in this assessment for recreational resources seek to enhance public access to the watershed while improving public safety and restoring natural systems. Recommended trail connections span a range of facility types that include full Class I multi-use paths to narrow single track style pedestrian and mountain bike trails. The development of continuous recreational trails from Interstate 805 to Mission Bay along Rose and San Clemente canyons and connecting the two canyons in the upper watershed is part of the long-term vision.



Class 1 – Paved "Bike Path" with an exclusive right-of-way, physically separated from vehicular roadways and intended specifically for non-motorized use. Bike paths offer opportunities not provided by the road system. They can either provide a recreational opportunity, or in some instances, can serve as a direct high-speed commute route if cross flow by motor vehicles and pedestrian conflicts can be minimized.

Class 2 – Signed and striped "Bike Lane" are established along streets in corridors where there is significant bicycle demand and where there are distinct needs that can be served by them. They are placed to accommodate bicyclists through corridors where insufficient room exists for safe bicycling on existing streets. Bike lanes are also intended to delineate the right-of-way assigned to bicyclists and motorists and to provide movements by each.

Class 3 – "Bike Route" within a street right-of-way identified by signage only. These bike routes serve either to provide continuity to other bicycle facilities or designate preferred routes through high demand corridors. As with bike lanes, designation of bike routes should indicate to bicyclists that there are particular advantages to using these routes as compared with alternative routes.

Undesignated – An additional category defined as locally recommended on-street routes that appear on area bikeway maps only.

2.5.1 Recommendations for improving Access to the Open Space System

- ☑ *Maintain and enhance existing access to the open space system*
- ☑ *Improve information and amenities provided at access points*
- ☑ *Provide open space and trail information to the public via a web site*

How to access the recreational resources of the RCW can be an impediment to recreation usage by new users. Genesee Avenue and Regents Road provide primary access to city park lands in Rose and San Clemente canyons. Access improvement recommendations include:

1. Trail access is an important element of any recreational trail system. The trail system could be an asset, but if it is not easily accessible, it loses its value as a resource to the community. The existing recreational trail system is currently accessible through a combination of fourteen designated and undesignated entry points (Figures 2-25 to 2-27). All of these access points, as well as six others (Figures 2-25 to 2-27) are recommended to be maintained and enhanced based on the following guidelines.

A. All trail access points should have an information kiosk that displays: a detailed map of trails within the region (e.g. Rose Canyon, San Clemente Canyon, and lower Rose Creek); a regional map showing how trails connect to adjacent communities; and information on appropriate trail usage and etiquette.

B. All trail access points should have receptacles for trash, as well as recyclables. Arrangements with local community groups may be required to manage the proper dumping and disposal of these receptacles if the trail access point falls outside of City of San Diego land ownership.

C. Educational information pertaining to ecosystem health; sensitive plants & animals; invasive plants & animals (Section 2.2.2); culture and history of the regional (Section 2.3.3); flooding; etc. should be incorporated wherever possible.

D. Outreach information pertaining to residential responsibilities of avoiding contributions to infestations of invasive exotic species, storm water runoff and pollution should be included at those access points predominantly used by local residents.

E. assessments of sidewalk and other pedestrian friendly improvements should be conducted for each access point and be prioritized for implementation.

F. The trail access point identified at the intersection of Nobel Drive and Judicial Drive (Figure 2-28) is particularly important as it provides a direct connection from the Nobel Athletic Area and Library (currently under construction) into the Rose Canyon Open Space Park and the associated trail system. Whether or not the proposed Coastal Rail Trail is implemented, a trail connection from this intersection into Rose Canyon is critical for developing a multi-use trail connection to Mission Bay.

2. Additionally, digital versions of the trail maps for the Upper Rose Canyon, Upper San Clemente Canyon, and lower Rose Creek should be made available to the public via the Rose Creek Watershed website (http://www.rosecreekwatershed.org) and/or the City of San Diego Park and Recreation Department website to facilitate the orientation of new and existing trails users.

Figure 2-25: Trail Access Points within Upper Rose Canyon

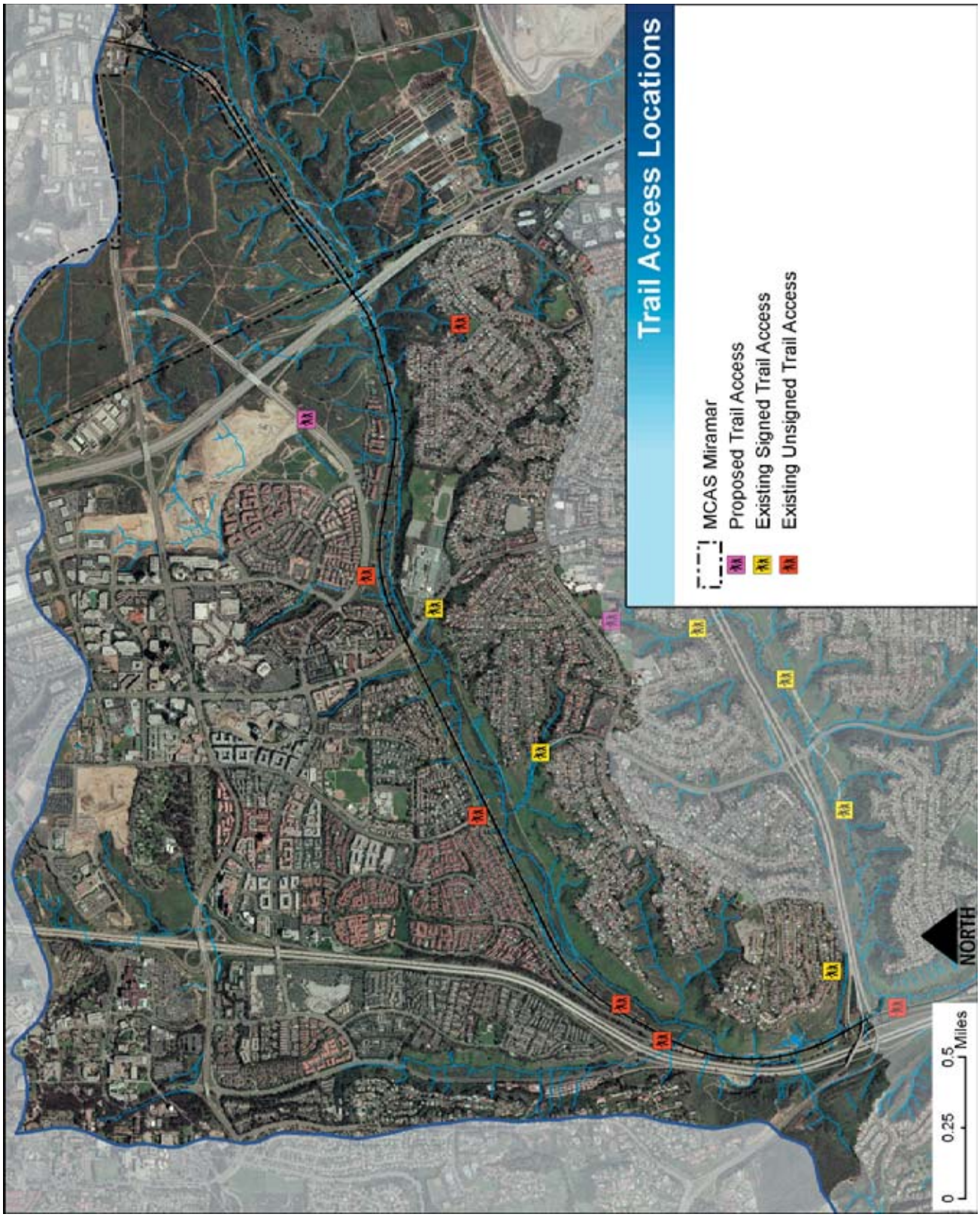


Figure 2-26: Trail Access Points within Upper San Clemente Canyon

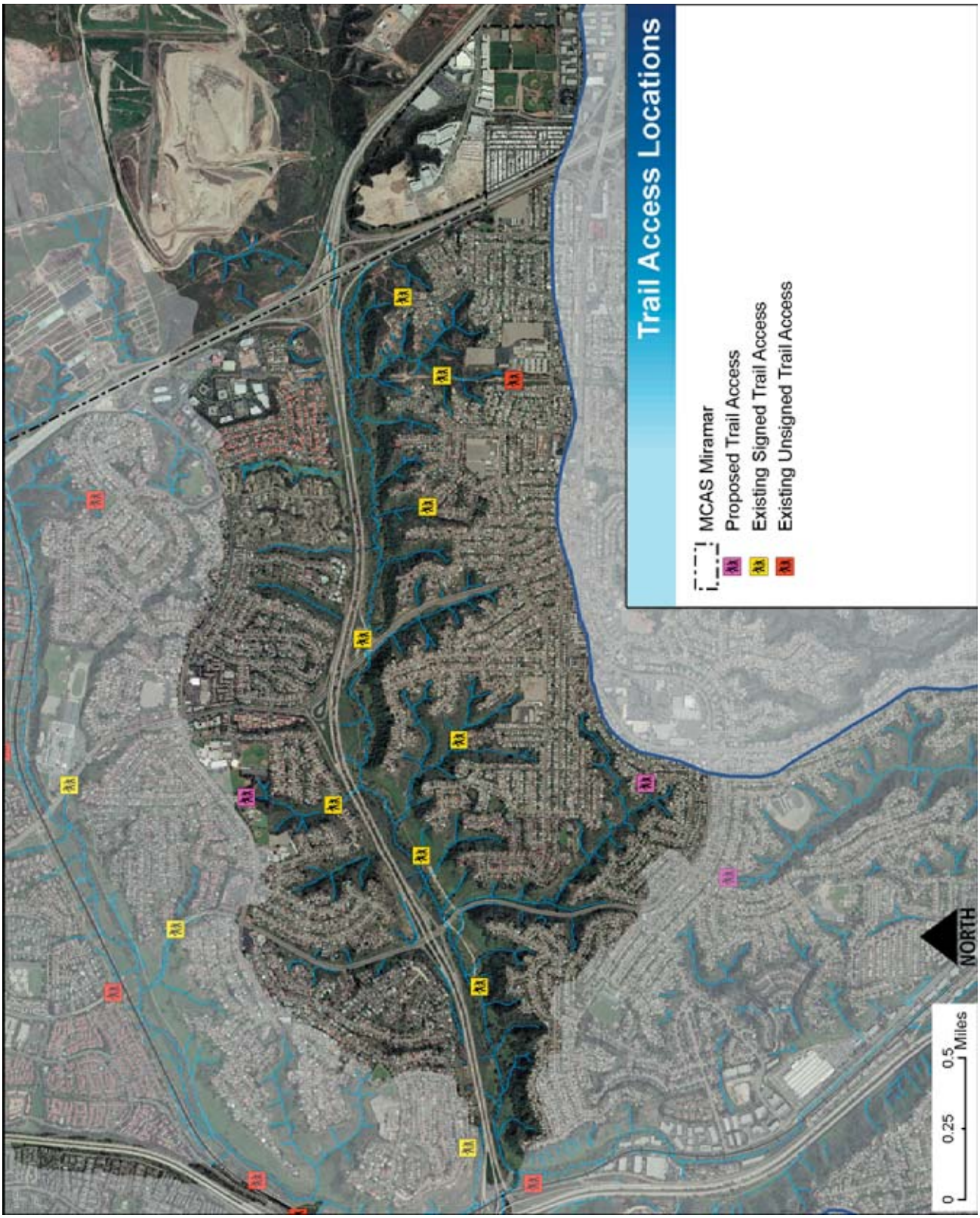
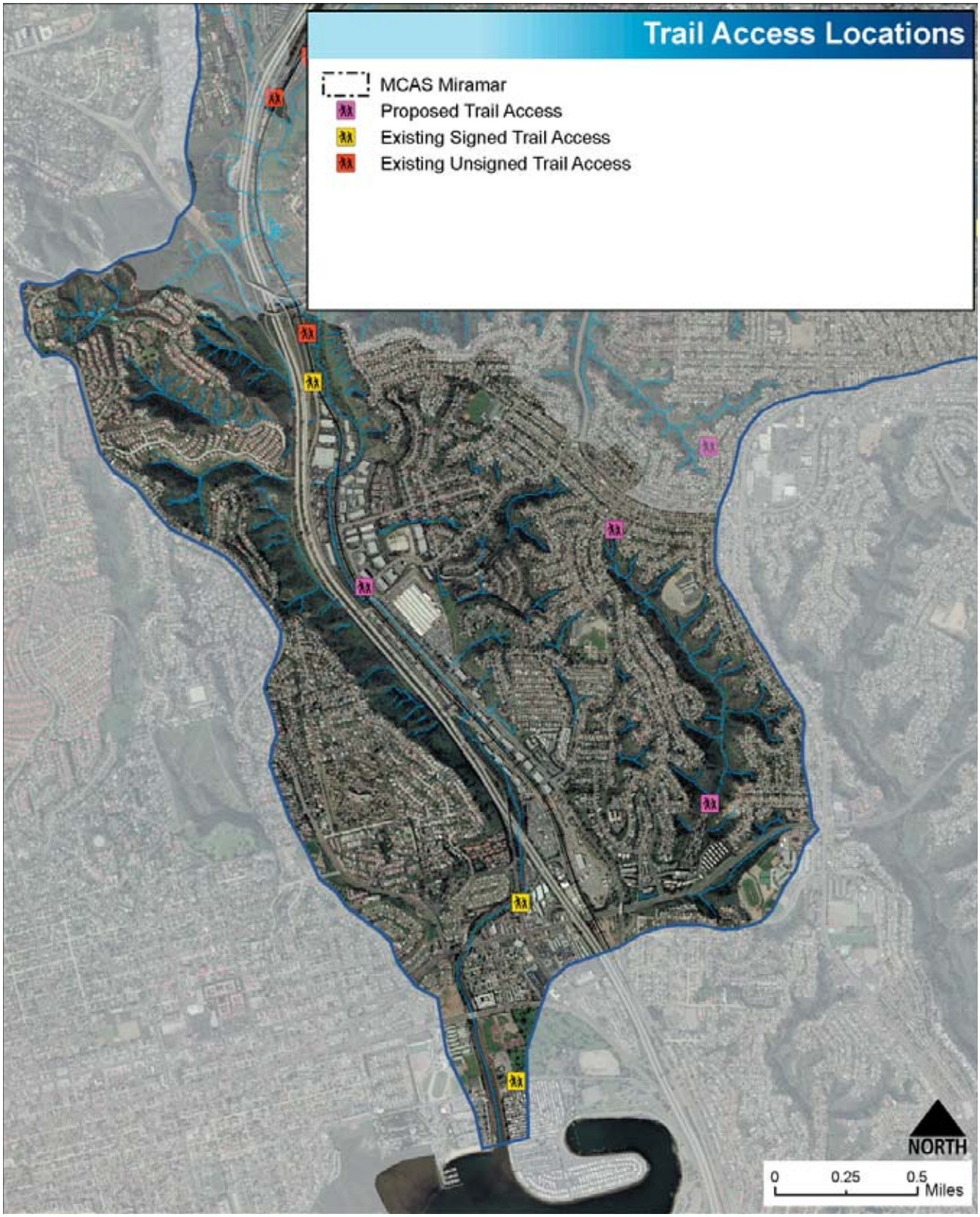


Figure 2-27: Trail Access Points within lower Rose Creek



2.5.2 Recommendations for improving Access within the Open Space System

- ☑ *Plan and implement new trail sections to improve trail system connectivity*
- ☑ *Develop trail system connectors utilizing surface street and sidewalks*
- ☑ *Stabilize and improve creek crossing for maintenance vehicles, bicycles, and pedestrians*

Opportunities to improve the recreational access within and between the various portions of the open space system would improve connectivity with the surrounding communities; provide year-round access; enhance the trail experience by providing loop trails; open up access to new areas; and improve the usability of the existing trails. Recommendations to accomplish these improvements include: new soft surface trails, sidewalk inter-connections, stabilized creek crossings, and bicycle/pedestrian bridges.

The City is currently undertaking long-term access planning for sewer mains in Rose and San Clemente canyons. As a general rule, the best-case for the health of the watershed would be to remove sewer lines from our canyons and place them in areas more directly adjacent to urban infrastructure where regular access and monitoring can be better maintained. For those sewer lines left in the canyons, trail recommendations must consider the City's needs for access to sewer lines (and storm drains) for maintenance to encourage joint use to prevent creation of duplicative trails.

1. Proposed new trails

Ten segments of new bicycle and pedestrian trails are recommended for further assessment and potential implementation, as shown in Figures 2-28 to 2-30. They represent 4.5 miles of new trails. The trails are proposed for a variety of reasons, including by-passing problematic creek crossings, connecting isolated tributary trails, and integrating recreational trails as part of environmental improvement projects. Detailed descriptions of the trail segments are provided in Chapter 4, Section 4.5.1 on page 4-15.

2. Trail System Connectors

In addition to the new proposed trail segments, seven connector routes are proposed using existing street sidewalks to inter-connect various trail access points to one another and effectively form a series of loop trails. These connector trails should be assessed for potential pedestrian and bicycle improvements for public safety. Otherwise, all that is needed for their implementation is general agreement by the community that these are the appropriate streets to use and then include them as part of the trail maps. Detailed descriptions of the trail connectors are provided in Chapter 4, Section 4.5.2 on page 4-17.

