



Figure 4-27. The Santa Fe Dam Nature Center celebrates its grand opening in April 2004.

interpretive themes. Staff would cooperate with each other on shared programs and events, promoting overall public awareness of the centers. Visitors could be issued “San Gabriel River Passports” to be stamped each time they visit one of the chain of educational centers along the river.

An overview of the educational center network, structured by reach and theme, might look something like the descriptions provided in Table 4-2.

Design guidelines should encourage *all* projects within the San Gabriel River corridor to incorporate an interpretive element that reflects river and watershed themes. Currently, several Master Plan projects already plan to include a significant interpretive element, complementing the educational programs of the major interpretive centers:

- Azusa Canyon River Park (R3.01)
- San Gabriel Canyon Spreading Grounds (R3.08)
- Buena Vista Wetlands (R3.24)
- Walnut Creek Nature Park and Nature Center (R4.11)
- Woodland Duck Farm (R4.15)
- Rio San Gabriel Park Interpretive Trail in Downey (R5.17)
- Downey Landing (R6.01)
- Riverview Park (6.07) in Bellflower

TABLE 4-2. FUTURE EDUCATIONAL CENTER NETWORK

Reach	Educational Centers	Area of Focus
1: Headwaters	■ Rincon Station	■ San Gabriel Mountains, U.S National Forest
2: San Gabriel Canyon	■ Morris Dam Peninsula Park (2.06)	■ San Gabriel Mountains; role of canyon dams in flood control, water supply and quality; military history of Morris Dam reservoir
3: Upper San Gabriel Valley	■ Forest Gateway Interpretive Center (R3.6)	■ U.S. National Forest
	■ Peter Schabarum Nature Center (R3.22)	■ Geology, mining ■ Watershed, water conservation, demo native plant gardens, education, culture, multi-age group activities, research
4: Lower San Gabriel Valley	■ San Gabriel River Discovery Center at Whittier Narrows (R4.26)	■ Watershed, water conservation
		■ Geology, mining
5: Upper Coastal Plain	■ Pio Pico State Historic Park (R5.06)	■ Culture, history
	■ Los Cerritos Wetlands Restoration (R7.07)	■ Tidal wetlands
6: Lower Coastal Plain	■ El Dorado Nature Center (R6.22)	■ Nature, science, biology for school age groups, wetlands
7: Tidal Influence Zone	■ Hellman Ranch Wetlands Freshwater Marsh Restoration (R7.10)	■ Tidal wetlands; Tongva village archaeological site



Figure 4-28. Interpretive exhibits like this poster for the San Juan Bautista de Anza Trail can be built in even very small spaces.

4.6 PARK DEVELOPMENT

New and expanded parks along the river is a core strategy for “greening” the San Gabriel River. Parks and trails open up the river environment, making it accessible and attractive to nearby residents and other visitors who come for recreation or simply to relax and enjoy the view. River parks link people to the river, while also serving as a gathering place for the communities in which they are located.

Existing Conditions

There are approximately 52 parks within or near the San Gabriel River corridor. By far the largest open space with recreational opportunities is the Angeles National Forest. Three notable regional parks serve the San Gabriel River: Santa Fe Dam Recreation Area in Reach 3, the Whittier Narrows Recreation Area at the southern edge of Reach 4, and El Dorado Regional Park in Reach 6 just above Coyote Creek. There are about 49 city parks along the river corridor.

The majority of the urbanized river corridor is covered by parks: there are parks within walking distance of the river along 66% of the west bank of the river, and 80% of the east bank. Areas that are “missing” parks include communities with very dense populations such as Baldwin Park in



COURTESY OF ANNE DOVE, NPS

Figure 4-29. Fishing is a popular activity on the West Fork.

Reach 4. Other underserved communities include sections of El Monte, Pico Rivera, West Whittier-Los Nietos, Bellflower and Long Beach.

However, many of the river-adjacent parks are not oriented toward the river. As a result, park visitors may not even be aware that the river is nearby. This pattern stems from several factors. Public parks near the river are generally fenced off from the river except at one access point. They are often located beneath the top of the levee, preventing people in the park from seeing the river on the other side. Ornamental trees or shrubs planted along the fence line also limit visual and physical connections to the river. In some places, active rail lines separate parkland from the river.

Landscaping in many existing parks often does not reflect the river environment. The typical “park aesthetic” is lawn and ornamental landscaping that is water-intensive with high maintenance requirements.

Future Opportunities

There are major park development opportunities in all reaches. The most significant of these are within utility rights-of-way, subject to California State Public Utilities Commission guidelines and approval. Other opportunities include confluences and reclamation of brownfields and vacant open space.

Reach 1

In Reach 1, park development will most likely focus on the key issue of preventing future impacts from the thousands of annual visitors who travel Highway 39 along the San Gabriel River corridor into the Angeles National Forest. Highway turnoffs, vista points, interpretive areas, and parking, along with comfort stations and other amenities, can better serve the volume of visitors. This could be achieved through a series of parks along Highway 39, catering to people traveling by autos or bicycles. Management of trash and other user impacts is also a key issue in this reach.

Reach 2

Morris Dam Peninsula Park (R2.06) is the primary park development opportunity in this reach. Site remediation by the U.S. Navy will be



Figure 4-30. World War II torpedo chutes are still found on the Morris Dam Peninsula.

necessary. As in Reach 1, highway turnoffs, vista points, and other similar mini-parks would better serve recreational visitors along Highway 39.

Reach 3

Future park development in this reach would consist primarily of opportunities created by reclamation of quarry operations and acquisition of privately held undeveloped lands. Current examples among Master Plan projects include:

- Robert’s Creek Restoration (R3.04)
- Azusa Rock Quarry Restoration (R3.11)
- Fish Creek Restoration and Public Access (R3.12)
- Wright-Romvary Properties (R3.18)
- United Rock Products Quarry #3 (R3.25)

Although quarry reclamation offers huge potential for new parks, this will have to be balanced with economic development opportunities that are also important to local cities. The final use for the quarry sites, three or four decades from now, will be determined through negotiations between quarry operators and the Cities of Azusa and Irwindale. Local cities are interested in commercial, industrial, and to some extent, residential development. Parks, open space and habitat can be compatible with



Figure 4-31. The Santa Fe Dam Recreation Area offers both active and passive recreation activities.

economic development. Other Master Plan projects with a significant park and open space component in this reach include:

- Azusa Canyon River Park (R3.01)
- San Gabriel Canyon Spreading Grounds (R3.08)
- Santa Fe Dam Recreation Area and Habitat Enhancements (R3.21)

Reach 4

There are several park development opportunities in Reach 4. In the northern half of the reach, many of the Master Plan projects will help address the existing parks “gap” near Baldwin Park and South El Monte:

- Caltrans ROW Open Space and Trail (R4.09)
- Barnes Park (R4.10)
- Walnut Creek Nature Park and Center (R4.11)
- Woodland Duck Farm Project (R4.15)
- Proposed bridge projects such as the San Gabriel River Bike Trail Bridge (R4.16) and San Jose Creek Bike Trail Bridge (R.17), along with additional gateways (to facilitate access to the Bike Trail and provide the equivalent of a park-like setting along the river corridor)



Figure 4-32. Dog parks like this one at Seal Beach can be developed in “leftover” spaces such as underneath utility towers.



