



THE GREEN SOLUTION PROJECT

ALAMEDA COUNTY, Phase I

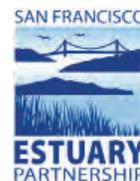
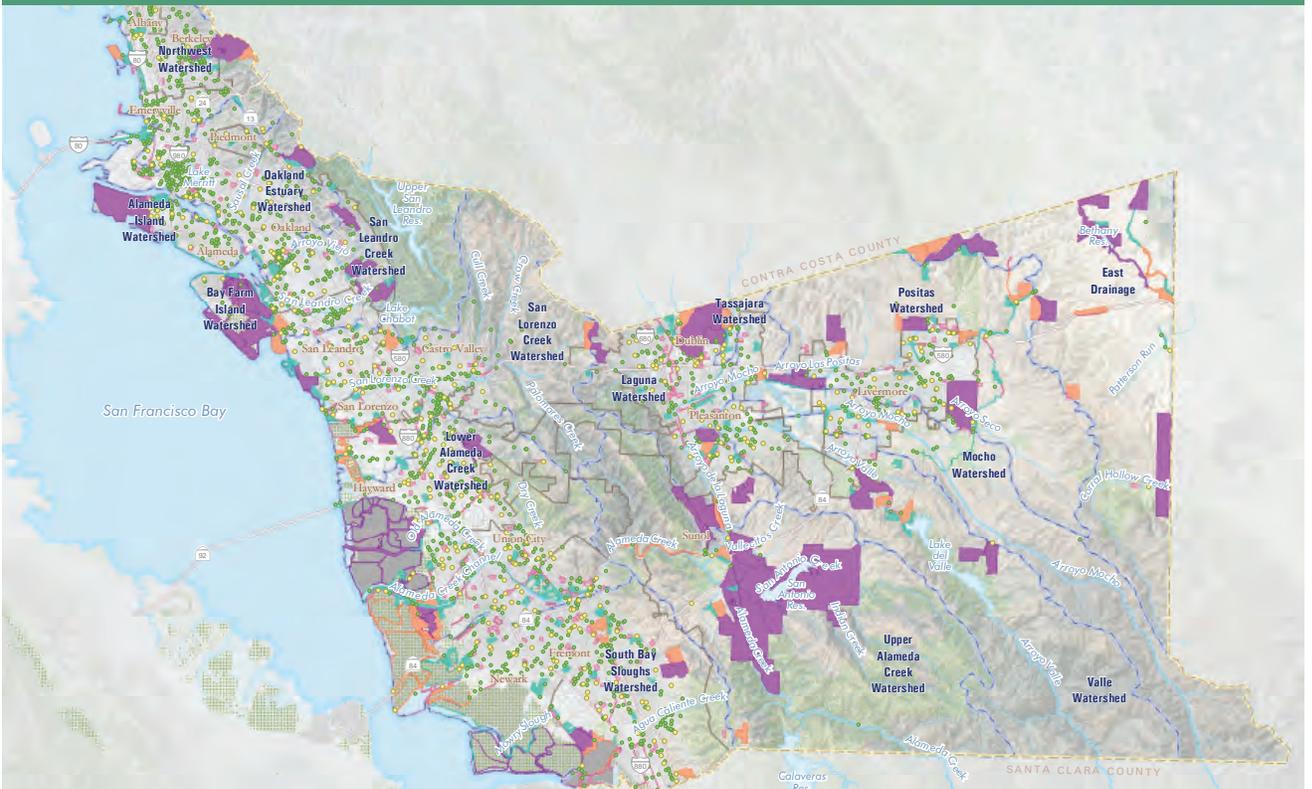
SAN FRANCISCO BAY AREA

EXECUTIVE SUMMARY & MAPS



Strategic Approach to Solving Water Quality Problems:

Creating parks, habitat and open space on public lands to naturally capture, filter and treat off-site runoff



ABOUT Community Conservation Solutions

COMMUNITY CONSERVATION SOLUTION'S MISSION is to tackle the most complex and challenging problems created when people and nature intersect. Community Conservation Solutions (CCS) does this by developing creative, practical and lasting solutions that unite diverse communities and interests and leverage investments of public funds. CCS has successfully crafted innovative solutions to serious environmental problems affecting California's natural and human communities by integrating the protection and restoration of natural lands and waters with compatible community uses, economic benefits and permanent public benefits.

Community Conservation Solutions works on diverse projects in urban and rural areas that help both natural habitats and people. Our projects range from parks and beaches to wilderness and watersheds, and from recreational sites to mixed-use developments. CCS is a 501(c)(3) non-profit, tax-exempt organization.