3. Creek Crossings

Creek crossings by trails, paths, and utility roads can cause areas of streambed and bank erosion due to the increased disturbance by feet, bicycles and maintenance vehicles. There are numerous creek crossings throughout the watershed (Figures 2-28 to 2-30), many of which are only crossable by pedestrians during low flow conditions. They act as barriers during any significant stream flow. The process of stabilizing these crossings with large cobbles and boulders to prevent future erosion can also create opportunities for makeshift pedestrian crossings that are available during a larger range of stream flows. The creek crossings have been categorized into two basic groups: maintenance roads and bicycle/pedestrian crossings. A typical solution for each category has been developed as described below. Additionally, there are a four existing crossings that would benefit from the construction of a bicycle/pedestrian bridge.

A. Maintenance road crossings should be designed to remain stable during periods of high stream discharge and stand up to usage by lighter-weight park ranger and heavy-duty utility maintenance vehicles. These crossings should be constructed at the same elevation of the existing streambed using 100 – 250 pound hand placed rock to construct a relatively even driving surface and minimize the distance between boul-

Figure 2-28: Access Issues within Upper Rose Canyon

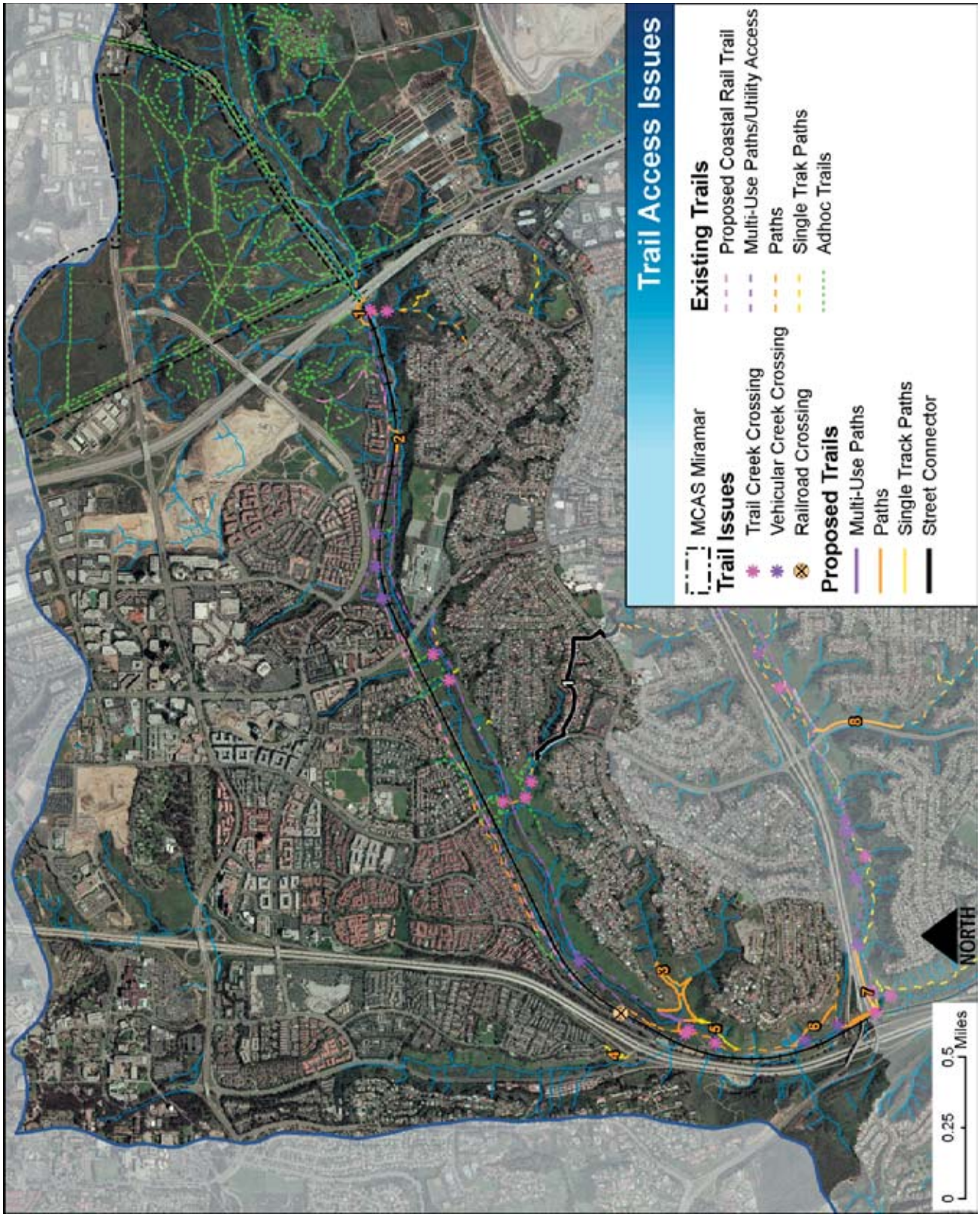


Figure 2-29: Access Issues within Upper San Clemente Canyon

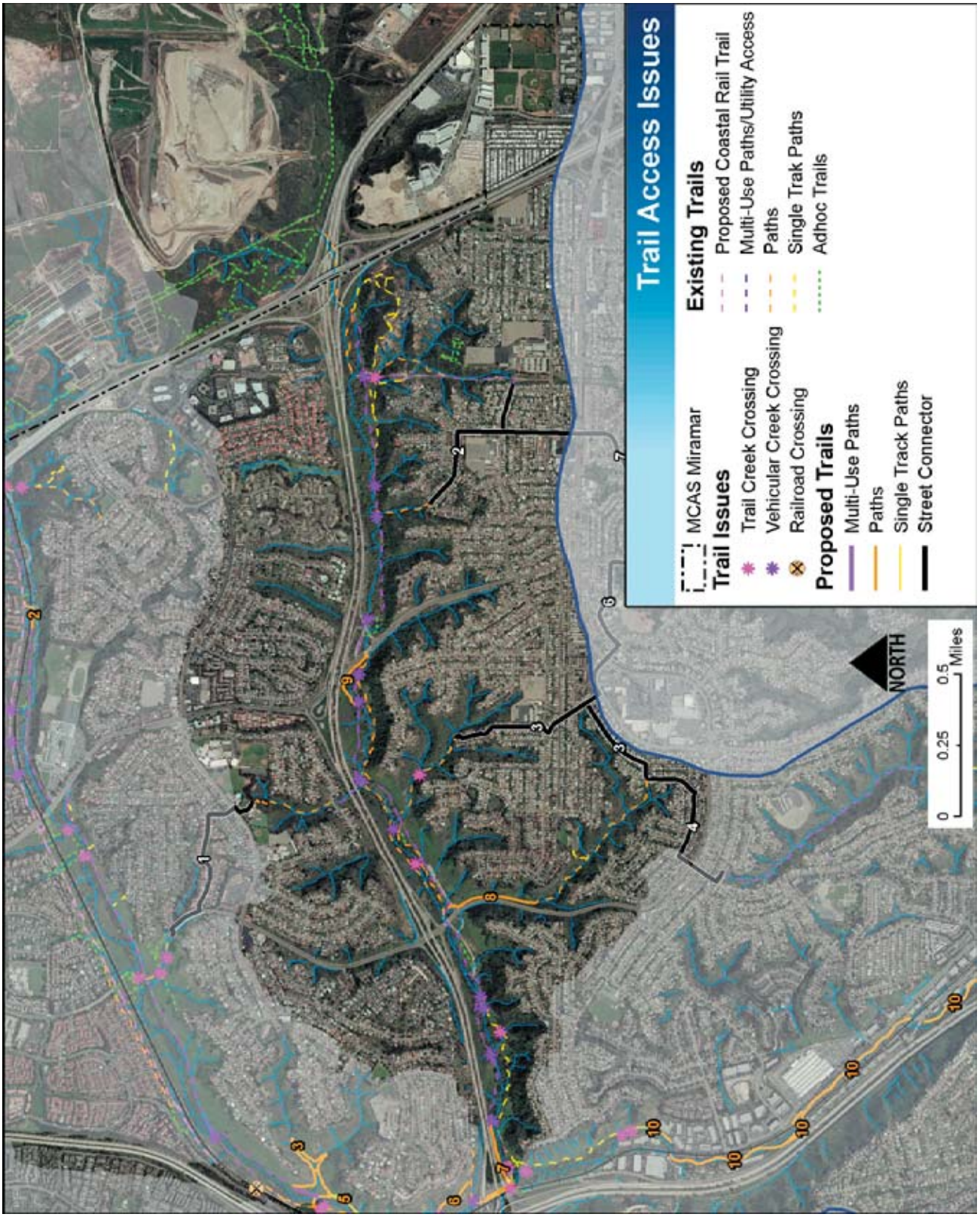
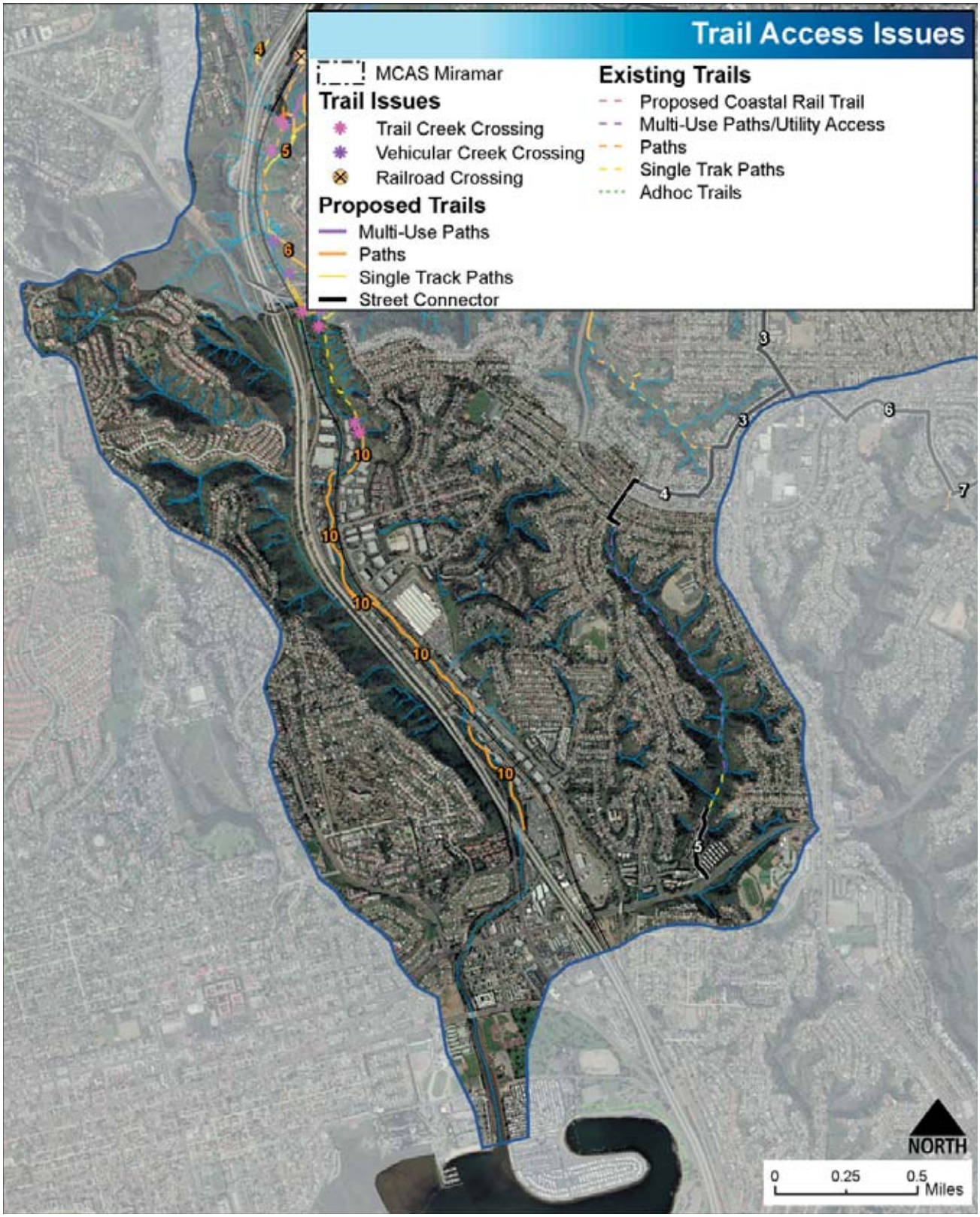


Figure 2-30: Access Issues within lower Rose Creek



ders. The crossing should be between 8 and 12 feet wide and extend from above the regular high water line from bank to bank. Larger boulders (up to 400 lbs.) can also be placed on the upstream edge of the crossing to provide a makeshift pedestrian crossing. These boulders should be placed as a rock vortex weir to promote deposition of sediments upstream of the crossing.

B. Creek crossings supporting bicycle and pedestrian users only do not need to be constructed in the same manner as the maintenance road crossings. The bicycle portion of the crossing should be constructed of large cobbles that are likely to remain in place during large storm events. The crossing should be between 2 and 4 feet wide and extend from above the regular high water line from bank to bank. The pedestrian portion of the crossing should be constructed of large boulders (up to 400 lbs.) and placed on the upstream edge of the bicycle crossing. These boulders should be placed as a rock vortex weir to promote deposition of sediments upstream of the crossings.

C. There are four existing locations within the RCW where narrow bicycle/pedestrian bridges, similar to the one in Mission Trails Regional Park (shown in the photograph below) should be considered in lieu of at-grade creek crossings: Rose Creek under Interstate 805; San Clemente Creek above Genesee Avenue; San Clemente Creek at Standley Trail; and San Clemente Creek below the west Regents Road parking lot. In siting each bridge, the results of the Hydrologic assessment (Section 2.6.1) need to be utilized to determine the appropriate elevation for the bridges to ensure moderate sized flood events can be passed under the bridges. Designs should consider whether structures could also provide maintenance access to sewer lines or storm drains to prevent duplicative structures. More detailed descriptions of these proposed bridges are included in Chapter 4, Section 4.5.3 on page 4-19. An additional bicycle/ pedestrian bridge is included in Section 2.5.5 in page 2-73.

2.5.3 Recommendations for Creating Regional Recreational Connections

☑ *Connect the communities of Clairemont and University City to Mission Bay*
☑ *Enhance existing multi-use paths*

Providing a multi-use trail connection from Interstate 805 through Rose and San Clemente canyons to Mission Bay is an integral component of the vision for the RCW. In developing this connection, many other benefits and environmental improvements will be gained along the way, such as invasive plant and animal control, wildlife corridor enhancement, stream velocity and associated erosion reduction, storm water detention, and water quality improvement.

1. Connecting Clairemont and University City to Mission Bay

This recommendation will connect existing Class 1 paths (see Section 3.5.2 for more information) in the watershed to other planned trails, plus add additional recommendations to create a continuous Class 1 path from the upper watershed to Mission Bay (Figures 2-31 to 2-33). This proposed Class 1 regional path will be accessible from University City through Rose Canyon; Clairemont residents and visitors could join the Class 1 path from the main trail in Marian Bear Memorial Natural Park. As with the other recommendations in this report, this trail should be designed to maximize other public enhancements proposed in this assessment, such as public safety, water quality, interpretive elements, and wildlife habitat.

A. Upper Rose Canyon

The northern 3 miles of this Class I path are currently being planned as part of the Coastal Rail Trail. This segment is routed from the intersection of Judicial Drive and Nobel Drive to the intersection of Gilman Drive and La Jolla Colony Drive, where it will connect with the existing Rose Canyon Bike Path as shown in Figure 2-31. The majority of this alignment relies on the use of the San Diego Northern Railroad (SDNR) maintenance road on the north side of the tracks, but does require grading the path into the slope along La Jolla Colony Drive to avoid wrong-way bicycle traffic along the Class 2 bike lane along La Jolla Colony Drive, or an un-safe mid-block crossing to reach the bike lane on the other side of La Jolla Colony Drive.

B. Upper San Clemente Canyon

There are no Class 1 paths proposed within Marian Bear Memorial Natural Park (Figure 2-32), as paved routes are not permitted according to the Parks' Natural Resources Management Plan. The existing main trail/ access road through the park will function as the regional trail connecting to the Rose Canyon Bike Path at the west end of San Clemente Canyon. The crossing of Rose and San Clemente creeks and the railroad are addressed in a separate recommendation (Section 2.5.5).