Figure 4-33. Pocket parks on small overlooked properties can provide shade, benches and water.

Quarry reclamation projects in Irwindale have significant park opportunities, if park development is included as an element in these reclamation plans. In the central and southern half of Reach 4, a variety of Master Plan projects in the unincorporated part of LA County in and near Whittier Narrows may form a chain of linked regional and local parks. This concept has been previously referred to as the San Gabriel Confluence Park, linking the Woodland Duck Farm (R4.15) to the Whittier Narrows, including the San Gabriel River Discovery Center (R4.26), the Lario Creek/Zone 1 Ditch Enhancement Project (R4.28), and the Rio Hondo.

Reach 5 and Reach 6

These reaches have the largest number of existing parks. They are very heavily used, suggesting that additional parks are needed. In these reaches, 13 new or enhanced park development projects area proposed. Additional opportunities may include the development of small parks, which can be especially valuable to underserved communities. Joint use programs with local schools can also provide a significant expansion of readily available park space for surrounding communities. The former NASA site in Downey (R5.01) could provide future long-term opportunities for creating new parks and open space.



Figure 4-34. These park benches are oriented to take advantage of picturesque river views on Naples Island, near the mouth of the river.

Reach 7

In Reach 7, proximity to the beach and marinas may create a different set of park opportunities:

- Coyote Creek Confluence
- DWP open spaces (R7.16)
- Oil field reclamation
- At the beach, possibly near River’s End Gateway (R7.17)

4.7 OPEN SPACE

Open space has many different forms: parks, school playgrounds, greenways and natural areas. The defining element is that it offers a respite from the hard-edged urban environment where people spend most of their time. Open space may be just a small 50-foot by 50-foot parcel of unused urban land, several acres of river-adjacent parkland, miles of utility right-of-way corridor, or hundreds of square miles in the Angeles National Forest. And the river itself is linear open space.

The Master Plan includes projects that maintain and preserve open space areas along the river, as well as opportunities to reclaim land that could become open space in the future.

Existing Conditions

Open space along the river is sparse, but there are exceptions: the natural areas of the Angeles National Forest (Reaches 1 and 2), Santa Fe Dam Recreation Area (Reach 3), Whittier Narrows (Reach 4), and El Dorado Regional Park in northern Long Beach (Reach 6).

Land use patterns along the river corridor vary considerably by reach, affecting the present and future open space potential along the river. The most dramatic divergence is between the wilderness of Angeles National Forest (Reaches 1 and 2) and the rest of the river as it flows through the highly urbanized areas of Los Angeles County from the foothills to the sea (Reach 3 to Reach 7). Even within the urbanized reaches, however, there are variations in land use patterns that may impact future open space potential. These variations are summarized as follows:

- Reaches 1 and 2: open space
- Reach 3: primarily industrial and open space, with some commercial
- Reach 4: industrial, residential, and open space, with only a little commercial
- Reach 5: open space, but primarily residential and some commercial
- Reach 6: residential with some commercial and open space
- Reach 7: open space, residential, with some industrial and commercial

Utility rights-of-way and easements have had the effect of preserving open space along much of the river corridor. In some cases, these corridors traverse existing parks. SCE owns or leases approximately 85 percent of the adjacent land along the river corridor. LADPW also owns and leases land along the river. In the past, these areas have had only limited public use because of safety, maintenance, CPUC-mandated fiscal responsibilities, and operational requirements. The conversion of SCE rights-of-way lands from nurseries and equestrian facilities to storage units is a current trend that may reduce available open space. SCE is responding to CPUC financial requirements to obtain the “highest and best use” on its available open space lands.

Connections to public schools also expands the network of de facto open space. There are also vacant lands along the river, under-utilized industrial lands and SCE/LADPW hiatus areas that currently do not allow public access.



Figure 4-35. Rose Hills Memorial Park, overlooking the river, is a large open space area where many families gather to celebrate the lives of loved ones.

Future Opportunities

Opportunities for open space enhancement include protecting all existing available open spaces and creating new open spaces through incremental acquisition and conversion of land over time.

Utility Rights-of-Way

The most significant open space opportunity along the river corridor is the SCE utility rights-of-way, which could be enhanced for passive recreational and habitat purposes. There is precedent for utility corridors being used in this manner. For example, in Sun Valley, the City of Los Angeles Department of Water and Power easements are being used for treatment wetlands to assist local cities in meeting water quality regulatory requirements. Selected portions of utility corridors might be used for habitat-friendly gardens, parks and trails. Planting with native vegetation not only increases habitat but could also reduce maintenance costs for utility companies.

Regulatory and fiscal challenges will have to be addressed if this open space vision is to become a reality. For example, SCE will need a safe harbor agreement to protect its operations if endangered species take up residence in newly established habitat areas within the right-of-way.

Conservation easements can also play a major role by providing utilities with a financial incentive not to convert plant nurseries to storage facilities. Conservation easements may be a viable form of public subsidy

to make up the difference between the revenue generated by storage units and other less environmentally-sensitive uses.

School Sites

Public school properties can be a key element in the creation of additional open spaces. Opportunities include El Monte and Baldwin Park (in Reach 4) and the lower river communities of Pico Rivera, Downey, Cerritos and Norwalk (in Reaches 5 and 6).

Gravel Quarries

In Reaches 3 and 4, future gravel quarry land reclamation may provide additional open space for recreation and habitat in conjunction with other economic development opportunities on these sites. Quarry sites identified in the Master Plan include:

- Azusa Rock Quarry Restoration (R3.11)
- United Rock Products Quarry #3 (R3.25)
- Hanson Quarry (R4.05)
- Rodefer Quarry (R4.06)
- Durbin Quarry (R4.07)

These quarries are private property. Some quarries, such as the Durbin Quarry and United Rocks Product Quarry #3, offer valuable commercial and industrial area reuse opportunities. Local cities are extremely interested in the property development that will improve their tax base.