ABOUT The Green Solution Project

COMMUNITY CONSERVATION SOLUTIONS' GREEN SOLUTION PROJECT is a major paradigm shift in how we clean up polluted runoff on a regional watershed scale. The Green Solution Project is a quantified, prioritized and practical approach to identifying public lands that can be converted to naturally capture and clean polluted runoff while creating new parks, wildlife habitat and recreation lands. The Green Solution Project uses cutting-edge digital technology to integrate hydrology with water quality, community and conservation needs. This provides cities and counties throughout California with a strategic road map to meet their runoff clean-up needs through conversion of lands already in public ownership to "smart," designed green open space that can clean, store and reuse runoff. CCS' Green Solution Project challenges conventional assumptions about the role that "green approaches" can play in naturally cleaning up polluted runoff throughout California and beyond. CCS' Green Solution Project is being considered as a solution to growing water pollution problems affecting California's rivers, lakes, wetlands, bays, beaches and ocean waters.

ABOUT The Project Team

CCS' GREEN SOLUTION PROJECT TEAM includes **PSOMAS** and **GreenInfo Network**. Psomas is a leading consulting engineering firm serving clients in the water/wastewater, transportation, public, institutional and private land development markets, and is committed to the advancement and implementation of sustainable stormwater solutions. GreenInfo Network is a non profit organization providing Geographic Information System (GIS) and related technology, data analysis and support to a wide range of water, land conservation and many other types of projects throughout California and the United States.

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For more information, contact us at:

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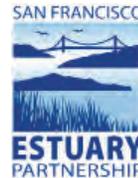
Strategic Approach to Solving Water Quality Problems:

Creating parks, habitat and open space on public lands to naturally capture, filter and treat off-site runoff

Technical Report, Analysis and Mapping By



Funded and Administered By



ABOUT THIS REPORT

PUBLIC AGENCY INPUT

In conducting this study, CCS received input from the Environmental Protection Agency Region 9, San Francisco Estuary Project, San Francisco Estuary Institute, Association of Bay Area Governments, State Coastal Conservancy, San Francisco Bay Regional Water Quality Control Board, Save the Bay and numerous other organizations and public agencies from throughout Alameda County. These include: the Alameda County Flood Control and Water Conservation district, Zone 7 Water Agency, East Bay Regional Park District, San Francisco Public Utilities Commission, Bay Area Rapid Transit District (BART), the Urban Creeks Council, and the Cities of Alameda, Berkeley, Dublin, Emeryville, Fremont, Hayward, Livermore, Oakland, Pleasanton and San Leandro.

DATA SOURCES

The Quality Assurance Project Plan (QAPP) prepared as a precondition to this project requires all Geographic Information Systems (GIS) data used in this analysis to come from authoritative sources and are in most cases sole sources of these datasets (e.g., county parcel data). These datasets are listed in Appendix I and were evaluated at the start of this effort and determined to have met minimum accuracy requirements per the QAPP. The Green Solutions project builds from existing data layers and does not create any new GIS datasets, so the methodology used to conduct the analysis as presented in this report fulfills the documentation requirements of the QAPP.

LIMITATIONS

See Section 1.4 of the Technical Report for a description of limitations of this report.

FUNDING SOURCES

Funding for the Green Solution Project was provided by: Environmental Protection Agency Region 9, San Francisco Estuary Project, and the Association of Bay Area Governments.

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CONTENTS

	PAGE NUMBER
EXECUTIVE SUMMARY	ES-1
FIGURES	
1 Effective Drainage Area by Watersheds.....	ES-6
2 Acres Needed for Runoff Treatment (Table).....	ES-7
3 Acres Needed for Runoff Treatment (Histogram).....	ES-7
4 Opportunity Public Parcels, Total Parcel Acres and Acres Suitable for Green Solution Projects, by Watershed (Table).....	ES-9
5 Opportunity Public Parcel Acreage Suitable for Green Solution Projects, by Watershed (Histogram).....	ES-9
6 Percent Need Met (Table).....	ES-10
7 Percent Need Met (Histogram).....	ES-10
ATTACHMENTS	
Assessment of Achievement of Project's Purposes and Objectives.....	ES-17
About The Community Conservation Solutions Team.....	ES-18
MAPS	
Map ES.1 - Impervious Lands.....	ES-20
Map ES.2 - Impaired Waters and Catchment Prioritization Index.....	ES-21
Map ES.3 - Opportunity Public Parcels, by Size.....	ES-22
Map ES.4 - Opportunity Public Parcels, by Owner.....	ES-23
Map ES.5 - Opportunity Public Parcels, by Land Use.....	ES-24
Map ES.6 - Priority Impaired Watersheds and Opportunity Parcels.....	ES-25

EXECUTIVE SUMMARY

How do Green Solution Projects improve water quality?