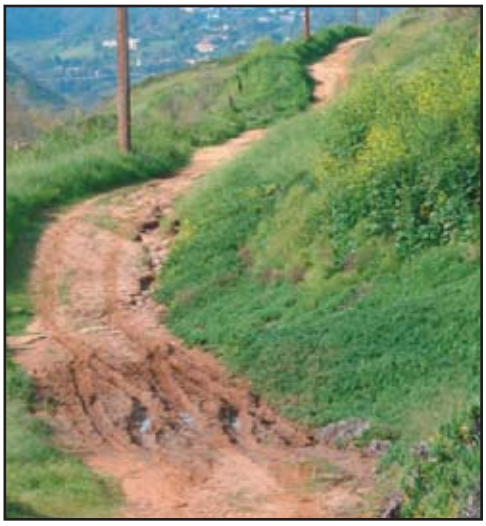


Figure 2-31: Regional Class 1 Paths in Upper Rose Canyon

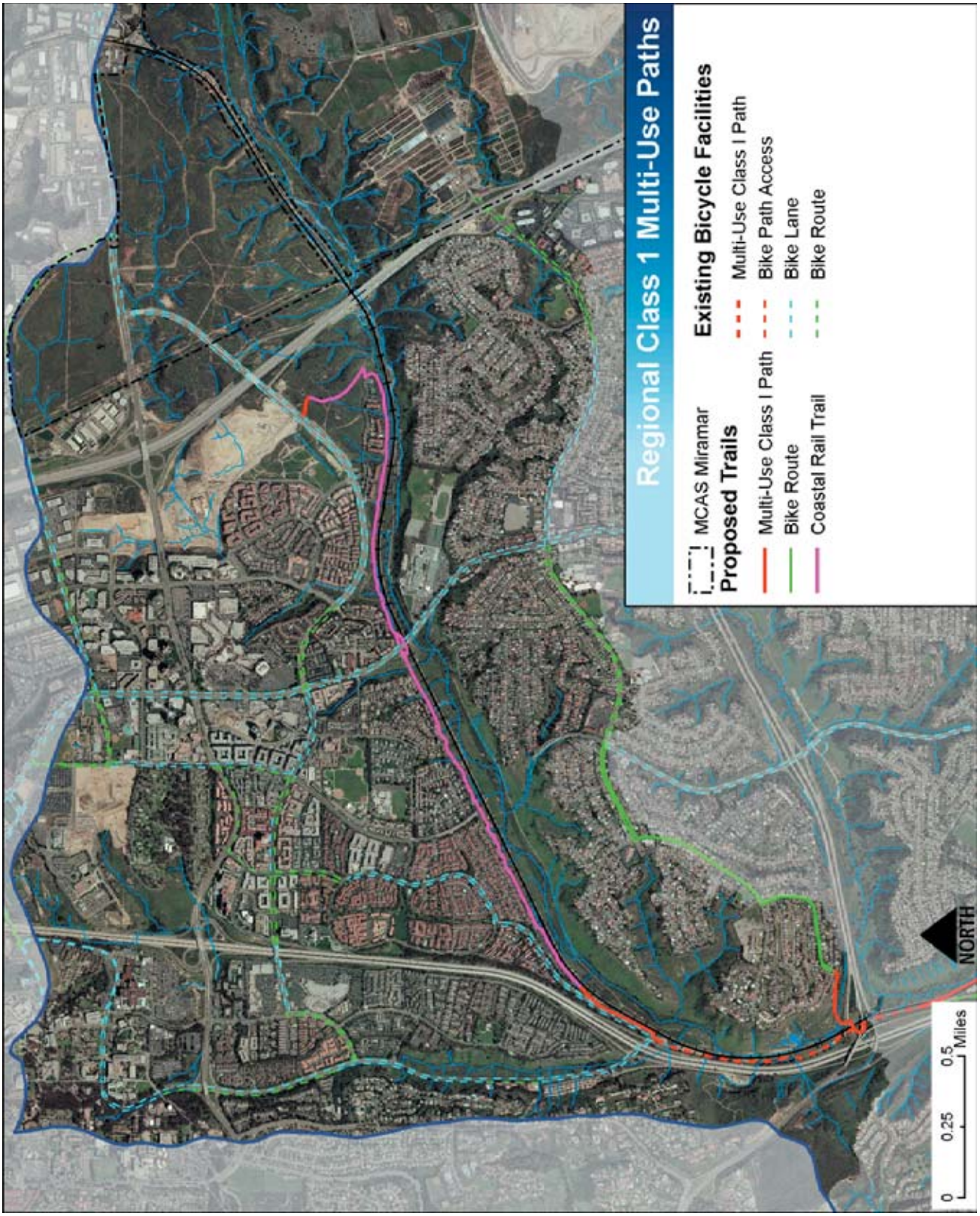


Figure 2-32: Regional Class 1 Paths in Upper San Clemente Canyon

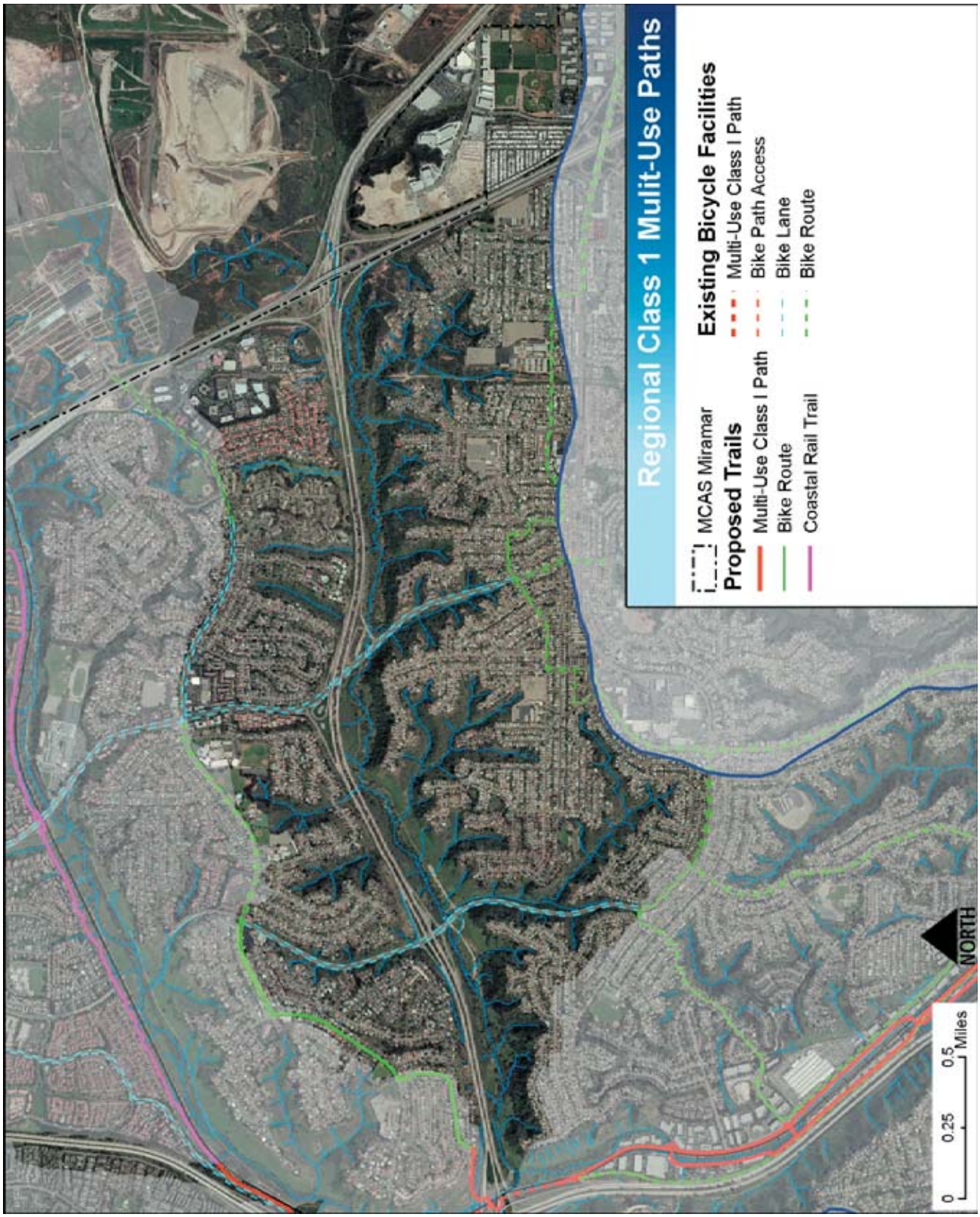
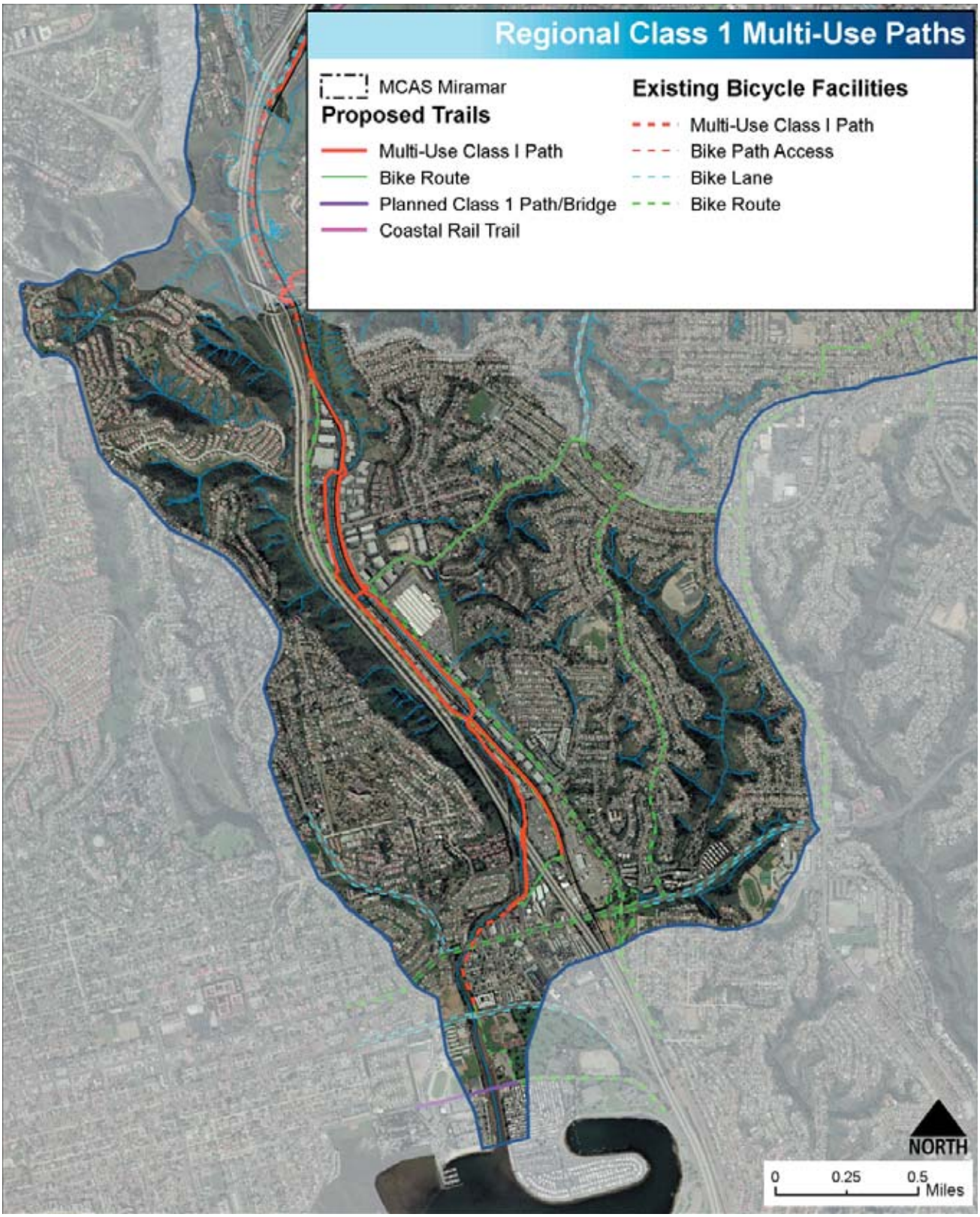


Figure 2-32: Regional Class 1 Paths in lower Rose Creek



C. Lower Rose Creek

A new Class 1 path is proposed to start at the current southern end of the Rose Canyon Bike Path. This new Class 1 path would create an approximately 2-mile long new path paralleling lower Rose Creek, connecting to the existing Class I path at North Mission Bay Drive. Two alternative alignments were developed and preliminarily reviewed, but additional analysis is recommended (Figure 2-33).

Alternative 'A' (Figure 2-34) begins at the end of the Rose Canyon Bike Path and immediately crosses over the railroad tracks via a bridge structure and then runs parallel to the railroad tracks past the business development to the east until the railroad crosses over Rose Creek via a trestle. At this point, the path departs form the railroad and utilizes the private road crossing over Rose Creek and then proceeds along the slope to come back parallel with the railroad tracks. The path follows the railroad tracks to the south until Jutland Drive, where it diverts to the east to follow along the top of the existing concrete flood control channel. At the south end of the channel, the path drops down the stream bank to cross under the railroad trestle and Santa Fe Drive. Once under Santa Fe Drive, the path comes back to the top of the stream bank and parallels the businesses along this portion of Santa Fe Drive before diverting to the west slightly to follow an existing earthen berm behind the SDG&E maintenance yard to Interstate 5, where it drops back down the stream bank to cross under Interstate 5 through one of the two eastern most openings. Once under Interstate 5, the path comes back up the stream bank and uses an existing path along the top of the concrete flood channel past the In-N-Out Burger towards North Mission Bay Drive, where a ramp is needed to allow the path to cross under North Mission Bay Drive and connect to the existing Class I path that continues down Rose Creek towards Mission Bay.

Alternative 'B' (Figure 2-35) departs from alternative 'A' prior to utilizing the private road crossing over Rose Creek and instead drops down the channel slope to cross under the railroad trestle and rises back toward to top of the stream bank as it continues south on the west side of Rose Creek. It proceeds parallel to the creek as it passes behind several businesses and the Santa Fe RV Campground, before diverting further to the west to run adjacent to Santa Fe Drive. Once the alternative reaches the next group of businesses along Santa Fe Drive (across from Jutland Drive), the alternative utilizes the existing landscaped area in front of the businesses to route the Class I path on the east side of Santa Fe Drive. This segment is separated from traffic by a fence. At the southern end of these businesses, Santa Fe Drive crosses Rose Creek. A new bicycle/pedestrian bridge would need to be constructed over the utility crossing on the north side of Santa Fe Drive. Once across the bridge, the alternative utilizes a portion of the railroad rights-of-way to keep the path separated from Santa Fe Drive by routing above the existing retaining wall and then cuts into the slope below the railroad tracks for the quarter-mile or so north of Damon Avenue. Along Damon Avenue, the path is proposed on the north side and would be separated from traffic by a fence, which would require the loss of on-street parking along