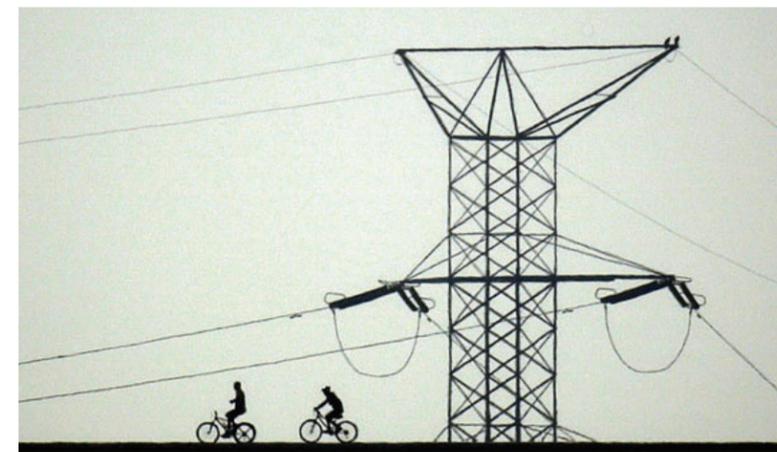


Figure 4-36. The land along utility towers can provide significant open space areas.

Proposals to set aside any portions of these properties for open space will need to account for these economic realities.

Undeveloped Land

An additional open space priority in Reach 3 is acquiring privately held undeveloped lands that should be preserved as open space. An example is the Wright-Romvary Properties acquisition in Duarte (R3.18). Abandoned railroad or transportation rights-of-way offer opportunities to acquire linear open space that can be used for trails, habitat, and other community purposes. Examples include:

- Pacific Electric Rails-to-Trails Project involving cities along Foothill Boulevard (R3.15)
- Whittier Greenway Trail and Connection (R5.05)
- West Branch Greenway Rails-to-Trails in Bellflower (R6.11)

Converting underused or abandoned lands currently zoned commercial, industrial and residential may represent a long-term opportunity to create new open space. A survey to determine the extent of these properties is required to assess the potential of this strategy. Although many cities will consider the economic development potential of such sites a priority, the value of such properties increases where there is an open space component, especially in areas adjacent to or near the river. This approach may be especially valuable in heavily developed Reaches 5, 6 and 7, as older buildings and facilities reach the end of their useful lifespans. Converting the former NASA site in Downey (R6.01), which combines new open space with new commercial and business development, may serve as a prototype for future developments.

4.8 REDEVELOPMENT AND RECLAMATION

Redevelopment can transform landscapes from prior urban and industrial uses, making them available for new economically viable and ecologically sustainable uses. Land recycling from one use to another enhances its value.

Land reclamation is the process of improving disturbed land (soil, vegetation and water) to achieve land equivalent to or as close as possible to pre-disturbed conditions. For example, “brownfields” are lands where a hazardous substance, pollutant or contaminant must be cleaned up to



Figure 4-37. Community gardens, such as this one in Long Beach, can offer multiple benefits in underused open space.

prepare the land for reuse. Land reclamation should be guided by the economic and social needs of the communities in which these sites exist.

Existing Conditions

The San Gabriel River corridor includes many productive gravel and sand mining operations, primarily in the alluvial deposits in the upper San Gabriel Valley (Reaches 3 and 4). There are 17 gravel quarries in Irwindale alone, and another active one in Azusa. These mines are in various stages of operation and have developed reclamation plans to be implemented during the next 7 to 30 years.

Many of these sites have significant economic development potential and for this reason are especially important for the future economic health of the cities in which they are located. In addition, the adjacency of these sites to the San Gabriel River adds to their significance. Multiple uses could complement or enhance their economic value. These uses could include parks and open space, habitat restoration, stormwater capture and cleanup, and flood hazard reduction.

A variety of challenges will need to be addressed at each site in order to reclaim them. In some of the deeper mining pits, such as Hanson Quarry, groundwater is currently exposed at a depth of 150 feet. Water levels in the groundwater basin have historically and naturally fluctuated greatly in depth. Erosion is also a problem on sites with significant excavation. However, bioengineering techniques could be used to control erosion, with the added benefit of restoring habitat and soil health. Some sites may include contaminated soils or remnant toxins that could be harmful to the

environment. These substances must be contained or cleaned up as part of the reclamation plan, especially if site runoff transports these substances elsewhere.

Other significant land reclamation challenges include the EPA Superfund sites in the San Gabriel Valley, oil fields west of Whittier Narrows (Reach 4) and an area by the Los Cerritos Wetlands in Long Beach (Reach 7).

Future Opportunities

On many sites, existing conditions may not meet current safety, accessibility and water quality standards, and post-occupancy reclamation plans must be prepared. The Master Plan’s integrated approach to future land uses supports a river system or watershed perspective. Each potential site should be examined in terms of its ability to address a variety of components. For example, the economic development potential of each site is very important, and must be addressed along with other potential benefits. Multiple uses can be integrated into some sites, rather than creating exclusive reserves for one function or another. Uses include:

- Land use conversion
- Open space
- Habitat restoration
- Interpretive features (demonstration areas)
- Groundwater recharge
- Flood protection
- Bioengineered wetlands (water quality)
- Economic development
- Reclaimed water

Gravel Quarries

Gravel quarries constitute the most significant land reclamation opportunity in the river corridor. A Quarry Reclamation Development Study (R4.04) is being conducted to more precisely determine the land reclamation potential of these projects, especially their potential feasibility for multiple beneficial purposes. For example, two former quarries that were already recycled as spreading grounds, are now sites for proposed second-tier land reclamation efforts. At the San Gabriel Canyon Spreading Grounds (R3.08), native landscaping improvements will enhance views of the nearby mountains by aesthetically improving the appearance of the

spreading basins—while also providing habitat. At the Buena Vista Wetlands (R3.24), LADPW plans to create bioengineered wetlands for habitat restoration. LADPW will need assurance that such habitat will not impose additional regulatory burdens. In addition to these existing efforts, Master Plan stakeholders have identified 11 gravel quarries as potential future land reclamation projects, including those listed below.

- Azusa Rock Quarry Restoration (R3.11)
- Azusa-Largo Pit (R3.16)
- Reliance Pit #2 (3.17)
- United Rock Products Quarry #3 (R3.25)
- United Rock Products Quarry #4 (R3.23)
- United Rock Products Quarry #1 (R4.01)
- United Rock Products Quarry #2 (R4.02)
- Bubalo Pit (R4.03)
- Hanson Quarry (R4.05)
- Rodefer Quarry (R4.06)
- Durbin Quarry (R4.07)



Figure 4-38. Reclamation plans for the Durbin Quarry can provide economic development and open space for the region.

The future end use of each of these quarry sites will vary depending on many factors, including the value of the land as determined by surrounding land uses. Some quarry sites can offer land reclamation that complements enhancements to the river corridor. Other quarry sites, especially those surrounded by commercial and industrial uses, will more likely be developed for purposes that can best enhance the tax base of the local cities in which they are located.