Green Solutions projects help cities and counties meet runoff clean-up needs through strategic conversion of existing public lands to new "smart" parks, habitat, recreation and open space lands, using soil, plants, and natural processes to capture and clean polluted urban and stormwater runoff from surrounding urbanized areas.



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This Executive Summary summarizes the results of Community Conservation Solutions' (CCS) Green Solution Project Phase I study for the watersheds of Alameda County, and presents our findings and conclusions. This study analyzed the potential of using existing public lands to naturally clean urban runoff that pollutes San Francisco Bay by creating a network of engineered, "smart" green open space lands throughout the county that can capture and treat significant volumes of off-site runoff from urbanized areas. This study is part of CCS' on-going efforts to develop practical solutions to difficult environmental problems that affect both people and nature. We are pleased to present this compilation of our innovative, analytical approach to improving water quality in San Francisco Bay, Bay wetlands, and the creeks, rivers, lakes, and shoreline of Alameda County.

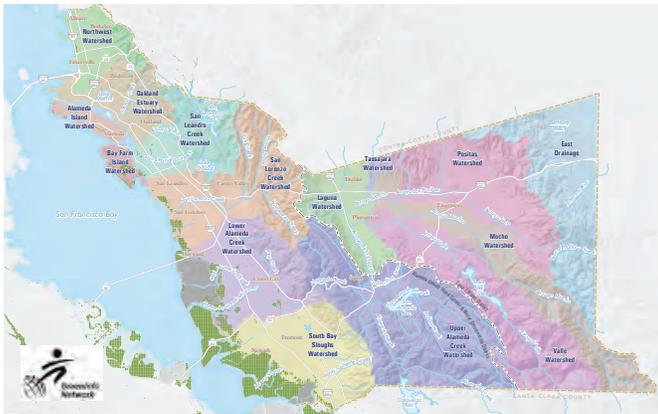
The Green Solution Project focus on existing public lands offers a cost-effective and readily available solution not only to serious water quality problems in Alameda County, but also to the need to

make urban communities healthier and more livable. Green Solution projects provide multiple benefits by creating new park, habitat, recreation and other open space lands, and address drought and global warming issues by capturing, storing and re-using stormwater.

The project team included Community Conservation Solutions, Psomas, who provided engineering support and prepared the Technical Report, and GreenInfo Network, who provided Geographic Information System (GIS) data analysis and mapping. This study was made possible by a grant from the U.S. Environmental Protection Agency, Region 9 to the San Francisco Estuary Partnership (SFEP). San Francisco Bay regional information was provided by the San Francisco Estuary Institute and grant financial administration was provided by the Association of Bay Area Governments. Alameda County was selected for this Green Solution Project study by SFEP and the State Coastal Conservancy as one of the top priority Bay Area counties in need of a quantified analysis to

By focusing on existing public lands, Community Conservation Solutions' Green Solution Project analysis provides a practical, quantified strategy to clean up polluted runoff on a regional watershed scale.

Watersheds of Alameda County



This Green Solution Project analysis evaluated public lands in Alameda County's 14 watersheds.

help address unmet and pressing urban runoff problems. Alameda County includes large amounts of paved, urbanized areas which result in high volumes of urban runoff in the county's creeks, lakes and San Francisco Bay. This urban runoff carries heavy pollutant loads that cause water quality impairments in the Bay.

INTRODUCTION

Polluted stormwater and urban (dry weather) runoff contaminates all of San Francisco Bay and much of Alameda County's water bodies, including 178 miles of rivers and creeks and over 174,000 acres of lakes and wetlands. All of San Francisco Bay and most of its contributing waters in Alameda County are in violation of the U.S. Clean Water Act and are listed as impaired under Section 303(d) of that act. These impaired waters have pollutant loads above the state and federal standards developed to protect human health and marine and aquatic life. The long-term, damaging impacts of polluted runoff on San Francisco Bay, wetlands, and human health and on the health of oceans, birds and marine mammals worldwide have been well documented. Cities and counties are under increasing pressure to improve water quality in the Bay and in Bay Area rivers, creeks, lakes and wetlands.

This **Green Solution Project** study presents an innovative and analytical approach to solving these problems on a regional, wa-



Polluted stormwater and urban runoff contaminates all of San Francisco Bay and much of Alameda County's rivers, creeks, lakes and wetlands.

tershed scale. CCS developed this approach in Los Angeles County to address in a quantified manner the need for lands that can naturally capture and clean the enormous volumes of polluted runoff that flow from developed, urbanized areas ("off-site runoff")¹. In contrast to many on-going municipal efforts that address urban runoff problems by treating on-site runoff on new development or re-development of individual properties, CCS' Green Solution Project approach provides a methodology to help solve the problems caused by off-site runoff and to identify projects for implementation.