Figure 2-34: lower Rose Creek Class I Path – Alternative A

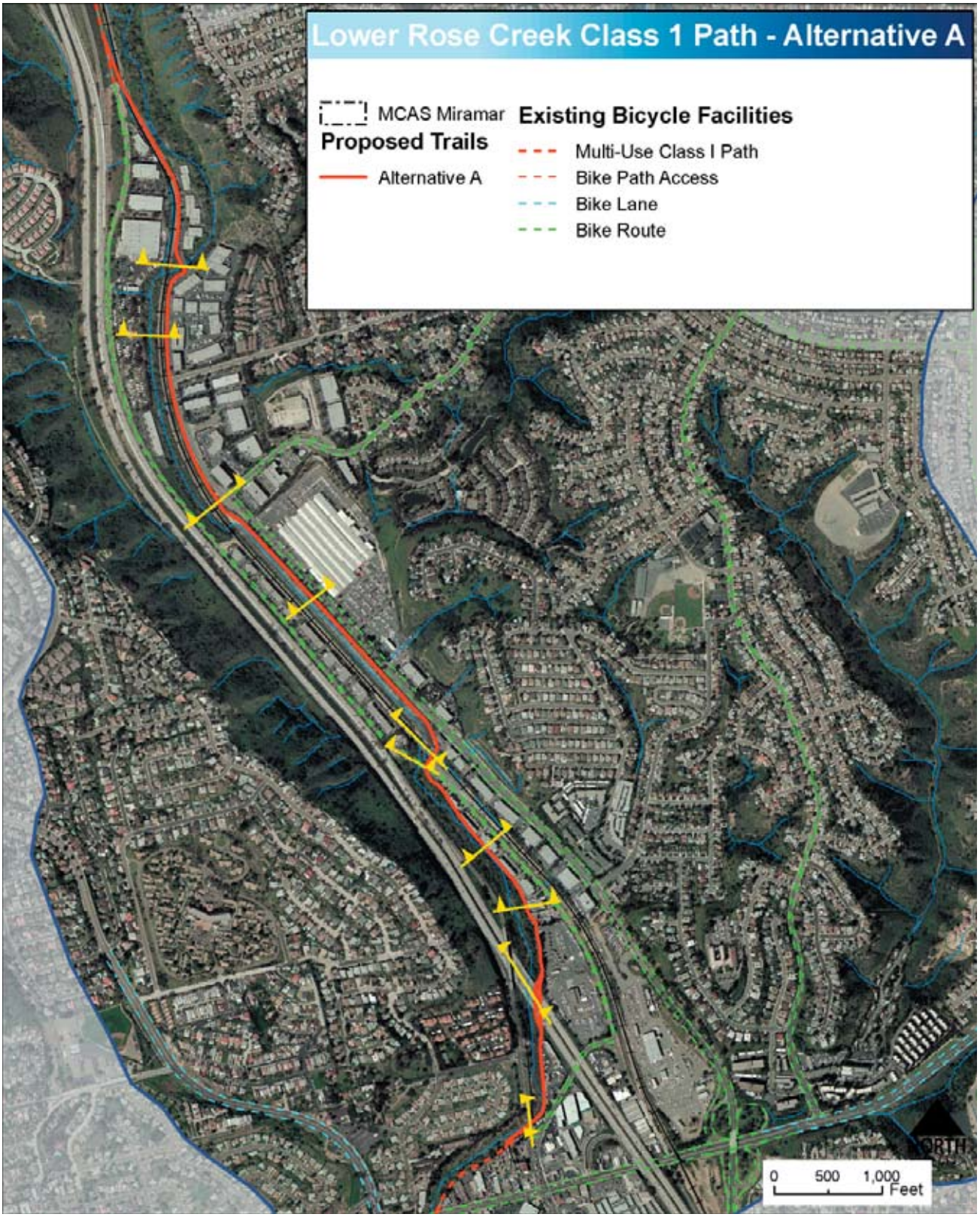
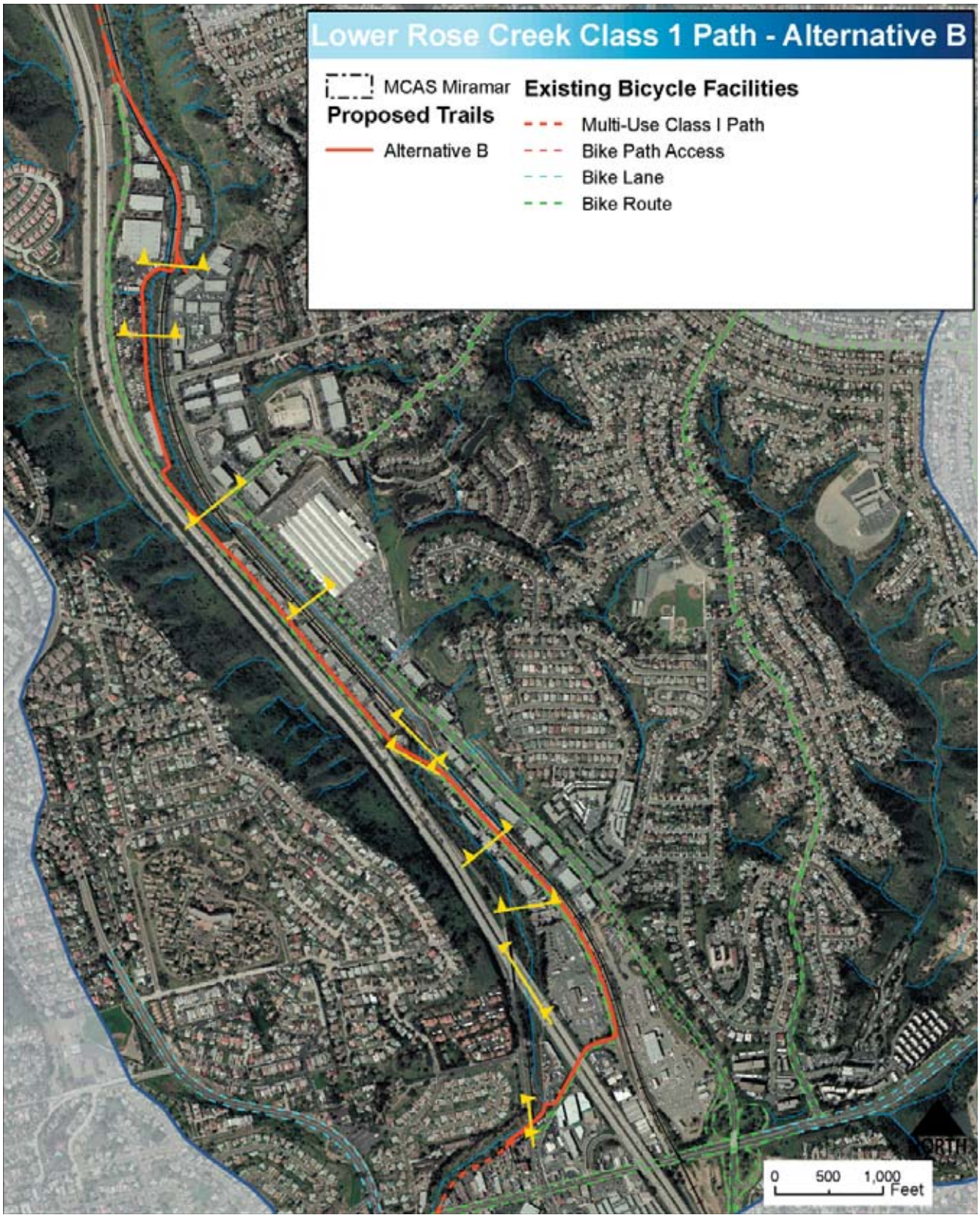


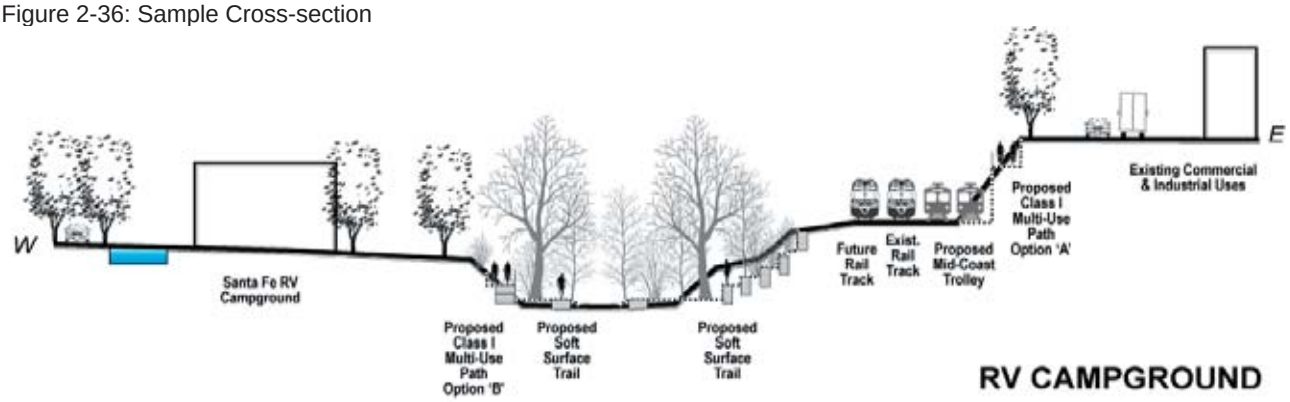
Figure 2-35: lower Rose Creek Class I Path – Alternative B



a portion of Damon Avenue to obtain the required width. The alternative would then depart from Damon Avenue just after the western most entrance to the In-and-Out Burger and re-connect with Alternative 'A' just before routing under Mission Bay Drive to connect to the existing path on the west side.

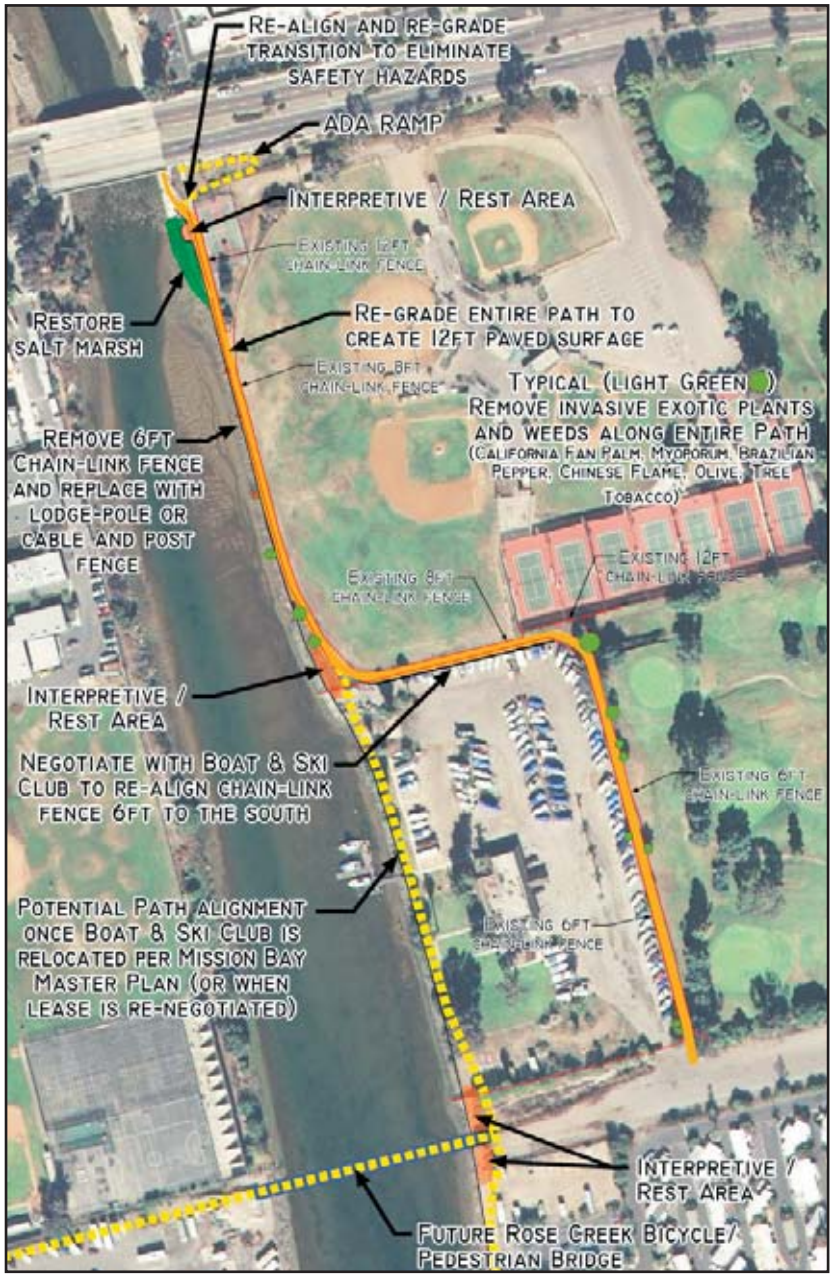
Both alternatives were assessed for preliminary feasibility through cross-sectional studies at the locations shown in Figures 2-34/35. Figure 2-36 is a sample of one of those cross-sections depicting the various elements proposed within the corridor. The remainder of the cross-sectional studies are included in Chapter 4, Section 4.5.4 on page 4-21.

Figure 2-36: Sample Cross-section



2. An additional section of a Class I path is proposed to replace and re-align the sub-standard path that currently connects from Grand Avenue to Mission Bay Drive around the Boat and Ski Club facility (Figure 2-37). The proposed alignment would route through the Boat and Ski Club lease area along lower Rose Creek and connect to Mission Bay Drive where the planned bicycle/pedestrian bridge over Rose Creek is proposed. Should the city have an opportunity to re-negotiate the Boat and Ski Club lease prior to its termination, it would be advisable to realign, redesign and widen the trail to one more fitting to its role as a gateway to Mission Bay Park. At a minimum, these improvements should be planned and designed for implementation as part of the long-range proposals described in the Mission Bay Park Master Plan for the De Anza Special Study Area.

Figure 2-37: Grand Avenue to Mission Bay Class I Improvements



As an interim measure, in addition to the re-alignment, the western 6-foot tall chain-link fence with constantine razor wire should be removed and replaced with a City of San Diego Park and Recreation Department standard lodge-pole fence. The facility would also be widened to meet Class I standards (width is as narrow as 5.5ft now, should be at least 8ft) and opportunities to create rest areas with benches to facilitate safe wildlife viewing and interpretive areas should be assessed as shown in Figure 2-37.

2.5.4 Regional Trail Linkages and Loops

☑ *Develop a trail connecting Rose and San Clemente canyons*
☑ *Develop a surface street connection between San Clemente and Tecolote canyons*

1. Connecting Rose and San Clemente Canyons

The city-owned open space parks in San Clemente and Rose canyons are currently both linear parks. Park users make their way to an end and return along the same path to their starting point. Park users are prohibited

from continuing east of Interstate 805 due to the MCAS Miramar boundary and access west beyond current park boundaries is problematic due to the need for a legal railroad crossing (Section 2.5.5).

Creating a regional trail loop to connect the two canyon systems has long been desired by the community to provide better access and enjoyment of both systems. This assessment recommends a connection be negotiated with MCAS Miramar, SDG&E and the Miramar Nursery, across a SDG&E easement that runs roughly parallel and slightly east of Interstate 805. This trail connection to the east, plus the improvements proposed in Section 2.5.5 at the west end of the parks, would create an 9-mile loop trail system through the two canyons. While security of MCAS Miramar is of utmost concern, this proposed route transects an area locked between the landfill, Interstate 805 and the Miramar Nursery. Unauthorized recreational use of MCAS Miramar has occurred for many years, so much so that neighborhood trails across the base are clearly visible on aerial maps. By channeling recreational trail users onto a proposed well-signed and monitored legal trail at the edge of the base, illegal recreational uses on other areas of the base could be reduced.

The southern portion of this alignment could also be accomplished through the implementation of the Class I path being proposed via a separate project by the City of San Diego to connect Governor Drive to Convoy Street.

2. Connecting San Clemente Canyon to Tecolote Canyon

Rose Canyon Open Space Park and Marian Bear Memorial Natural Park are both part of the Tri-Canyon Ranger District. The third canyon park is Tecolote Canyon Natural Park, which begins a short distance to the south of several access points to Marian Bear Memorial Natural Park. It is recommended that trail system interconnects be developed utilizing neighborhood streets to provide both bicycle and pedestrian access between the two canyon systems (Figure 2-38).

Figure 2-38: Connectioning Marian Bear Memorial Natural Park and Tecolote Canyon

2.5.5 Creating Safe and Legal Railroad Track Crossings

☑ *Improve the existing At-grade crossing*
☑ *Create a bicycle/pedestrian bridge over the railroad tracks*

Part of the vision to create an interconnected recreational trail system within the RCW is to connect the trail systems within the Rose Canyon Open Space Park and the Marian Bear Memorial Natural Park with the existing and proposed Class 1 multi-use paths described above. One major obstacle currently prevents this: there are no legal public railroad crossings over the existing San Diego Northern Railroad (SDNR) tracks.

Most visitors to the open space parks in the watershed are unaware that it is illegal to cross the railroad tracks; volunteer trails criss-cross the tracks in many areas; those caught can be subject to fines as much as $1,000. To address this issue, two actions are being recommended: 1) upgrade the existing private at-grade railroad crossing north of Gilman Drive to appropriate safety standards and make it available for public use; and 2) construct a bicycle/pedestrian bridge over the railroad tracks at the interchange of Interstate 5 and State Route 52.

1. Improve Existing At-Grade Crossing

The existing railroad crossing north of the Rose Canyon Bike Path currently has deficiencies that prevent the immediate opening of the crossing for trail users, even if access were approved by the railroad. The surface is an uneven mix of timber railroad ties, patches of ballast and an uneven asphalt surface between the two tracks. The northbound track is elevated 1-2 inches above the southbound track. The railroad ties are uneven and rise almost an inch over the tracks in certain spots, creating a trip hazard. There are also gaps of 3 to 4 inches between the railroad ties and the tracks. The ramps that approach the tracks are paved with asphalt and are 9 feet in length, but tend to be littered with ballast from passing trains, maintenance vehicles and trail users. There currently is no fencing that prevents trail users from illegally crossing the railroad tracks, or warning signs that notify if a train is coming. On a positive note, sightlines are adequate and signage exists to warn trail users not to cross the tracks.

Some solutions to the at-grade railroad crossing include: leveling the traveling surface for trail users; reducing gaps caused by the railroad tracks; reducing the loose material around the crossing; incorporating signals and signage; and separating the railroad tracks and the trail. A travel surface that is flush with the railroad tracks and without large gaps can reduce the potential for tripping hazards and allow wheelchairs and bikes to safely cross. The trail surface should be hardened to reduce the debris that scatters over the tracks as users pass. Eliminating the ballast fillings can prevent loose material from accumulating across the travel surface.

Separation between the railroad tracks and the trail is another solution to limit the trespassing along the railroad corridor and improve the safety and welfare of the trail users. Examples of barriers include vegetation, fencing and vertical grade separation. Based on the physical conditions surrounding the at-grade crossing, neither a vegetative barrier nor vertical grade separation are practical. A fence 4 to 6 feet high is the most appropriate barrier at this location. The fence should be installed as shown in Figure 2-39 and run at least 100 feet in either direction to deter trail users from crossing at other locations than the improved at-grade crossing.

The at-grade crossing currently is roped off and incorporates a passive warning device; a sign that alerts trail users not to cross the tracks. This warning device does comply with the Manual on Uniform Traffic Control Device (MUTCD) minimum recommended treatment where each approach to the crossing has at least one Crossbuck sign. If the crossing is to be opened, an active warning device should be used at this crossing. Active warning devices include a combination of bells, flashing lights, automatic gates and other devices that are triggered by the presence of an oncoming train.