Abandoned and Underused Land

Other major stakeholder-proposed projects demonstrate the value of land recycling for creating new uses on abandoned or underused properties that have the potential to significantly transform the landscape. At Morris Dam Peninsula Park (R2.06), the proposed land reclamation project would transform a former Navy torpedo testing facility into a regional park. The Woodland Duck Farm (R4.15), a former agricultural facility, is being reclaimed to provide multiple recreational, habitats, and water quality benefits. At Downey Landing (R6.01), the 160-acre former NASA industrial facility is being recycled as a mixed-use commercial and business project, including a 11.5-acre park with a biofiltration swale system to capture and clean stormwater. The City of Downey has allocated \$20.5 million to complete soil and groundwater cleanup at this reuse site.



Figure 4-39. The proposed Downey Landing park on the site of a former NASA facility is a significant land reclamation project.

Three stakeholder-proposed rails-to-trails projects include a land reclamation component:

- Pacific Electric Rails-to-Trails Project (R3.15)
- Whittier Greenway Trail Connection (R5.05) and
- West Branch Greenway Rails-to-Trails Project (R6.11)

RMC has granted the San Gabriel Valley Council of Governments funding to identify brownfield sites in the San Gabriel Valley, some of which are likely to be found within or near the San Gabriel River corridor. This study will be useful for identifying additional future land reclamation opportunities and obtaining funding for such projects.

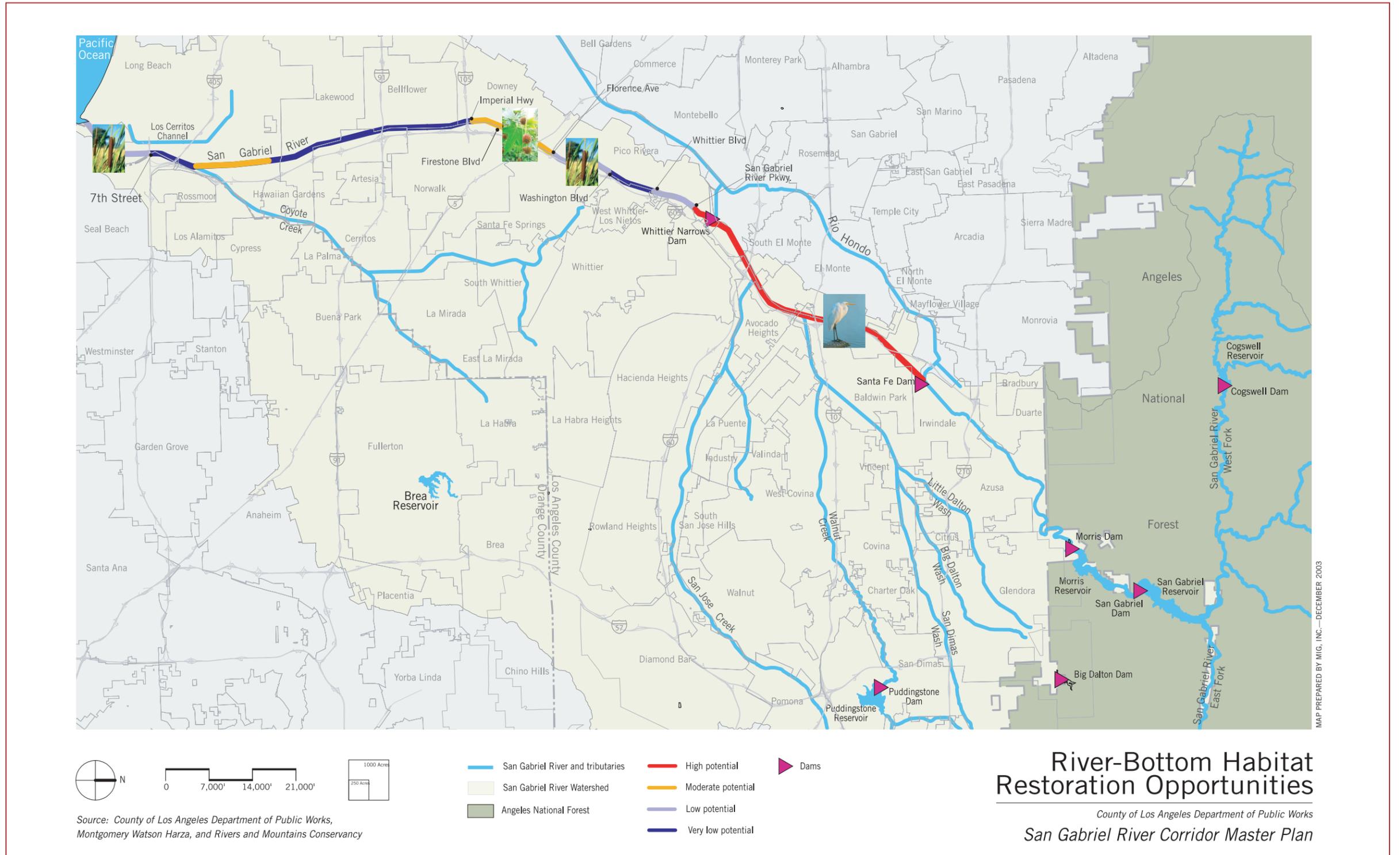
4.9 FLOOD CHANNEL ENHANCEMENTS

Flood channel enhancements refer to projects that can improve flood prevention for properties adjacent to the river. Following the multi-objective framework provided by this Master Plan, flood channel enhancements would also include elements of habitat restoration, recreation and open space. It is possible to creatively blend flood control engineering with ecology to improve flood protection and restore some of the natural attributes of the river system. For example, flood control levees can be set back from the river in adjacent open space areas to widen the floodplain, allowing habitat to be expanded—while still maintaining and improving flood protection for adjacent communities. Natural-looking terraces built over engineered levees can mimic natural features.

Existing Conditions

There is a complex relationship between flood control, water conservation and habitat restoration—all of which can be affected by a number of factors, including the design of the storm drain system, the capacity of the flood control channels, and the type of vegetation growing in those channels.

The existing storm drain system is designed to quickly move runoff from rooftops to streets to the San Gabriel River to the Pacific Ocean. This creates a “peak flow” situation when the river carries large volumes of water, traveling at a fast velocity, for a short period of time. As a result, stormwater that might otherwise be captured for storage, recharge and other values, is quickly lost to the sea.



Map 4-8. River bottom habitat restoration opportunities.



Figure 4-40. Even though the river is in a concrete channel, there is enough open space available at El Dorado Regional Park to consider partial floodplain restoration at this point.

The majority of the San Gabriel River channel is designed to meet capacity requirements for a 100-year flood event. Existing data on channel capacity indicates there are significant stretches of excess capacity along the channel. Computer modeling will be required to confirm this data. Excess capacity suggests that there are opportunities to undertake flood channel enhancements, which can provide benefits for habitat restoration, recreation and other purposes.