This Green Solution approach is essential to effectively address water pollution problems due to urban runoff, particularly in developed areas where the natural functions of watersheds, rivers and the soil itself have been dramatically altered. These urbanized areas also often lack adequate natural open space for residents, and, in Alameda County, have lost much of their historic wetlands and other native habitat.

The Green Solution Project analysis identifies existing public lands throughout Alameda County that are suitable for conversion and retrofit to "smart" green spaces that can act as natural filters and treatment areas, while also providing important and badly-needed park, habitat and recreation opportunities. By focusing on existing public lands, Community Conservation Solutions' Green Solution Project analysis provides a practical, quantified strategy to:

- Help public agencies solve water quality problems
- Capture and treat off-site runoff from large areas of urbanized land
- Clean up polluted runoff on a regional watershed scale
- Meet San Francisco Bay Regional Water Quality Control Board requirements
- Create new park, habitat and green open space
- Restore natural habitat in areas impacted by decades of poor planning and urban growth



Summary of Findings

The results of this study are very exciting, and show that there is a substantial amount of existing public land – **up to 16,000 acres on over 2,500 parcels** – suitable for Green Solution Projects throughout Alameda County. Implementing Green Solution projects on these sites **could treat polluted runoff from up to 172,000 acres, or 270 square miles** – an area equal to nearly 70 times the size of Oakland International Airport. **These lands could meet up to 40% of the polluted runoff clean-up needs in Alameda County, and could create 16,000 acres of new habitat, parks and open space lands.** (See *Opportunity Public Parcel maps by size, owner and land use on pages ES-22 through ES-24.*)

Implementing Green Solution projects on the 2,500 suitable public parcels identified by this study could treat polluted runoff from up to 270 square miles of Alameda County – and would create 16,000 acres of new habitat, parks and open space.

BACKGROUND

Green Solution projects include regional projects on large public parcels that can clean runoff from surrounding areas and serve a large drainage area, as well as projects that clean runoff from a small area or a single site.

The **Green Solution** approach provides a strategic “road map” for selecting projects for implementation, and focuses on combining water quality improvements with land conservation to:

- Convert impervious and other areas to “smart” green spaces
- Use soils and plants to naturally capture and filter pollutants from runoff
- Treat off-site runoff
- Focus on high pollutant loading areas
- Create and restore natural habitat
- Provide new parks and green open space in urban areas
- Make effective use of public funds by focusing on lands already in public ownership
- Improve water quality in the Bay, and in creeks, rivers, lakes, wetlands and ocean waters

Other benefits of Green Solution projects can include reducing runoff volumes, storing and recycling treated runoff for re-use as irrigation, and re-charging groundwater supplies.



A state-of-the-art Green Solution Project that uses underground vaults and a surface park, habitat and recreation area to naturally capture and treat polluted runoff from surrounding urban areas. New open space benefits a park-poor community, and the project recharges the local groundwater basin. Sun Valley Watershed Project, L.A. Co.

1. *The Green Solution Project: Creating and restoring park, habitat, recreation and open space on public lands to naturally clean polluted urban and stormwater runoff.* Community Conservation Solutions, Geosyntec Consultants and GreenInfo Network. March 2008.

Green Solutions effectively utilize natural treatment processes which take advantage of the natural functions of soils and plants to filter, treat and reduce the volume of runoff. These natural processes include:

Biofiltration: filtration of pollutants through vegetation and soil

Bio-uptake: biological processes including assimilation of pollutants such as nitrogen and phosphorous, which soil and plants can convert for their beneficial use

Infiltration: the process by which water on the ground moves into the soil

Evapotranspiration: the process of transferring moisture from the earth to the atmosphere by evaporation and transpiration from plants