2. Create a Class I Bicycle/Pedestrian Bridge Crossing

The feasibility of constructing a Class I bicycle/pedestrian bridge over the railroad tracks (both the existing SDNR and proposed Mid-Coast Trolley) was assessed to locate potential locations for a bridge where topography and trail access would both minimize and justify to the cost of a bridge. The only location within the RCW that met these criteria was the State Route 52 and Interstate 5 interchange. The abutments for the interchange provide beneficial topography, and the adjacency of trail connections to the Rose Canyon Open Space Park, Marian Bear Memorial Natural Park, and Rose Canyon Bike Path is ideal. Within this area, three alternative bridge and access trail alignments were identified (Figure 2-40) and assessed through cross-sectional studies

Figure 2-39: Recommended Improvements to the At-grade Railroad Crossing

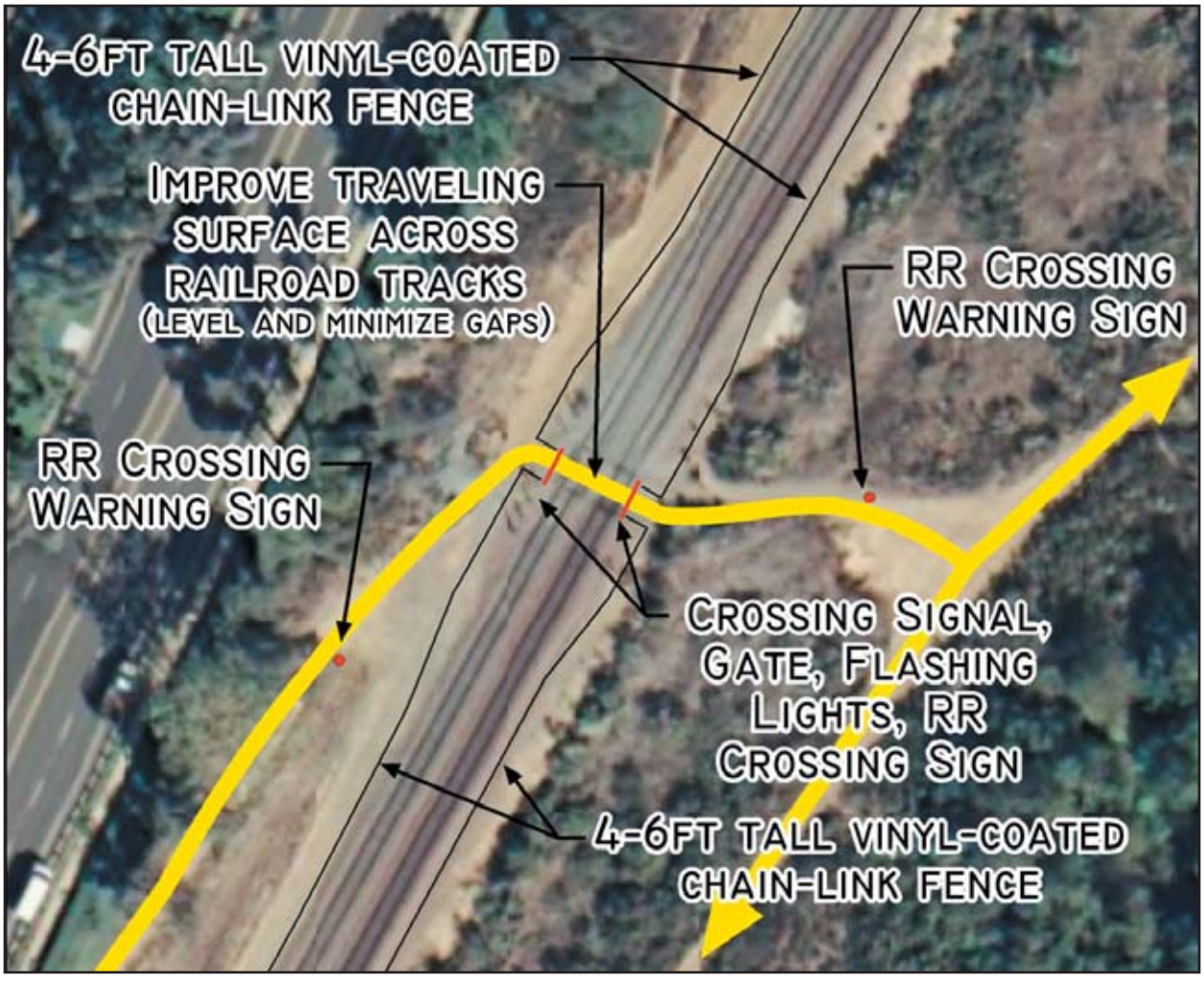
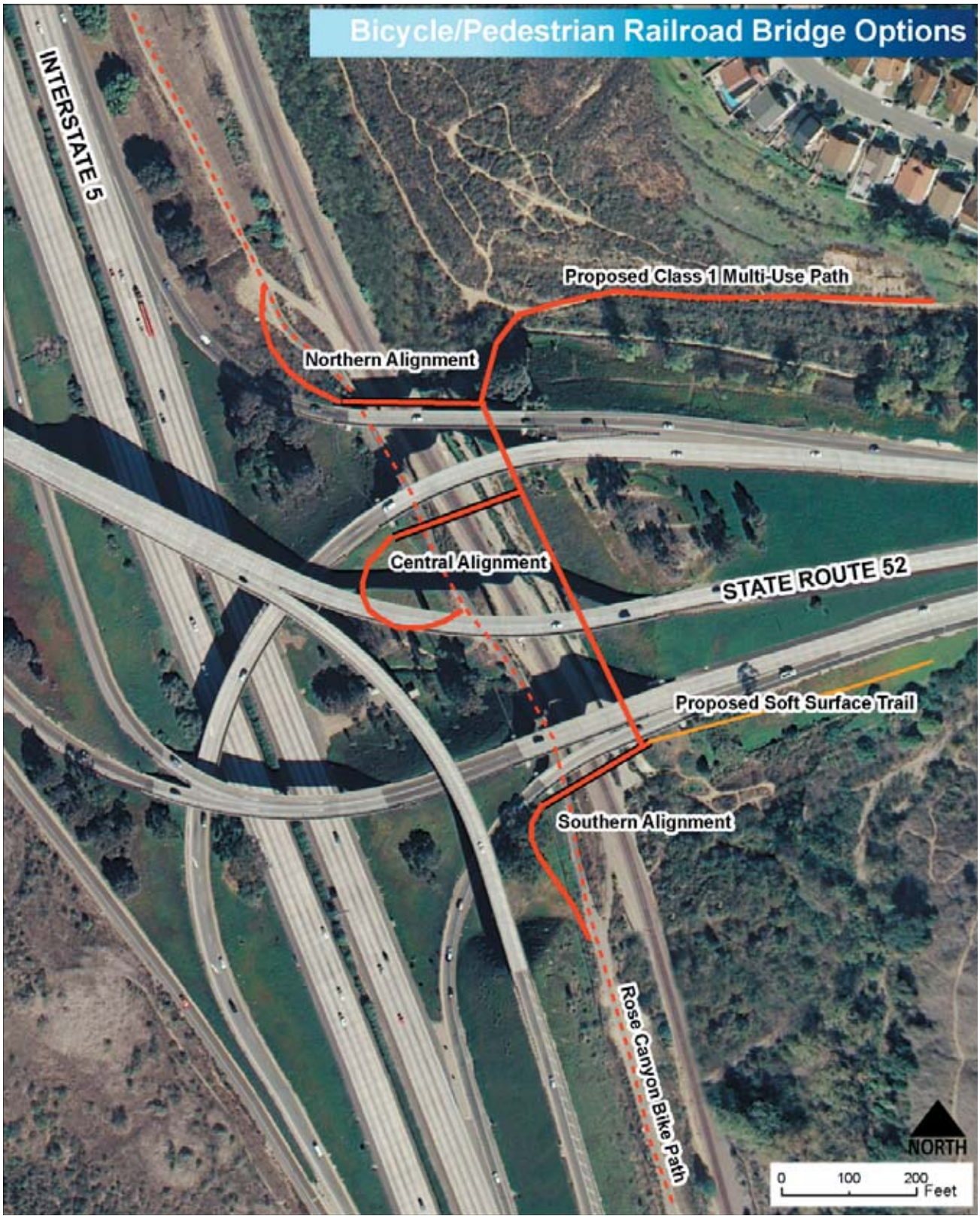


Figure 2-40: Plan view of Bridge Alternatives



(Figures 2-41 to 2-43). Each of the three alignments has potential merit. However, none of them are considered a preferred alternative at this time. All three alignments are recommended for further discussion with Caltrans to determine the alternatives feasibility and Caltrans' potential support. The alternatives all share a few characteristics. All three alternatives propose the bridge to be a Class I path that will be continued to the north and east along the existing utility access road to connect to the University City community at the intersection of Bloch Street and Bothe Avenue. Bothe Avenue would then be used as a Class 3 Bike Route to connect to the intersection of Regents Road and Governor Drive via Stressman Street and Governor Drive. All three alternatives propose to develop a new 4-foot wide soft surface trail to the south and east to connect to the main trail within Marian Bear Memorial Natural Park. This new alignment would avoid two existing creek crossings that are not easily navigable by pedestrians or bicycles. This would provide access into the lower portion of the park during periods when San Clemente Creek is flowing too high to allow safe crossing.

Figure 2-41: Cross Section of Northern Bridge Alternative

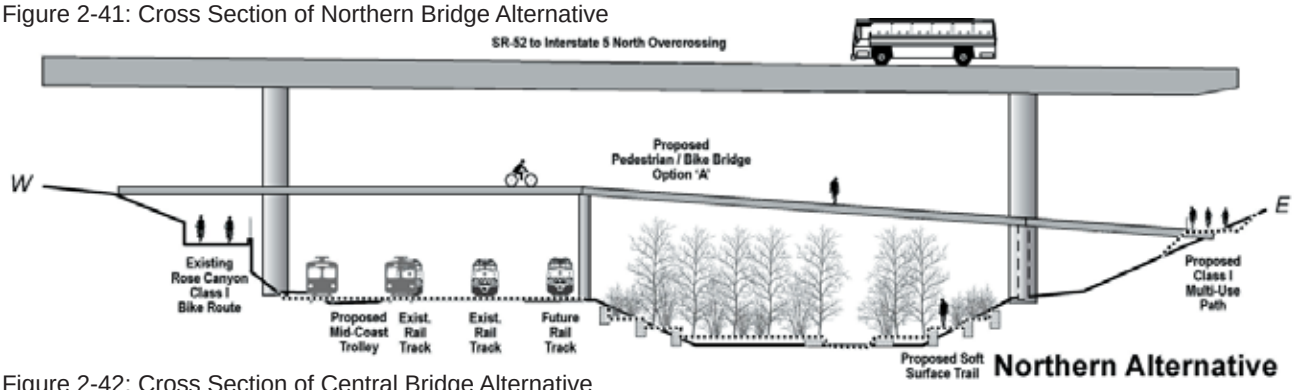


Figure 2-42: Cross Section of Central Bridge Alternative

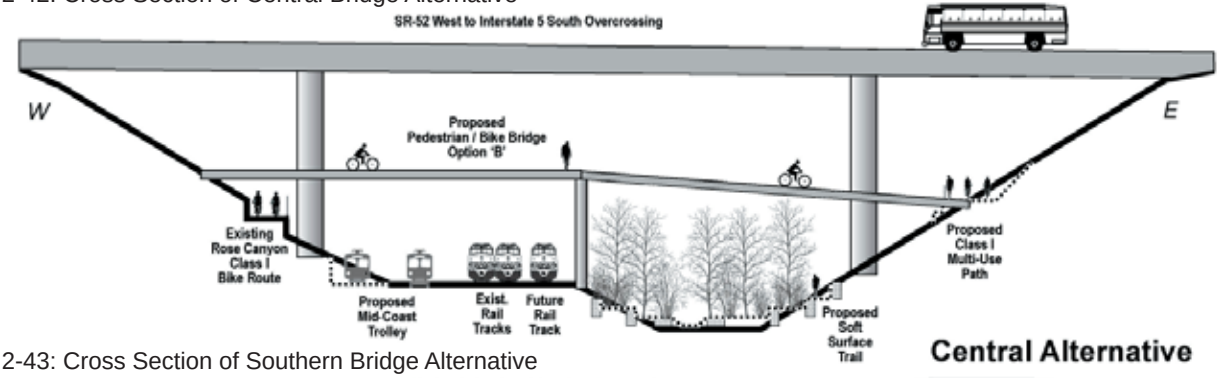
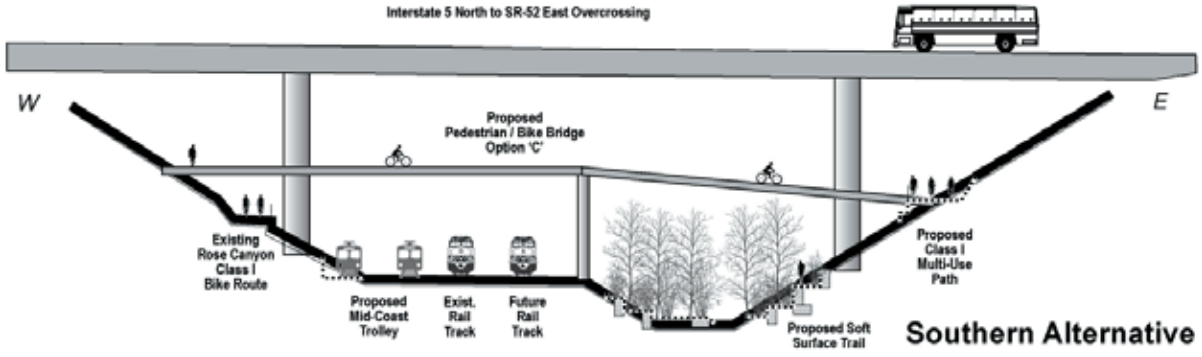


Figure 2-43: Cross Section of Southern Bridge Alternative



2.6 Recommendations for Water Resources

- ☑ *Develop data and models to improve understanding of hydrology and hydraulics*
- ☑ *Reduce erosion from multiple sources*
- ☑ *Modify or remove concrete flood control channels*
- ☑ *Monitor and reduce water pollution*

Water is the lifeblood of a watershed. Its drainages and streams are the circulation system that not only transports water, but also nutrients, sediments, and pollutants that can both enrich and degrade natural resources as they are transported downstream.

Water enters the Rose Creek Watershed in two primary ways: from the sky as the watershed captures rain after a storm; and through the storm drain system, which directs storm water and dry weather runoff from the city's streets through a system of pipes to the creeks and eventually to Mission Bay. In carrying water from the upper reaches of MCAS Miramar to Mission Bay, San Clemente and Rose creeks support the plants and animals that the public enjoys in Marian Bear Memorial Natural Park, Rose Canyon Open Space Park and Mission Bay Park, creating an oasis of nature adjacent to urban development. Water in this manner moves native seeds through the watershed, allowing more urbanized areas downstream to benefit from the rich biodiversity upstream on MCAS Miramar.

That same enriching water can degrade natural resources and threaten public safety if it moves too fast through the watershed or at a volume greater than the creeks and storm drain system can support. Problems include erosion that can undermine the natural flow of a stream, "down-cutting" the banks to destroy trails and natural features and create public safety concerns for hikers and cyclists. In addition, when a stream is down-cut, the water is often transported in a much narrower channel, no longer spreading across the land to nurture adjacent riparian plants and animals.

Water can also transport matter detrimental to the health of the watershed, including invasive and exotic seeds such as Pampas Grass that can take over entire canyons and out-compete native plants. Water also transports pollutants, causing unhealthy creeks and closed beaches. Approximately 60 percent of San Diego's pollutants are transported on sediments, small particles of soil or other elements that are carried downstream by water, often due to erosion. The remaining 40 percent of pollutants are carried directly in the water column.

During the review of water resources matters for this assessment, the project team focused on the impacts of water moving through the watershed. The following recommendations seek to minimize the negative impacts of moving water while maximizing the positive aspects. Like the other recommendations in this assessment, these recommendations are designed to complement recommendations in other sections.

2.6.1 Recommendations for Hydrology and Hydraulics

- ☑ *Collect field data for stream flow*
- ☑ *Collect field data for precipitation*
- ☑ *Develop modeling tools for hydrology, hydraulics, and sediment transport*

Accurate hydrologic information (hydrology and hydraulics) is essential for planning, designing and implementing watershed restoration and enhancement projects. Hydrologic information helps to define the amount and intensity of rainfall, the rate of flow in streams, and the balance in the stream between soil and water. Hydraulic information helps to further define how water moves through a stream and the potential impacts of that movement such as erosion. This information is essential both when designing improvements to a stream system or resolving pre-existing problems as alterations to a stream will have implications downstream.

Based on the review of the existing data and reports pertaining to hydrology and hydraulics within the RCW, two conditions become evident: 1) All of the reports appear to rely on the 1970s-era U.S. Army Corps of Engineers developed 100-year floodplain and associated flow volumes and rates. This is an issue because the watershed has experienced significant development since then (Figures 2-44 and 2-45) and is most likely subject to potentially significant increases in flow volumes and rates (over and above what was then indicated) caused by the additional hydrologic modifications that have occurred since the 1970s; 2) All of the more recent assessments have focused on the hydrologic change caused by a land conversion on a case-by-case basis, with little or no consideration of cumulative downstream impacts.

To correct these deficiencies, several actions need to occur: field data needs to be collected for stream flow; precipitation data needs to be augmented with field data; a hydrology model that converts rainfall into stream flow needs to be developed; a hydraulics model that assess stream volumes, flow rates, and floodplain elevations needs to be developed; sediment transport needs to be assessed where the hydraulics model suggests erosion or deposition based on flow rates; and geomorphology (the study of landforms, including their origin and evolution, and the processes that shape them) needs to be assessed to guide where, and in what form, improvements for hydrology or hydraulics should be made.

1. Collect field data for stream flow

There is currently a lack of monitoring data related to the hydrology and hydraulics of the stream flows throughout the RCW. Having current field data for hydrology and hydraulics would be extremely beneficial to provide calibration and validation data for the models to ensure they accurately predict the stream flow environment under varied conditions. The number of monitoring locations could vary from a minimum of three to as many as seven, depending on the funding available. At a minimum, monitoring locations should include below the confluence and within each of the natural parks. A preferred scenario would be to have monitoring locations below Mission Bay Drive; along the mid-section of Santa Fe Drive; below the confluence; just upstream of the confluence along both Rose and San Clemente creeks; and just to the east of Interstate 805 along both Rose and San Clemente creeks. The monitoring parameters should include at a minimum stream flow volume and rate, but should also consider collecting various water quality parameters to allow development of flow-weighted concentrations. One wet season of monitoring data is needed at a minimum, and at least two seasons are preferred. One of the monitoring locations below the confluence should be considered as a permanent stream gage.