The longest stretch of excess capacity is about 9 miles long and carries 5,000-30,000 cfs in excess of 100-year flow. This occurs in Reach 4, from Santa Fe Dam down to just below Whittier Narrows Dam.

Lower Reach 5, from Florence Avenue to Imperial Highway, is a 3-mile stretch with excess capacity of 3,000-5,000 cfs.

There are two under-capacity reaches, one in Reach 5 from Whittier Boulevard down to Washington Boulevard (where the San Gabriel Coastal Basin Spreading Grounds are located) and one in Reach 7, from the I-405 Freeway down to 7th Street (just after the concrete ends and soft-bottom zone of tidal-influence begins).

The remainder of the river, half of Reach 5, all of Reach 6, and most of Reach 7 has excess capacity from 0-3,000 cfs.

Vegetation management and removal of exotic species (especially *Arundo donax*) can have a beneficial impact on channel capacity and on native habitat restoration. The distribution of native alluvial fan sage scrub and native riparian species, naturally adapted for seasonal periods of scarce

water, is more widely spaced and less dense than arundo. Riparian species easily root in alluvial soils following a flood, providing rapid regeneration of habitat while preventing erosion of the fragile soils.

In contrast, an arundo forest is denser, taller and less diverse. Arundo forests out-compete native plant species, make less water available for recharge downstream, and provide little habitat value. This plant community also impedes groundwater infiltration because its dense, extensive root system retains water near the ground surface, where it either evaporates or is absorbed by the plants.

Future Opportunities

Over the long-term, river enhancement projects must be designed to attenuate peak flow by capturing and slowing down potential flood waters, reducing flood risk and allowing future stream restoration projects to safely move forward.

Flood Plain Restoration

Open space areas along the river may offer opportunities to set back levees from the river to restore flood plain functioning, including meandering channels and sandbars. Such restoration is most feasible where river-adjacent open space exists in conjunction with excess flood channel capacity, or where open space can even enhance flood control capacity. Utility easements, spreading basins and reclaimed gravel quarries offer



Figure 4-41. The soft-bottom segment of the river in Reach 5 is regularly mowed to minimize vegetation for flood control purposes.

opportunities to increase flood channel capacity while contributing to floodplain restoration efforts. The most significant wide, open space areas along the San Gabriel River exist in Azusa, Irwindale, Whittier Narrows and Long Beach. Other open space opportunities are the numerous river-adjacent community parks and industrial lands with reclamation potential.

The El Dorado Regional Park Wetlands and Master Plan (R7.01) is an example of one possible future flood plain restoration opportunity. Long Beach park planners are studying proposals for removing concrete from the eastern side of the San Gabriel River channel adjacent to El Dorado Park to create a more natural channel. Removing the concrete would require that about 200 feet in width of the existing El Dorado Park become part of the floodplain. Much of El Dorado Park is over 2,500 feet wide, so the restored floodplain would be less than 10 percent of the current park width. However, the floodplain may only be partially flooded every one to five years. During dry periods, it could continue to provide open space for recreation and habitat.

Spreading Grounds

Quarry reclamation, as demonstrated by the San Gabriel Canyon Spreading Grounds in Azusa, provides an opportunity to reuse these sites as spreading grounds or as retention/detention areas for floodwaters. Closure plans for these quarries include additional open space and possible opportunities for retaining stormwater:

- United Rock Products Quarry #3 (R3.25)
- Quarry Reclamation/Water Storage Study (R4.04)
- Hanson Quarry (R4.05)
- Rodefer Quarry (R4.06)

Riparian Habitat

In the near term, segments of the soft-bottom portions of the San Gabriel River that have excess capacity could be managed to allow native riparian willow scrub plant communities to thrive. This would provide linear and riparian habitat, shade, cooler water temperatures and a visually pleasing river greenway. COE regularly maintains its channels, including annual mowing of vegetation. LADPW and COE would need to negotiate a “safe harbor” agreement that will allow vegetation to be maintained without penalty. A rigorous exotic species eradication and maintenance schedule would be needed so native plants can be established and sustained over the long term. A field study to identify areas within the river channel that

could handle the additional growth of native vegetation would also need to be undertaken.

The reaches with excess channel capacity also provide opportunities to expand the single-purpose flood channel for multiple-uses. The greatest opportunity is in Reach 4, in the 9-mile stretch from Santa Fe Dam to just below Whittier Narrows Dam. Coincidentally, this is also the location of the critical “missing habitat linkage” from the Puente-Chino Hills to the San Gabriel Mountains, which could be at least partially restored by allowing the regrowth of native plant communities in the soft bottom portions of the river.

Multi-Objective Solutions

Beyond flood plain restoration, the best overall opportunity for addressing flood protection is through individual projects that include multi-objective solutions. Over 50 percent of the Master Plan projects integrate this principle. For example, some recreational and habitat improvement projects will contribute to flood protection by incorporating designs to hold back stormwater and reduce peak flows, including:

- Santa Fe Dam Recreation Area and Habitat Enhancements (R3.21)
- Whittier Narrows Wildlife Lakes (R4.29)
- Whittier Narrows Legg Lake Improvements (R4.30)
- Whittier Narrows Dam Water Conservation Pool (R4.31)



Figure 4-42. Above Whittier Narrows, vegetation is managed to allow for habitat.

Stream restoration projects can serve multiple purposes including providing habitat, improving water quality and reducing peak flows. Examples of these projects include:

- Robert’s Creek Restoration (R3.04)
- San Jose Creek Habitat and Trails Restoration (R4.19)
- Lario Creek/Zone 1 Ditch (R4.28)
- North Caruthers Channel Improvements (R6.10)

Wetlands can be effective in attenuating peak flows by capturing runoff for habitat, including:

- Buena Vista Wetlands (R3.24)
- El Dorado Regional Park Wetlands and Master Plan (R6.21)
- Los Cerritos Wetlands Restoration (R7.07)
- Hellman Ranch Wetlands Freshwater Marsh Restoration (R7.10)

Open space can be an opportunity to incorporate wetlands, retention or spreading basins to hold back floodwaters, including:

- Woodland Duck Farm Project (R4.15)
- Pico Rivera Golf Course Enhancements (R5.01)
- Downey Landing (R6.01)
- DWP Open Space (R7.16)

Although these and other individual projects should strive to address flood protection in their design, hydrologic analysis must be performed in each case to verify the extent of their potential contribution to this goal.

Finally, current flood management projects, facilities, and practices should be re-examined for multi-objective possibilities including:

- Sediment Management and Removal Study (R2.04)
- Flow Study below Morris Dam (R2.07)
- San Gabriel Canyon Spreading Grounds (R3.08)
- Inflatable Rubber Dams to Increase Groundwater Recharge (R4.14)
- Paseo Del Rio at SG Coastal Basin Spreading Grounds (R5.08)
- Paseo Del Rio at Rio Hondo Spreading Grounds (R5.09)
- Marina Drive Urban Runoff Diversion System (R7.15)

Under-Capacity Areas

Two segments are under-capacity and do pose a potential flood hazard. These can be addressed by attenuating peak flows upstream in the watershed. In addition, the potential to use adjacent land for flood storage can be investigated. The first segment is just over 1-mile long, along the San Gabriel Coastal Basin Spreading Grounds in Pico Rivera from Whittier Boulevard to Washington Boulevard. These spreading grounds may be an opportunity to expand the floodplain in this segment, with no net loss in water conserved.

The second under-capacity segment is in Long Beach. It is about one-mile long, from the I-405 Freeway down to 7th Street (22 Freeway). Utility easements on both sides of the river in this stretch might provide land area for the additional needed capacity.

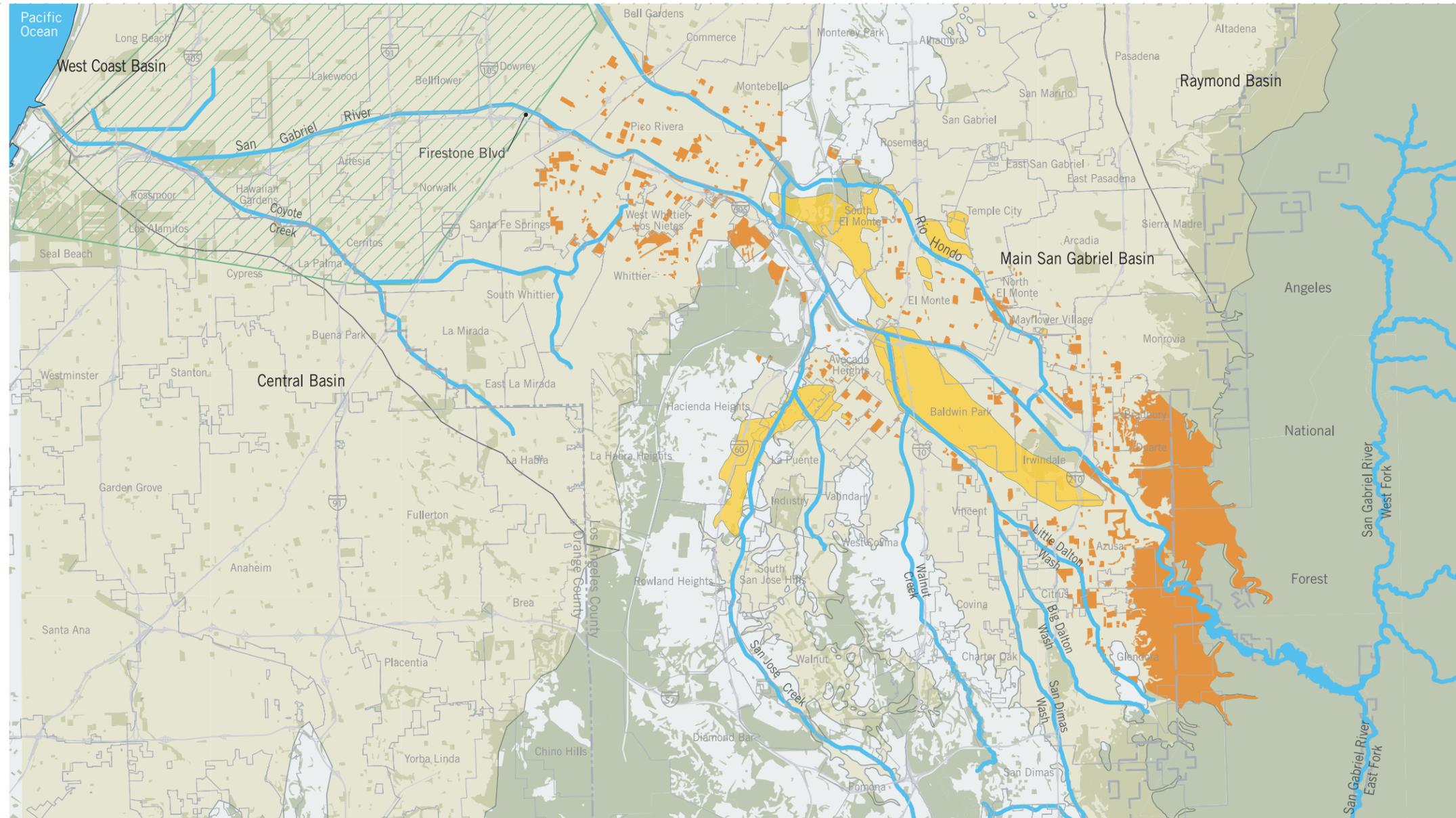
4.10 GROUNDWATER RECHARGE

The Southern California water supply is a combination of local surface and groundwater, imported water from the Colorado River watershed and Northern California, and reclaimed water. The San Gabriel Valley receives most of its water from the river and groundwater basins. The local water supply begins as rainfall that percolates into the underlying groundwater basins. Imported water helps fill the groundwater basins and meet local demand. Reclaimed water is treated wastewater made available for reuse purposes, including groundwater recharge. A complex web of water agencies buy, sell, pump and manage these precious water resources.

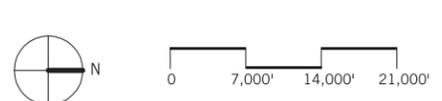
Existing Conditions

Groundwater basins store local rainfall for use, but demand far exceeds the available local water supply, so water must be imported and stored in the basins. Two groundwater basins underlie the San Gabriel River: the Main San Gabriel Basin and the Central Basin. A small portion of a third groundwater basin, the West Coast Basin, lies under the mouth of the river in Long Beach.

The Main San Gabriel Basin was created from erosion of the San Gabriel Mountains. That erosion resulted in a bowl of unconsolidated alluvium, or sand and gravel, filling the San Gabriel Valley. This created a permeable condition that retains rainfall underground—as long as the surface ground above remains unpaved. Similar conditions existed below Whittier Narrows, creating the Central Basin. The Montebello Forebay area is an especially productive recharge area. LADPW operates engineered spreading grounds,



MAP PREPARED BY MIG, INC.,—DECEMBER 2003



Source: County of Los Angeles Department of Public Works and Rivers and Mountains Conservancy

- San Gabriel River and tributaries
- Groundwater basins
- Parks and open space
- Parks and open space (recharge opportunities)
- Contaminated plumes (no recharge)
- Clay lens (no recharge)

Note: Potential groundwater recharge sites omitted due to two factors: Presence of aquaclude (clay lens prohibiting recharge) south of Firestone Boulevard, and contaminated groundwater plumes near Whittier Narrows, Baldwin Park and Irwindale.