2. Collect field data for precipitation

Augmenting the existing precipitation data collected on MCAS Miramar at the golf course by collecting data from other areas of the watershed would provide information about variations in rainfall intensity and volumes as a storm moves over the watershed. This information allows for better simulation of the conversion of rainfall to stream flow by computer models, which is used to generate floodplain elevations for various storm events. Without precipitation data from various locations throughout the watershed, assumptions have to be made about the variance or uniformity of rainfall over the watershed that can result in the delineation of higher or lower floodplain elevations. Similar to the stream flow monitoring, there are options pertaining to the number of moni-

Figure 2-44: Impervious Surfaces in 1966

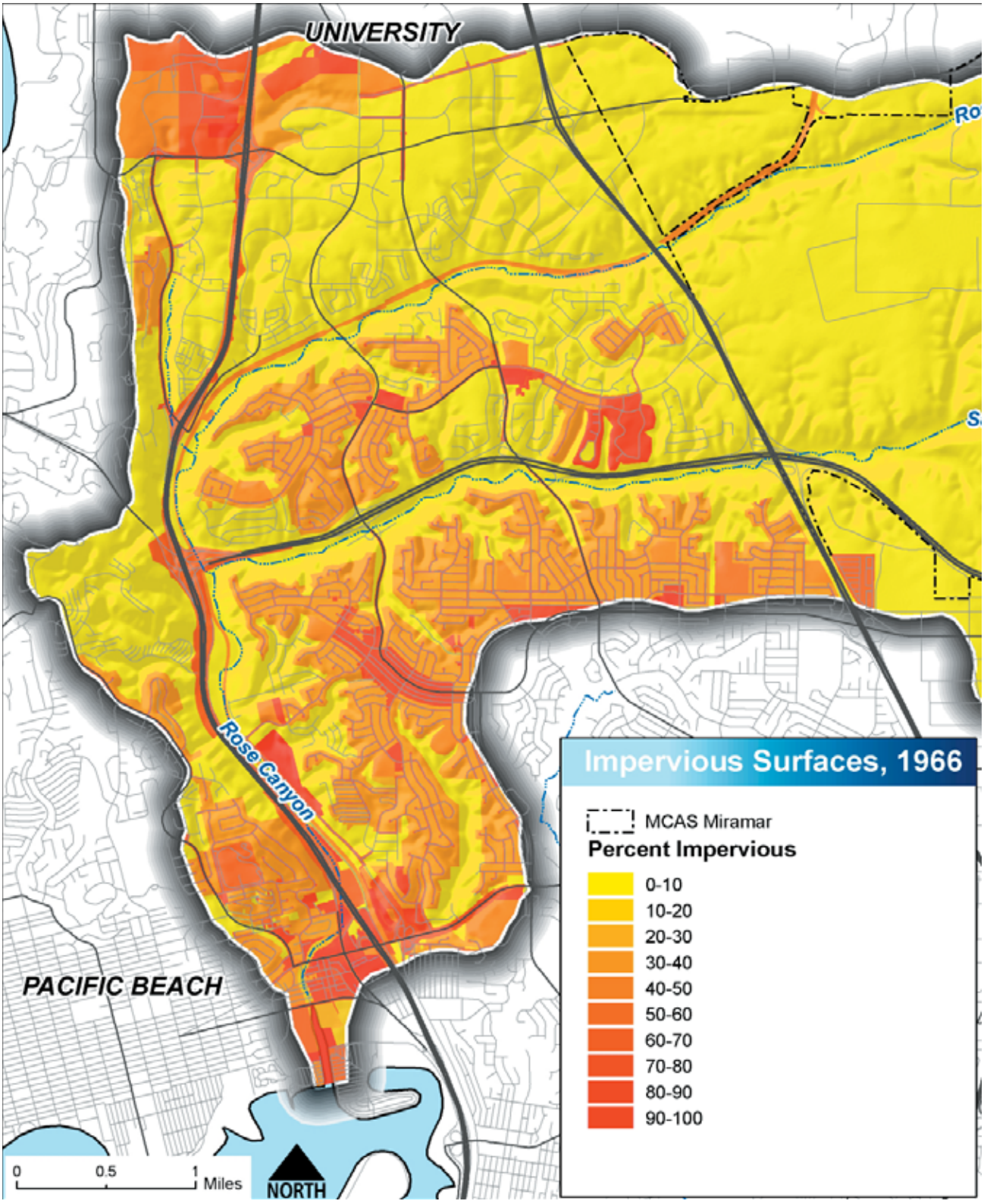
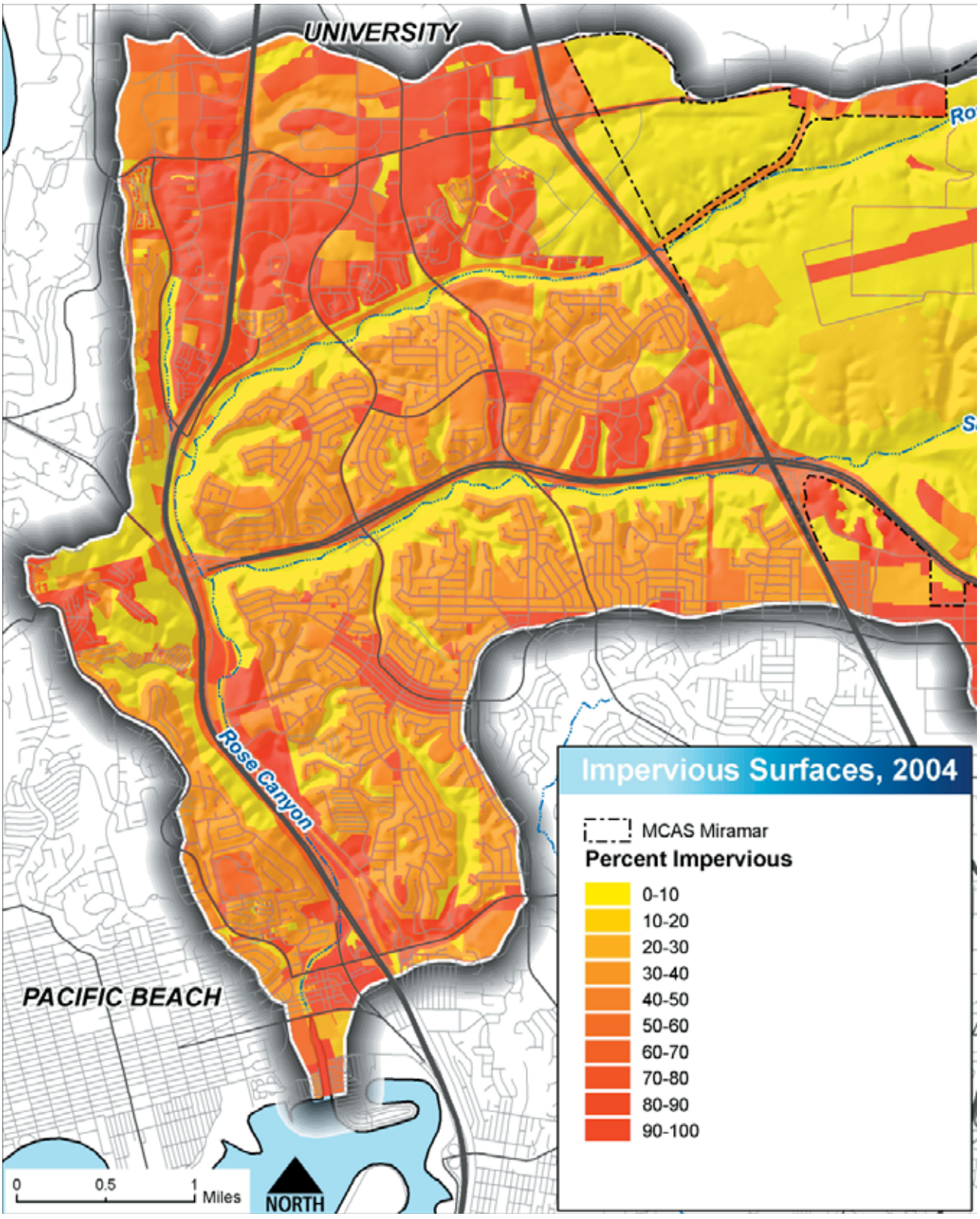


Figure 2-45: Impervious Surfaces in 2004

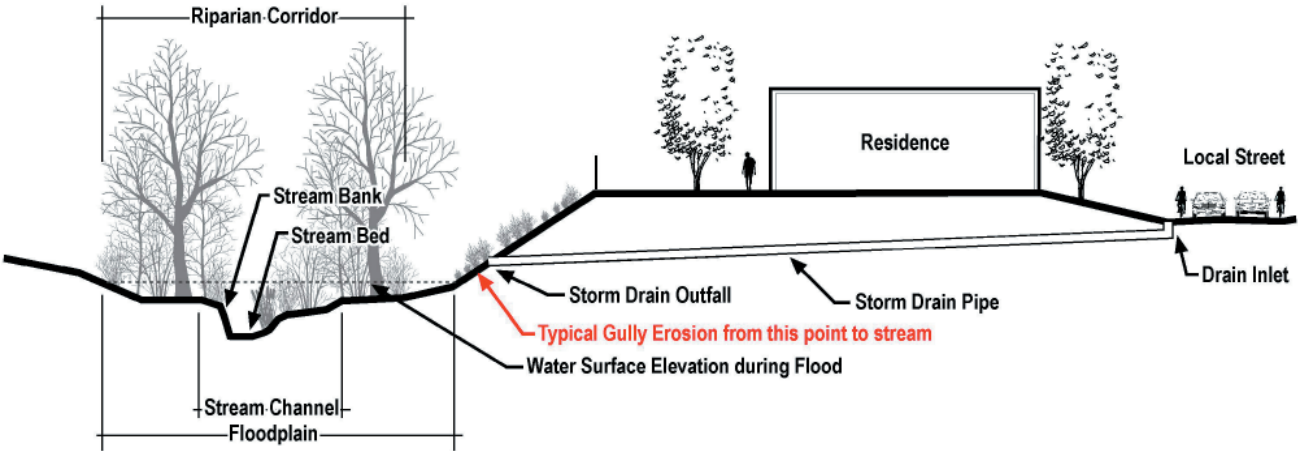


toring locations. The minimum would include two additional locations, one in the headwaters of San Clemente Creek and the other near the confluence. Additional locations could include near the recycling center on Convoy Street, on the UCSD campus, within Stevenson Canyon, on Mount Soledad, and at the Mission Bay golf course. One wet season of monitoring data is needed at a minimum, and at least two seasons are preferred.

3. Develop modeling tools for hydrology, hydraulics, and sediment transport
It is recommended that a watershed-wide hydrology and hydraulic assessment (computer model development), that also considers sediment transport and geomorphology be conducted. This study should provide accurate information pertaining to the limits of various flood flows (5-, 10-, 25-, 50-, and 100-year) and the flow rates that associate with them. The results of this assessment will provide much needed information to help determine the feasibility and appropriate siting of many of the other recommendations in this assessment. The model results will also help determine if urban development within the watershed since the 1970s era floodplain study has significantly altered the 100-year floodplains throughout the watershed, and if additional flood protection improvements are needed.

2.6.2 Recommendations to Reduce Erosion

- ☑ *Develop an adaptive management plan for erosion control*
- ☑ *Implement stream bank and bed erosion control projects*
- ☑ *Restore gully erosion along tributaries*
- ☑ *Improve storm drain and culvert outfalls to minimize downstream erosion*
- ☑ *Re-grade problematic trail sections to eliminate erosion*
- ☑ *Monitor the streams to determine long-term erosion or deposition rates*



Many of the stream banks and streambeds within the RCW are experiencing varying degrees of erosion (Figures 2-48 to 2-50). In addition to the erosion that is occurring within the main drainages of Rose and San Clemente creeks, most of the tributary canyons have been impacted by erosion associated with storm drain discharges and are currently characterized by moderate to severe erosion and gully formation. Some of these gullies are deep, as much as 15-20 feet, and could pose a hazard to the public.

The causes of the erosion are likely complex and interconnected, with the primary ones being the degree of imperviousness (amount of concrete and asphalt) and the amount of hydrologic modifications (culverts, gutters, storm drain channels). Storm drains that discharge into the upper portions of tributary canyons, and culverts that have been improperly designed and

installed are responsible for slope and down stream gully erosion in many areas throughout the watershed, with most of the occurrence happening west of I-805 (Figure 3-27). The combination of these and other factors is currently delivering more runoff from a storm faster than what occurred naturally before the watershed was developed (see Section 3.3.5).

The increased volume of runoff means the stream channels fill to capacity during a smaller rainfall event than during pre-development, which in turn places added stress to the stream banks and bed to enlarge to accommodate increased flow volume until a new equilibrium is reached. Erosion is undermining the health and safety of the watershed and, if left unchecked, it will continue, resulting in a loss of public and wildlife values and threats to public safety and health. Addressing erosion will require a focus on three primary elements: stream discharge, channel slope and vegetative cover.

2.6.2.1 Factors in Erosion Control

Stream Discharge: As the stream discharge (volume and velocity) of runoff within the stream channel increases, so does its potential energy. This increase in potential energy enables the runoff to erode and transport a greater volume of sediment, as well as a larger sediment size (gravel and cobble instead of silt and sand). If the volume of sediment entering the stream system from natural erosion processes is not sufficient to balance out the potential energy of the increased stream discharge, the remaining energy will be exerted on the stream banks and bed, which may result in un-natural rates of erosion. In order to reduce this un-natural rate of erosion, actions need to be taken to reduce the volume and velocity of the runoff within the stream channels.

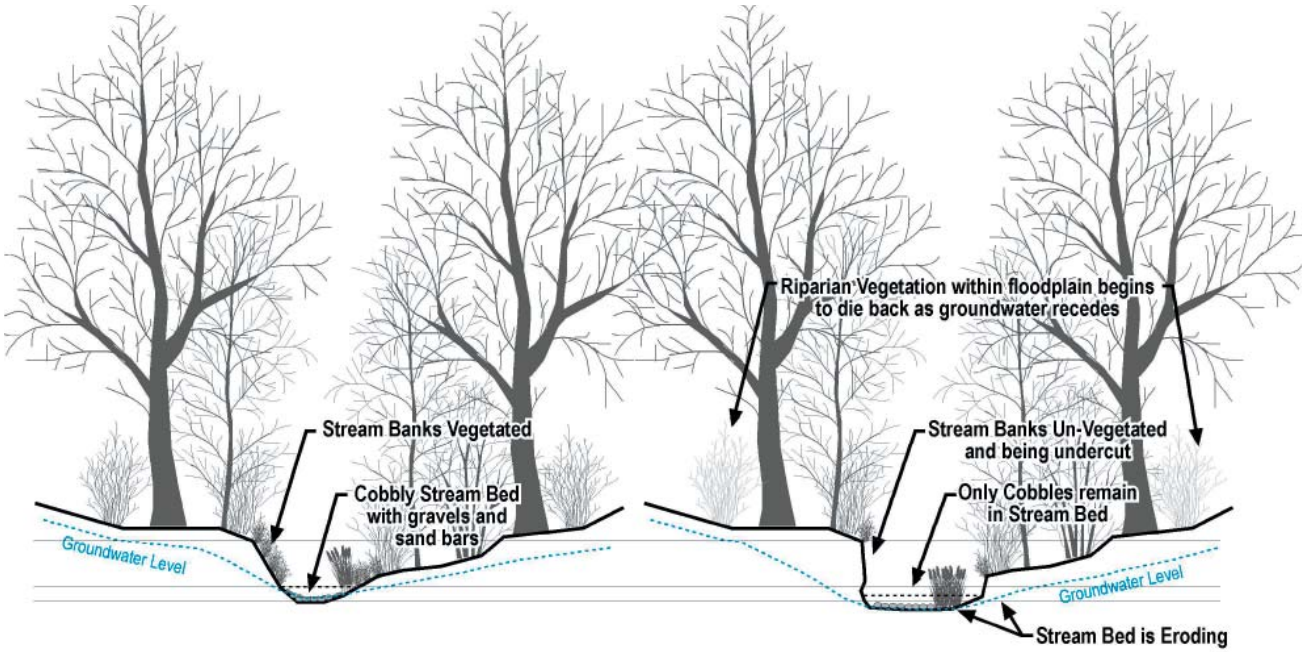
Channel Slope: A typical result of a sediment imbalance within the stream channel is a change in channel slope. If an imbalance between stream discharge and transportable sediment exists as described above, and the stream discharge is greater, then one of the typical results is for the slope of the channel to steepen as the streambed erodes. If the streambed is less erodible than the banks, the stream banks may erode as the stream widens until a new equilibrium is reached. If a steam channel has more transportable sediment within it than the flow rates of the runoff can transport, the slope of the channel typically decreases as sediment deposits on the streambed. Most reaches within the RCW currently exhibit characteristics of a sediment-deprived system, with the channel slopes continually increasing as evidenced by the lack of deposition of sands or other fine sediments and the dominance of cobble bars. Actions to reduce the channel slopes and prevent further streambed erosion need to be implemented.