Groundwater Recharge Opportunities

County of Los Angeles Department of Public Works
San Gabriel River Corridor Master Plan

Map 4-9. Groundwater recharge opportunities.

ensuring that a measurable quantity of water is continually recharged to these groundwater basins. These include:

- San Gabriel Canyon Spreading Grounds in Azusa
- Santa Fe Spreading Grounds in Irwindale
- San Gabriel Coastal Basin Spreading Grounds in Pico Rivera

Two spreading facilities on the Rio Hondo take water from the San Gabriel River. Below the Santa Fe Dam, water is sent through the Buena Vista Channel to the Peck Road Water Conservation Park. The Zone 1 Ditch, or Lario Creek, takes water from the San Gabriel River down to the Rio Hondo Coastal Basin Spreading Grounds in west Pico Rivera.

Other areas of the river corridor have impermeable conditions, which do not allow groundwater recharge. South of the Central Basin, an impermeable clay layer—called an aquaclude—sits underneath the river from Downey to the confluence of Coyote Creek in Long Beach. The urban fabric (parking lots, streets and buildings) can also create impermeable conditions, even in areas where favorable geologic conditions would otherwise enable groundwater recharge.

Untreated groundwater pollutants can also reduce the local water supply. Contaminated groundwater plumes in the lower Main San Gabriel Basin have been moving slowly southward toward the Central Basin. The primary area of the plume is just east of the San Gabriel River, starting above Irwindale by the I-210 Freeway, moving south parallel to the river through Baldwin Park, and resurfacing on the other side of the river below South El Monte, above Whittier Narrows. A groundwater treatment facility was built in the Whittier Narrows Recreation Area to treat these contaminated plumes.

The complex web of water suppliers include the Metropolitan Water District of Southern California as the wholesaler, and numerous local agencies as water purveyors and resellers. Jurisdictional responsibility goes to many agencies for surface water and groundwater supply and the quality of both surface and groundwaters. Water agencies and suppliers include:

- Main San Gabriel Basin Watermaster
- Metropolitan Water District of Southern California
- San Gabriel River Water Committee
- San Gabriel River Watermaster
- San Gabriel Valley Municipal Water District
- San Gabriel Valley Protective Association



Figure 4-43. Permeable paving at the edges of parking lots and driveways can increase permeable surfaces that allow infiltration.

- San Gabriel Valley Water Association
- Southeast Water Coalition
- Three Valleys Municipal Water District
- Upper San Gabriel Valley Municipal Water District
- Water Replenishment District
- Central Basin Municipal Water District

Future Opportunities

If the overall permeability of the watershed is increased, additional recharge of groundwater basins can expand the local water supply. In general, system-wide recharge opportunities should be encouraged on most land use types, starting with large open space areas on public lands. Applying best management practices and watershed-sensitive design to all planning, design and construction could offer significant recharge potential.

Many Master Plan projects have the potential for groundwater recharge. The two best opportunities are at the base of the San Gabriel Mountains (from Reach 3 to halfway down Reach 4 past the Santa Fe Dam) and from Whittier Narrows Dam in Reach 5 down to Firestone Boulevard. There may be opportunities on lands outside the existing spreading grounds that

would be an adjunct to the significant groundwater recharge activities already taking place in these reaches.

In Reaches 6 and 7, the aquaclude or clay lens begins, preventing water from reaching the groundwater basin. In addition, recharge is not appropriate above the contaminated plumes.

There is some recharge potential among the many small parks and open spaces that lie above the groundwater basin along the entire river corridor. Many are less than 20 acres, which limits the amount of recharge potential from a single site. But, added together, the cumulative benefit from these sites could be substantial. Runoff from adjacent land uses could be diverted to these sites for groundwater recharge. These sites could be regraded to collect stormwater runoff in ponds, meandering streams or other holding areas.

Additional future opportunities to increase recharge potential include those listed below.

- Consideration can be given to those sites where excess reclaimed water is available from the San Jose Creek Water Reclamation Plant (55 MGD), Los Coyotes Water Reclamation Plant (30 MGD), and the Long Beach Water Reclamation Plant (17 MGD).
- Multi-agency coordination can resolve conflicts associated with lined lakes between water recharge, water-based recreation and habitat value.
- Additional recharge facilities between Whittier Narrows and Firestone Boulevard could further reduce the percent of rainfall water that is lost to the ocean.
- The Groundwater Augmentation Study being conducted by the Los Angeles and San Gabriel Rivers Watershed Council is exploring the opportunities and constraints of directly recharging aquifers with polluted urban stormwater runoff. Pilot projects can demonstrate best management practices for groundwater recharge design, implementation and management.

4.11 WATER QUALITY IMPROVEMENT

Water quality is a top priority for all local municipalities. The Clean Water Act regulatory requirements, administered by the State of California through the Regional Water Quality Control Boards (Regional Board), have set high water quality standards. Implementing the total maximum daily

load (TMDL) standards will require funding that may be beyond the capability of local jurisdictions. Regional solutions such as strategically located treatment wetlands in currently available open space areas may be at least part of the solution for urban water quality problems plaguing local streams and rivers.

Existing Conditions

The Los Angeles Regional Board has identified major watershed issues for the San Gabriel River in its Watershed Management Initiative Chapter of December 2001. These water quality issues include:

- 764 companies or other entities with minor, general, industrial stormwater, or construction stormwater permits under the National Pollution Discharge Elimination System (NPDES)
- Sluicing and disposal of sediments from reservoirs
- Protection of groundwater recharge areas
- Ambient toxicity
- Excessive trash in recreational areas of upper watershed
- Mining/stream modification
- Extensive stream modification for mining and water reclamation
- Urban and stormwater runoff quality
- Nonpoint source loadings from nurseries and horse stables
- Lack of understanding of estuary dynamics (e.g., the salinity)
- Septic systems leaking into groundwater

According to the Regional Board, impairments to the San Gabriel River include nitrogen and effects, trash, metals, historic pesticides, coliform, chlorides, and PCBs. Currently, the only completed TMDL plan is the East Fork Trash TMDL, which will take 10 years to bring the area into compliance. The currently scheduled TMDLs for the San Gabriel River include:

- Nitrogen and metals (river), fiscal year 04/05
- Coliform, fiscal year 02/03
- Nitrogen (lakes), fiscal year 03/04
- PCBs, pesticides and metals (lakes), fiscal year 05/06

The associated constituents or pollutants for reaches in the current 303(d) list include:

- Coyote Creek (entire stretch of main stem): Abnormal fish histology, algae, coliform, copper, lead, selenium, zinc
- San Gabriel River (from below I-91 Freeway to I-405 Freeway, below the confluence of Coyote Creek): Abnormal fish histology, algae, coliform
- San Gabriel River (below Whittier Narrows Dam to below I-91 Freeway): Coliform, copper, lead, zinc
- San Jose Creek, Reach 1 (from confluence with Puente Creek to confluence with San Gabriel River): algae, coliform
- San Jose Creek, Reach 2 (from top of main stem to confluence with Puente Creek): algae, coliform
- Walnut Creek (from Puddingstone Reservoir to confluence with Big Dalton Wash, excludes last stretch of Walnut Creek to the San Gabriel River confluence): pH, toxicity

The San Gabriel River has two impaired reaches listed, as well as impaired tributaries that flow into the river. The impaired tributaries bring in the listed impairments into the San Gabriel River system.

Future Opportunities

Roughly half of the Master Plan projects will address most of the Regional Board watershed issues for the San Gabriel River. This includes the proposed constructed treatment wetlands, which will improve urban and stormwater runoff quality. Both structural (constructed) and non-structural (education and outreach) best management practices (BMP) for reducing non-point source pollution must be implemented in order to fully address the water quality problems in the highly urbanized areas of the river.

Well-designed social marketing programs can enhance the effectiveness of all proposed programs. A public outreach campaign to all the communities along the river and within the watershed will raise awareness of how everyone's daily choices affect water quality.

Treatment Wetlands

Constructed treatment wetlands are engineered systems designed to mimic the natural water purification processes of wetland vegetation, soils, and microorganisms. They are usually located in large open spaces downstream of areas where industrial, commercial or heavy residential uses generate polluted stormwater runoff. These new wetlands send urban runoff through a veritable obstacle course of vegetation and soil that cleanses the water.

However, treatment wetlands might pose a threat to wildlife that will be attracted to what appears to be a new habitat—but which may actually harbor toxic compounds. Some constructed treatment wetlands are intended only to provide water quality treatment, not habitat. Other wetlands may offer multiple benefits, including habitat and recreation.

There are more constructed wetlands opportunities in Reach 3, between the Angeles National Forest and the Santa Fe Dam Recreation Area. Additional opportunities may exist in open space areas of Reach 4 near the confluence with San Jose Creek, in Reach 5 below Whittier Narrows, and in parks and other limited open space areas adjacent to the river in Reach 6. As surface water rights are fully appropriated, the issue of water rights will have to be addressed in the design and implementation of all proposed and future wetland projects.

Mapping the historic streams and wetlands may provide clues on how best to manage, design and restore surface and groundwater resources for maximum habitat, water supply and water quality benefits. It may be possible to daylight streams or remove concrete channels in selected locations.

Bioengineered wetlands that capture runoff from paved areas and vehicular traffic should be carefully studied before such water is allowed to percolate. Petroleum hydrocarbons and MTBE could contaminate the groundwater basin. Even if percolation is minimal, USEPA should be advised of such projects.

Vector Control

Any new or restored wetland area—whether for habitat or stormwater treatment—must be planned and designed in coordination with the local mosquito and vector control agency. Poorly designed and maintained



COURTESY SAN GABRIEL VALLEY MOSQUITO AND VECTOR CONTROL DISTRICT

Figure 4-44. Proper design and construction and regular maintenance of wetlands will minimize mosquito breeding.

wetlands could have negative impacts on the health of wildlife, park visitors, and nearby residents due to the potential for vector-borne diseases. These can include West Nile virus, St. Louis encephalitis, western equine encephalomyelitis, malaria, Hanta virus, plague, Murine typhus, and Lyme disease.

No matter how well designed these facilities are, they will breed mosquitoes and they will have an impact on human health. Given the potential risk to public health, the number and scope of bioengineered wetlands that can be fully monitored and safely maintained within the the San Gabriel River Corridor Master Plan project area should be carefully assessed. This calculation must take into consideration the available human and financial resources that can be confidently applied without interruption.

Additional Water Quality Improvement Opportunities

Nonpoint source loadings from nurseries and horse stables can be mitigated either on site, from another preferred location, or downstream through treatment wetlands processes. A more complete understanding of estuary dynamics will be needed. The Coyote and Carbon Creeks Watershed Management Plan (R7.01) will study the southern San Gabriel River Watershed, down to the mouth of the river. An assessment of septic systems needs to occur in the near future to identify their locations and current conditions and propose management recommendations, including future treatment conversion options.

Beyond constructed treatment wetlands, other Master Plan projects will address additional water quality issues identified by the Regional Board. The Sediment Management and Removal Study (R2.04) will address sluicing and disposal of sediments from reservoirs. Through thoughtful design of trail enhancements and edge treatments, the following projects could help protect groundwater recharge areas:

- Hanson Quarry (R4.05), land reclamation project to partially or completely fill the quarry to minimize exposure of groundwater
- Inflatable Rubber Dams to Increase Groundwater Recharge (R4.14)
- Paseo Del Rio at San Gabriel Coastal Basin Spreading Grounds (R5.08)
- Paseo Del Rio at Rio Hondo Spreading Grounds (R5.09)
- Marina Drive Urban Runoff Diversion (R7.15)

Trash Reduction

Excessive trash in recreational areas of the upper watershed in the Angeles National Forest is addressed by a proposed project that will assess recreational needs along Highway 39 and the San Gabriel River (R2.03). In the meantime, actions can be taken to reduce the amount of trash affecting the upper watershed. This includes providing trashcans, ash receptacles, portable toilets, and educating visitors to the forest about trash and restroom options both in the forest and in their communities.

Mining Mitigation

Several proposed land reclamation projects will mitigate surface or groundwater modifications brought about by mining activity:

- Azusa Rock Quarry Restoration (R3.11)
- United Rock Pit #3 (R3.25)
- Quarry Reclamation/Water Storage Study (R4.04)
- Hanson Quarry (R4.05)
- Rodefer Quarry (R4.06)
- Durbin Quarry (R4.047)

Other Ongoing Studies

Other ongoing programs and studies will help shape the direction of future water quality improvement efforts along the San Gabriel River. Multiple agencies and organizations including the Friends of the San Gabriel River, Los Angeles and San Gabriel Rivers Watershed Council, the Regional Board, Southern California Coastal Waters Research Project (SCCWRP) and others joined together to perform system-wide water quality sampling in September 2002 and 2003. SCCWRP is using data gathered to develop computer models of flow and pollutant loading. The San Gabriel Mountains Regional Conservancy is developing the “San Gabriel River Watershed Management Plan Above Whittier Narrows” for the Regional Board. This multiple-objective plan will address nonpoint source pollution reduction strategies. SCCWRP has also proposed studying regional water quality treatment wetlands within the San Gabriel River Watershed.