Vegetative Cover: Vegetative cover is an important characteristic to help gage the health and stability of the stream channel. Under natural conditions, the streambeds of the Rose Creek Watershed are part of a highly dynamic environment with a cobble substrate and mobile sands and fine sediments being constantly introduced and transported through the stream channels by natural erosion. Vegetative cover was likely comprised of minimal riparian vegetation stabilizing the stream banks and quickly transition to upland communities (Figure 2-46).

Under pre-development conditions, the highly erosive native soils maintained a sufficient supply of transportable sediment within the stream channels, and vegetative cover kept stream bank erosion at natural rates, with significant stream channel changes only occurring during episodic flood events. As the watershed has developed, the natural erosion processes have been interrupted as land has been covered with impervious surfaces, which has not only reduced the amount of natural sediment supply, but has also increased the runoff volume and velocity associated with a given storm event. The increased runoff volume and velocity from larger storm events generates enough energy to move the protective cobble substrate and expose the underlying streambed to these erosive stream discharges. As the streambed gradually erodes, the stream banks become undercut and often collapse, thereby displacing the vegetative cover that was stabilizing the stream bank under natural conditions (Figure 2-47). The new un-vegetated stream banks are highly susceptible to continued erosion and may continue to recede until the stream discharges reach a new equilibrium with the sediment transport, or new vegetation becomes established and stabilizes the bank. Re-introducing native vegetative cover on stream banks needs to be a component of any stream restoration action.

Figure 2-46: Cross-section depicting a more natural stream channel environment

Figure 2-47: Cross-section depicting an eroded stream channel environment



The following actions are recommended to correct and keep in check stream-related erosion throughout the RCW:

1. Adaptive Management to Control Erosion

A long-term adaptive management approach is recommended to remedy the conditions that led to and continue to contribute to erosion throughout the watershed, as well as restore the watercourses to more stable conditions. The goal of this approach is to incrementally modify the physical environment to more stable conditions and then establish appropriate native vegetation communities to help reduce future erosion potential and provide wildlife habitat.

A variety of restoration techniques can be used to reduce the energy associated with the existing stream discharges and develop a more stable stream channel environment. A key aspect of the approach is to consider the problems on a watershed scale and not try to fix the issues at a given site without understanding how that site is affected by upstream activities and affects downstream activities. To accomplish this, combinations of the structural and non-structural restoration techniques described in Section 4.6 should be implemented throughout the watershed.

In addition, there are characteristics unique to the different types of erosion that are discussed below:

A. Stream Bank and Streambed Erosion

The stream banks and streambeds of Rose and San Clemente creeks have been steadily eroding in many areas for the past 40 or 50 years as the stream channels attempt to find a new equilibrium with the increased storm flows associated with the increased developed area throughout the watershed. Some areas may have attained a new state of equilibrium, while other areas are still actively adjusting through the down-cutting of streambeds or the erosion of stream banks (Figures 2-48 to 2-50). The results of the hydrologic assessment previously recommended will help determine the likely characteristics of a stream channel in equilibrium with current storm discharges (e.g. width, depth, bed sediment size, bank vegetative cover), which can be used to assess which areas are likely stable and will remain so, versus those areas that are actively adjusting and should be targeted for stabilization and restoration efforts. Additional information about streambed and bank restoration practices can be found in Chapter 4, Section 4.6.1 on page 4-25.

B. Tributary and Gully Erosion

In addition to the erosion that is occurring within Rose and San Clemente creeks, most of the tributary canyons have been impacted by storm drain discharges and are currently characterized by moderate to severe erosion and gully formation (Figures 2-48 to 2-50). Due to the severity (15-20 feet deep) and length (>0.5 mile) of some of these gullies, a long-term adaptive management approach (e.g. incremental improvements starting at the downstream extents of the gully to raise the streambed and stabilize the stream banks) may be necessary to correct the conditions that led to and continue to contribute to the erosion, as well as restore the gullies to more stable vegetated conditions. Before or while the gully erosion is addressed, the storm drain and culvert outfalls need to be altered to correct, or at least alleviate, the physical characteristics that led to the erosion problems initially. In addition to addressing the physical characteristics associated with the tributary erosion and gully formation, efforts to reduce the amount of runoff draining through these drainages should be undertaken at the site and neighborhood scale as discussed further within the Storm Water Runoff Reduction section that follows. Without these reductions of storm water runoff, all of the solutions described in Chapter 4, Section 4.6.2 on page 4-28 will have an elevated potential for failure.

C. Storm Drain and Culvert Erosion

Storm drains that discharge into the upper portions of tributary canyons and culverts that have been improperly designed and installed are responsible for localized erosion around their outfalls, as well as slope and down stream gully erosion in many areas, with most of the occurrence happening west of I-805 (Figures 2-48 to 2-50). Most of the existing storm drains and culvert outfalls were constructed without energy dissipaters or concern for downstream erosion. Concerns about erosion only occurred when it threatened public or private infrastructure (e.g. railroad embankments or sewer mains), or as the maintenance costs for dredging the mouth of Rose Creek in Mission Bay escalated annually. The outfalls that occur at the top of the major gullies are priorities for corrective actions.

The City of San Diego first looked into addressing erosion issues in 1986 when they hired Woodward Clyde Consultants to assess the RCW and define improvement projects to reduce the sediment load to Mission Bay. Unfortunately, most of the recommendations of that report were never implemented. The issue areas identified in 1986 have continued to degrade and others have manifested. Addressing the degraded and improperly designed outfalls is the first step in restoring many of the eroded tributaries, and is therefore of a higher priority for implementation. Phased project implementation should be considered wherever possible to address the outfalls first and the downstream gully erosion second. As mentioned before, efforts to reduce the amount of runoff draining through these outfalls should be undertaken at the site and neighborhood scale as discussed further within the Storm Water Runoff Reduction section that follows. Without these reductions of storm water runoff, all of the solutions described in Chapter 4, Section 4.6.3 on page 4-30 will have an elevated potential for failure.

2. Trail Erosion

Trail related erosion occurs in a variety of forms throughout the watershed west of Interstate 805. Most of the eroding areas are relatively small in scale and act as a minor sediment source to down stream areas, but can result in significant degradation of the recreational trail system. Figures 2-48 to 2-50 show the locations of identified trail erosion issues. The vast majority of these erosion issues relate to improper handling of storm water runoff that has led to the erosion and degradation of the recreational trails. Many of these problem areas can be fairly easily fixed through the use of knicks or rolling grade dips to help stabilize the trails and create a self sustaining drainage system to minimize future trail erosion. See Chapter 4, Section 4.6.5 on page 4-33 for more information.

Figure 2-48: Areas of Erosion within Upper Rose Canyon

Figure 2-49: Areas of Erosion within Upper San Clemente Canyon

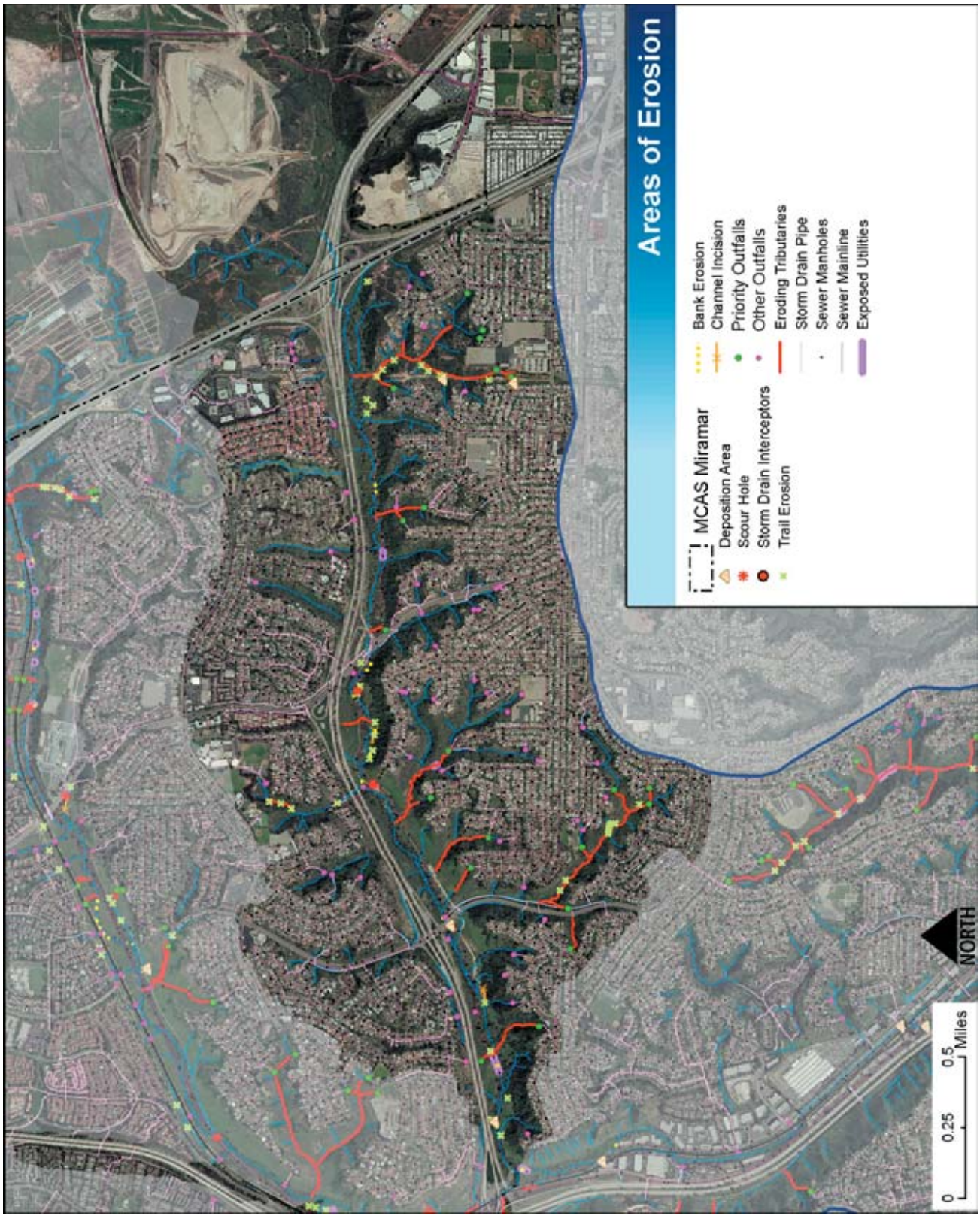
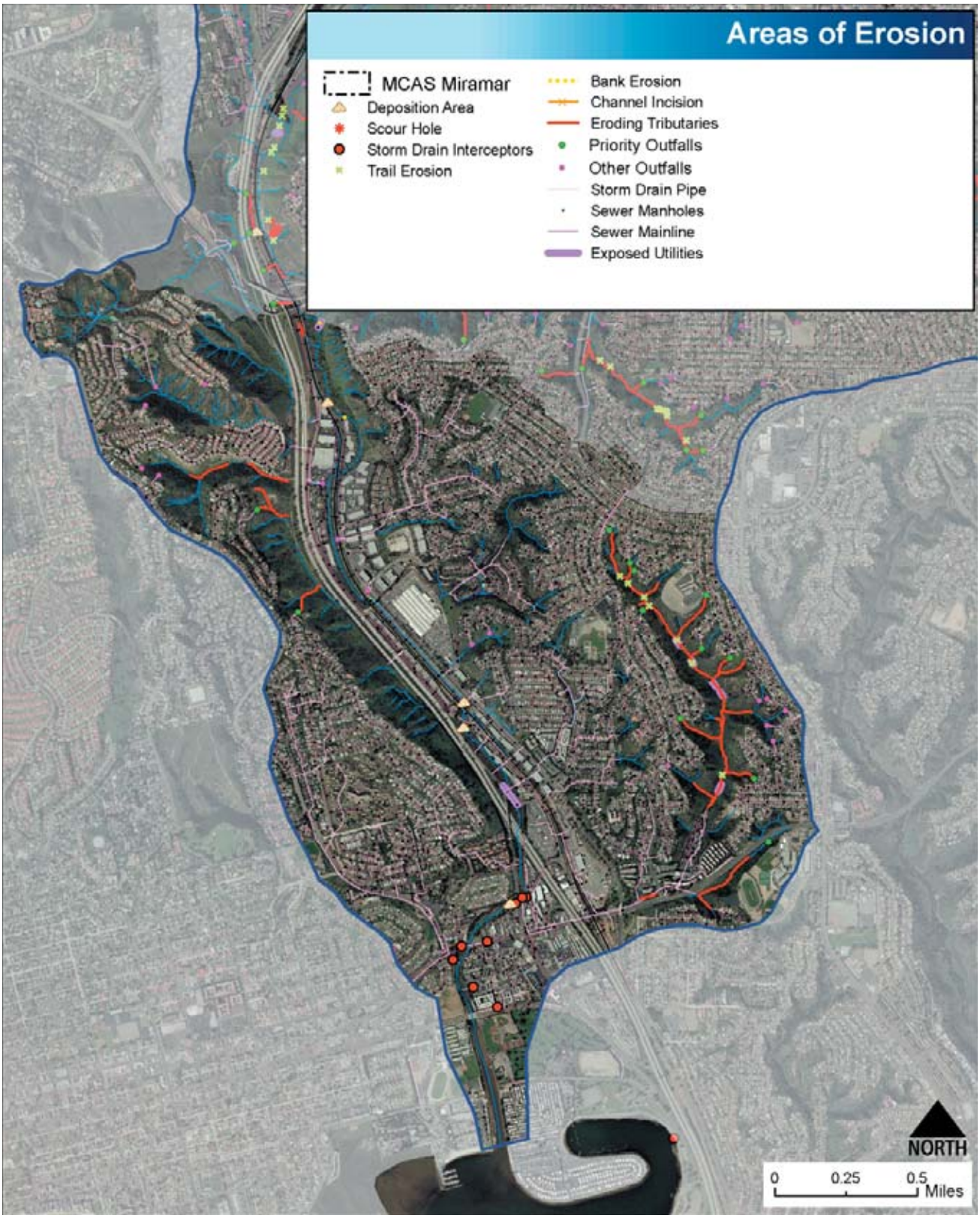


Figure 2-50: Areas of Erosion within lower Rose Creek



3. Determining Sediment Balance

Understanding the sediment balance within the RCW is important to determining the feasibility of many of the stream channel restoration techniques previously discussed. Is there enough sediment moving through the system to re-build the streambed? Is active channel down cutting and widening still occurring and at what rates? What does the sediment profile of the transported sediment look like? Is it made of mainly sands, gravels, and cobble? Or are there significant proportions of silt and clay? Answers to these questions and others will influence the restoration techniques chosen for a given location within the watershed. Components of monitoring include measuring Total Suspended Solids (TSS) and bed-load sediments; defining long-term transects for cross-sectional and longitudinal profiles of a stream reach to compare changes over time to determine erosion and deposition rates. The TSS monitoring should be done as part of the hydrologic monitoring. The physical monitoring (transect and profile) is recommended at five locations: below the confluence, within the open space parks, and upstream of the open space parks within the edge of MCAS Miramar, and should be collected on an annual basis at a minimum, with the optimum including after major storm events as well.

2.6.3 Recommendations to Modify Flood Control Channels

☑ *Remove concrete flood control channels wherever feasible and restore native plants*

Many communities nationwide are reassessing flood control and floodplain management approaches to determine whether more environmentally friendly solutions exists. Restrictive zoning, the development of river parkways (e.g. floodplains that double as recreational and open space areas), and the modification of concrete channels to incorporate vegetation and recreational opportunities are happening more frequently. Many of these efforts are occurring in much larger and more developed watersheds such as the Los Angeles River. Within the RCW, the City of San Diego has effectively addressed the first two options with the acquisition and dedication of the Rose Canyon Open Space Park and Marian Bear Memorial Park. Having these parks in place potentially allows for a dynamic floodplain environment to be re-introduced through the implementation of the streambed and stream bank improvements previously discussed. All three methods, or any combination of them, need to be assessed for implementation in the lower Rose Creek portion of the watershed.

The results of the recommended hydrologic assessment will provide crucial information that will aid in the determination of whether the existing concrete channels can be modified or removed while still maintaining flood protection to the developments along the creek. The results of the hydrologic assessment could suggest that zoning restrictions and floodplain dedications may be needed to prevent future recurrent flood damage from larger storm events. There are many questions to be answered before any concrete flood channel can be removed. The potential for erosion, slope damage or channel scouring must be analyzed along with the results of the recommended hydrologic assessment. Also to be considered is whether changes in the flood carrying capacity could occur and how they could be addressed. Ongoing maintenance of a newly restored channel must also be addressed. Any restoration design must consider the potential to support disease vectors, such as mosquitoes, so that the newly restored channel creates a positive net benefit to both humans and wildlife. Removal of the channel should be implemented only if the results of the hydrologic assessment indicate it will create a net positive benefit to the public in terms of public safety, public health, recreation and wildlife enhancement.

1. Concrete Channel Removal

There are four significant reaches of concrete channel (Figure 2-51) from Gilman Drive to Mission Bay that have been targeted for potential removal and conversion to alternative materials and designs that would allow the establishment of native vegetation communities and public access.

Figure 2-51: Concrete flood control channels




The first is a 1,500-foot long concrete trapezoidal channel located about 0.25 miles above the State Route 52/ Interstate 5 interchange along the railroad tracks. The second is a 700-foot long concrete trapezoidal channel occurring underneath the State Route 5 /Interstate 5 interchange along the railroad tracks. The third is a 3,000-foot long concrete trapezoidal that occurs between Morena Boulevard and Santa Fe Street and is terminated at either end by railroad bridges. The fourth is a 800-foot long concrete box channel with flow direction fins that occurs between Interstate 5 and Mission Bay Drive.

The conversion of these concrete channels to native plant communities would provide for a number of potential benefits: 1) improve public safety in lower Rose Creek; 2) provide missing habitat linkages for various species; 3) provide structurally varied vegetation communities (canopy trees, understory trees/shrub, groundcover) that can help improve overall bio-diversity of the watershed; 4) improve water quality through bio-filtering and stream shading; 5) improve storm water detention through increases in channel roughness and the introduction of pervious substrates; and 6) provide new public recreation benefits.

To determine the feasibility of these efforts, the updated hydrology and hydraulic information discussed in the previous action will be needed to: 1) compare the current 100-yr floodplain with the 1970s U.S. Army Corps of Engineers floodplain to assess potential increases in flood risk to developments and public infrastructure adjacent to or within the lower reaches of Rose Creek; 2) identify current flow volumes and rates associated with various flood flows to determine if alternate construction materials and techniques would remain stable or become an ongoing management problem; 3) based on the flow volume (cfs) and rate (fps), determine the cross-sectional volumes needed to convey various flood flows and use this information to design benches at appropriate elevations to support various wetland and riparian communities and re-establish a more dynamic floodplain environment. Detailed techniques are discussed in Chapter 4, Section 4.6.4 on page 4-31.

Removing the concrete channels, incorporating native riparian vegetation, and constructing recreational trails are integral to the vision defined for lower Rose Creek. This comprehensive approach ensures that the varied issues (illegal activities, wildlife corridor, habitat diversity, water quality, flood management, etc) within lower Rose Creek are addressed and as many multiple benefits are gained as possible.

2.6.4 Recommendations related to Water Pollution

- ☑ *Monitor dry weather runoff to determine pollution sources and potential solutions*
- ☑ *Collect storm water quality data coincident with hydrology and hydraulics data*
- ☑ *Reduce storm water runoff through capture and infiltration*
- ☑ *Inform land-owners of storm water reduction measures through outreach materials*
- ☑ *Develop a long-term stream monitoring program to monitor trends in stream health*

Reducing storm water runoff and the pollutants it transports has become a major focus of water quality improvement efforts nation-wide. Within the San Diego region, the San Diego Regional Water Quality Control Board adopted the Municipal Storm Water Permit (Order No. 2001-01) in 2001 that established progressive storm water pollution reduction targets and program requirements that all copermittees (the cities within San Diego County and the County) had to meet. The copermittees established Project Clean Water (http://www.projectcleanwater.org/) as a forum to collectively discuss and address these new storm water requirements in a consistent manner. As part of the Storm Water Permit, all jurisdictions are required to organize along watershed boundaries and cooperatively identify priority watershed issues and develop solutions. The RCW is part of the Mission Bay Watershed Management Area and the City of San Diego has sole responsibility for complying with the Storm Water Permit and other water quality standards identified within the federal Clean Water Act or the state Porter-Cologne Act.

Bacterial contamination in Mission Bay has been the focus of investigations by various entities since the early 1980s. These investigations resulted in the construction of a low-flow interceptor system that diverts dry weather urban runoff out of the storm drain system into the sanitary sewer system at a cost of approximately $10 million over 3 phases. Due to continued bacterial contaminations, the City of San Diego also undertook a bacterial source identification study in 2004 (Mission Bay Epidemiology Study, MEC 2004) to determine, via DNA, the origin of the bacteria (human, canine, avian, etc). The results indicated that 67 percent of the bacteria originated from birds (avian species), 10 percent from dogs (canine species), and 5 percent each from humans and other land mammals, and a final 4 percent from marine mammals.

Since 1996, the mouth of Rose Creek has been on the 303(d) list (See Section 3.8.2) as being impaired by lead and eutrophic conditions, and all of Mission Bay with bacterial contamination. In addition to these 303(d) listed pollutants, other pollutants of concern (See Section 3.8.2) include: sediment, nutrients, other heavy metals, organic compounds, trash and debris, oxygen demanding substances, oil and grease, and pesticides.

In addition to the ongoing monitoring efforts within Mission Bay, various City of San Diego departments have been monitoring locations (14-24 locations) within the RCW (Figure 3-31) since 2001 in an effort to better understand the sources and distribution of bacterial contaminants. As part of the MOU with the City of San Diego for this assessment, the City has continued to collect dry weather monitoring data, with the purpose of the monitoring to detect and eliminate illicit connections and illegal discharges into the storm drain system. The results of these efforts have indicated sporadic exceedances of water quality standards for ammonia, pH, and total coliform, but to-date has provided little guidance as to the sources of the pollutants. As more data is collected, the City's goal is to track the pollutants upstream to identify the source and remedy the discharge. If pollutants can't be tracked to a specific source(s), but are found throughout the watershed, watershed-wide programs for pollutant reduction should be implemented.

1. Dry Weather Pollution Monitoring

The City monitoring program has established that dry weather runoff from urban areas is contributing to water quality pollution, but has yet to identify the sources or potential solutions to this ongoing problem. It is recommended that more focused water quality monitoring be undertaken within the urban areas contributing to the existing monitoring stations that have shown consistently higher concentrations of pollutants relative to the other stations. The purpose is to determine the sources contributing to the dry weather flow and their contributions to the pollutant load (e.g. is lawn over watering the primary contributor of nutrients). Scheduling issues (e.g. time of day, day of week, week of month) can become important aspects to consider when undertaking this detective work style of monitoring as businesses and homeowners alike typically maintain a routine schedule for watering and maintaining their landscapes, washing cars, hosing off sidewalks, etc. so that the monitoring results conducted on a given day may be markedly different the next day due to when these types of activities are scheduled. Time of day can also be important, especially during the summer months when temperatures are high enough to evaporate significant volumes of dry weather runoff; temporarily stranding pollutants in the street gutters until the next runoff event flushes them down the storm drain system.

2. Storm Water Runoff Monitoring

Collecting water quality data coincident with hydrologic data will allow for the development of flow-weighted concentrations. These can be important when trying to determine if periods of critical pollution concentrations exist that are missed during typical grab sample monitoring (e.g. are there periods of elevated toxicity from

pesticides during the first flush in upstream locations that does not show up at the receiving water due to dilution?). Other appropriate storm water runoff monitoring would be associated with measuring the effectiveness of installed management practices. This determination would be most effective by collecting pre-practice data, as well as post installation, and could be designed to capture the effectiveness of a single practice or a series of practices that flow to a particular storm drain.

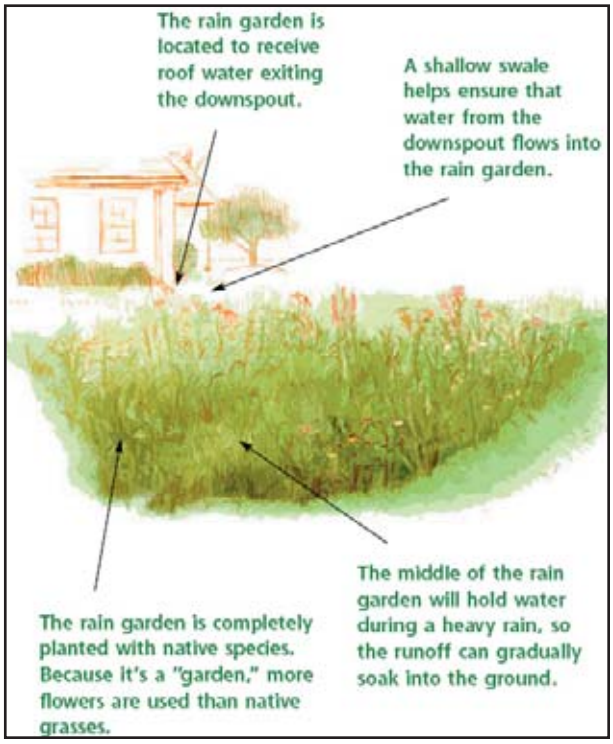
3. Storm Water Runoff Reduction

The reduction of storm water runoff is a necessary component of the successful restoration of the storm drain and culvert outfalls, the eroded tributaries, and the main stream channels of Rose and San Clemente creeks. Reduction efforts can be undertaken at a variety of scales using a variety of best management practices. The goal of this action is the actual reduction of storm water runoff through the use of best management practices (BMPs) that utilize infiltration techniques to capture and allow storm water to soak into the soil for storage and more natural release into the stream channels. A description of recommended BMPs (dry well, trench drain, rain garden, rain barrel) for storm water reduction can be found in Chapter 4, Section 4.6.6 on page 4-34. Due to the low infiltration rates that naturally occur throughout most of the RCW; infiltration tests done by a professional geotechnical engineer are highly recommended to ensure the BMP will properly drain and not create a nuisance with standing subsurface water. To account for the natural limitations of the native soils, the BMPs are recommended for installation in series (rain barrel to trench drain to rain garden to dry well to storm drain system) to ensure the least amount of runoff reaches the dry well as possible, thus minimizing the potential for standing subsurface water.

The purpose of these BMPs is not to capture 100 percent of the runoff from all storm events, but to capture the runoff from the first one-half to one inch of rainfall, which represents the most frequent storms within the San Diego region. A typical volume of rainfall targeted for capture (retention or re-use) from a 2,000 square foot home with a two car garage and 20 foot long driveway is as follows:

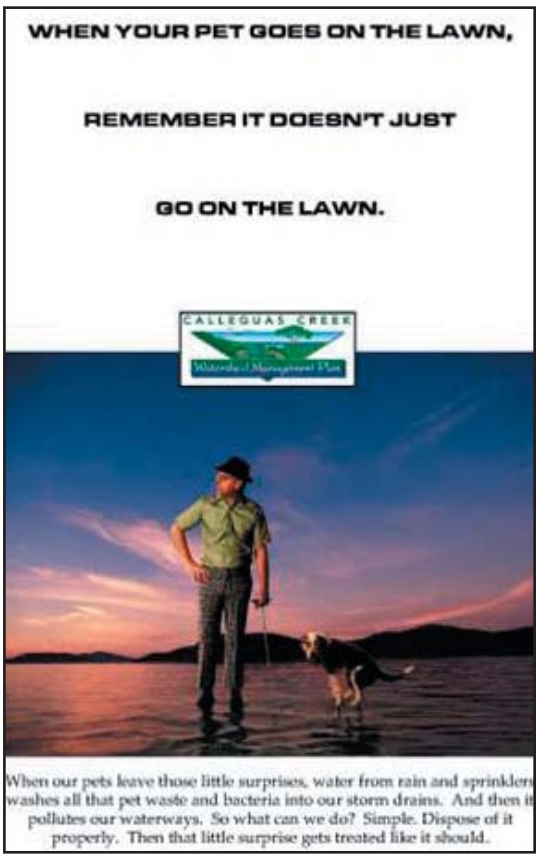
2,000 sq.ft. roof X 0.5 in. of rain = 83.3 cubic feet of runoff (~623 gallons)
40 x 20 ft. driveway X 0.5 in. of rain = 3.3 cubic feet of runoff (~25 gallons)

These volumes would be used to size one or more of the recommended BMPs for installation on a given property. When each property is calculated by itself, it is hard to understand the value of storm water retention on a single property. Many of the storm drain outfalls may only have twenty properties contributing to the erosion problem. However, if five properties were to implement these BMPs within that drainage area, the volume of runoff flowing through that outfall could be substantially reduced, thereby making downstream improvements and restoration efforts easier to undertake.

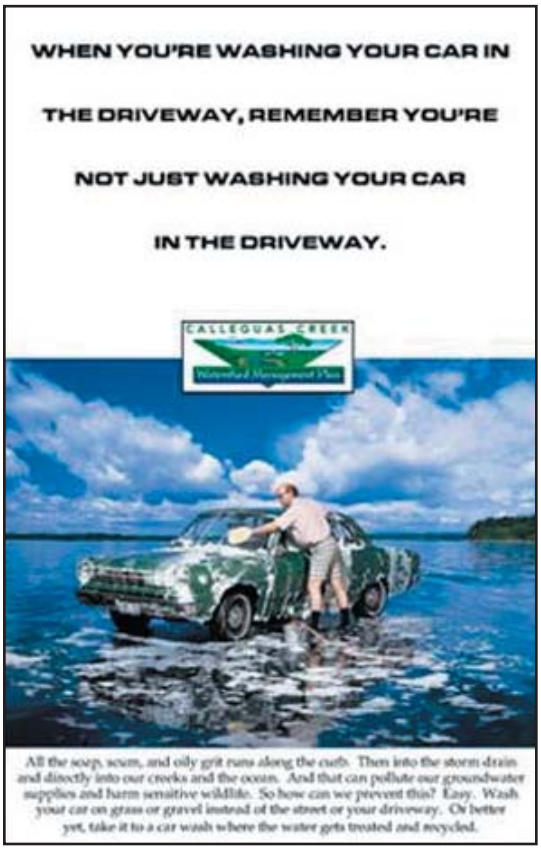


4. Outreach Materials for Storm Water Runoff

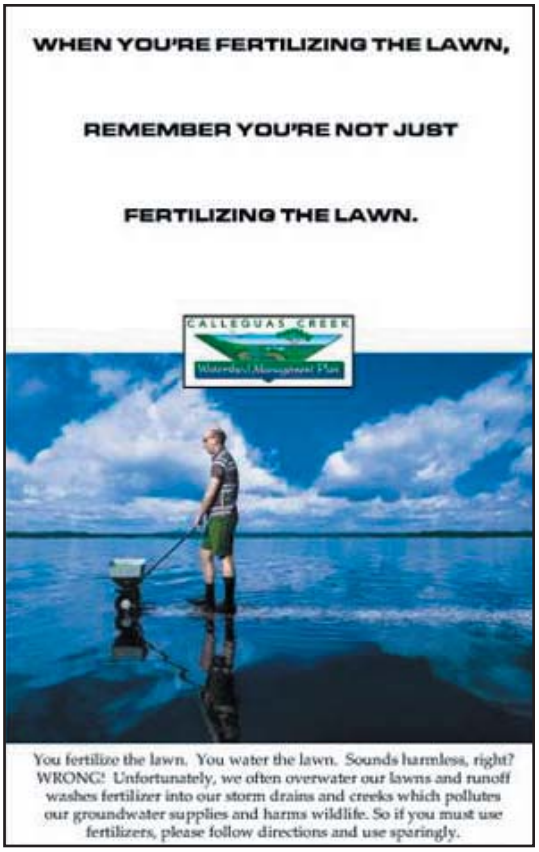
The first step could be to develop outreach materials that describe the proportion of storm water runoff generated from rooftops, patios, walkways, and driveways and the associated downstream issues of erosion, flooding, and pollution. These efforts should build on those of the City of San Diego Storm Water Pollution Prevention Division as described on their website ***www.sdthinkblue.gov***. The second step could then focus on the types of improvement projects that individual landowners could implement (see the techniques described in the Section 4.6.4). Associated with this second step could be the development of demonstration sites that showcase the individual techniques at a minimum and could even show how they can work in series. The demonstration site(s) could be on public lands, but could also utilize residential or business properties if the owners are willing to allow visitors during specific timeframes. For more information on developing public outreach materials see Chapter 4, Section 4.1 on page 4-1.



Sample Public Outreach Flyer about Pollution form Pet Waste



Sample Public Outreach Flyer about Pollution form Detergents



Sample Public Outreach Flyer about Pollution form Fertilzers

5. Stream Monitoring

Establishing a long-term monitoring protocol to track trends in the health of the watershed is an important aspect of watershed management. Current water quality monitoring only provides a snapshot of what pollutants are in the water or sediments at that moment in time. It does not provide information about whether or not a highly concentrated discharge of pollutants occurred a week prior or if it had significant effects on the in-stream biota. It is recommended that stream bioassessments utilizing the "California Stream Bioassessment Procedure" be conducted at a minimum of three (preferably five) locations within the RCW. The San Diego Stream Team already monitors one site along San Clemente Creek within Marian Bear Memorial Natural Park. Additional sites are recommended at the following locations: 1) Upper Rose Canyon near Interstate 805, 2) Upper Rose Canyon above the confluence with San Clemente Creek, 3) Upper San Clemente Canyon above the confluence with Rose Creek, and 4) lower Rose Creek downstream of North Mission Bay Drive. These sites would provide a gradient of data from areas least impacted by urban runoff to those most impacted, and could provide valuable insights to the types of improvement projects needed to improve the in-stream habitat conditions. Coordination with MCAS Miramar regarding additional sites within the Station is also recommended. Bioassessments are standardized protocols for assessing biological and physical/habitat conditions within wadeable streams in California and are adaptations of the national Rapid Bioassessment Protocols outlined by the U.S. Environmental Protection Agency in "Rapid Bioassessment Protocols for use in Streams and Rivers" (EPA/841-B99-002). Full information on the California implementation can be found on the California Department of Fish and Game's Aquatic Bioassessment Laboratory website at www.dfg.ca.gov/cabw/cabwhome.htm.

Caddis Fly Larvae

Mayfly Larvae

Freshwater Snail

Hellgrammite

Black Fly Larvae

Damselfly Larvae

Dragonfly Larvae

Stonefly Larvae