Other: biological, physical, and biochemical processes

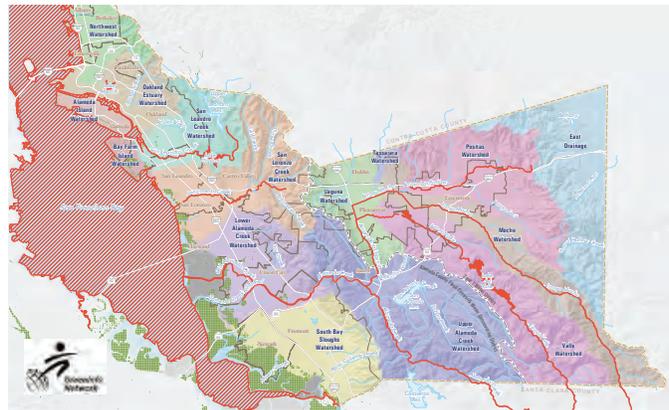
The natural treatment processes utilized by Green Solutions provide high pollutant removal efficiencies and can be more cost effective than structural Best Management Practices because they are passive systems and require little energy, operations and maintenance, and because they take advantage of the efficient natural functions of soils, plants and microbial activity.^{2,3}

The Urgency: Polluted Urban Runoff Damages San Francisco Bay & Alameda County's Creeks, Rivers and Lakes

There is an urgent and growing need to clean up polluted runoff to improve water quality in San Francisco Bay and in Alameda County, where most water bodies – and all of the Bay^{4,5} – are listed as impaired under the U.S. Clean Water Act, which sets water quality standards intended to protect human health and marine and aquatic life. Polluted runoff is a serious problem throughout the San Francisco Bay Area, where extensive urbanization has resulted in vast areas of paved surfaces and daily high volumes of contaminated runoff. The environmental sensitivity of the San Francisco Bay estuary makes polluted runoff especially problematic. Pollutants carried by runoff impacts the large number of fish, bird and marine mammal species that depend on the Bay's waters and wetlands for survival, including many that are sensitive, threatened or endangered⁶.

Daily urban runoff carries pollutants directly into creeks, rivers, lakes, and Bay waters – in most cases without treatment of any

Cities and Impaired Water Bodies



Almost all property in every community throughout Alameda County produces runoff that flows into San Francisco Bay.

kind. Urban runoff is pollutant-laden water that flows through county and city drains every day from sprinklers, yards and landscaping, hosing down driveways, sidewalks, cars and parking lots, washing equipment outside businesses, and from other daily home and business uses. Almost all property in every community throughout Alameda County produces runoff. Even in dry weather, over seven million gallons of runoff flow to the Bay every day. When it rains, the problem is far worse, as the high volumes of stormwater carry huge amounts of trash and pollutants through the county's drainage system very quickly.⁷

Pollutants in Alameda County's runoff include infection-causing bacteria, toxic metals, pesticides, household and industrial chemicals, trash, oil, oxygen-choking fertilizers, pharmaceuticals and other toxins. The S.F. Bay Regional Water Quality Control Board has established Total Maximum Daily Loads (TMDLs) for mercury, PCBs and pesticide toxicity, and is expected to establish TMDLs for over 160 additional pollutants.

The pollution impacts from urban runoff are endangering oceans and marine life around the world⁸ – and this does not count the additional millions of tons that are carried by ocean currents and which accumulate in huge floating "rafts" of plastic trash in the Pacific Ocean between California and Japan. Trash chokes one million seabirds worldwide every year; plastic is found in the stomachs of seabirds, turtles and marine mammals around the world, and toxic pollutants and bacteria from runoff can be fatal to marine mammals. Low oxygen "dead zones" are spreading due to increasing fertilizer use and growing coastal populations.⁹



Dry weather runoff from sprinklers, yards, car washing and hosing down driveways generates millions of gallons of water every day in Alameda County.

A Green Solution Approach is Essential to Capturing Off-Site Runoff

Pollution associated with stormwater and daily urban runoff can only be solved by addressing pollutant loading throughout watersheds. This includes taking full advantage of all opportunities for retrofit and for conversion of impervious surfaces to pervious lands that allow soil and plants to naturally capture, infiltrate and clean runoff.

METHODOLOGY & FINDINGS

Here we present a summary of the CCS Team's Report and Findings. For details regarding the methodology, technical approach and analysis conducted, refer to the Technical Report.

Our results are presented with a low, average and high for all findings. This range reflects the statistical variability between and within the watersheds of Alameda County, including geography, rainfall patterns, relative imperviousness of subwatersheds, the types of land uses, and the design volumes and corresponding area required for Green Solution Best Management Practice projects.

This study focused on the water pollution clean-up needs within the watersheds of the Alameda County Flood Control & Water Conservation District and the Zone 7 Water District.

CCS' quantified analysis focuses on how to make best use of lands already in public ownership that are suitable for both water quality improvement and green multiple-benefit projects that can help meet requirements established by the San Francisco Bay Regional Water Quality Control Board through the Municipal Regional Stormwater National Pollution Discharge Elimination System Permit ("MRP") for the Bay.

The CCS Team quantified the amount of acreage needed in each watershed of Alameda County for retrofit or conversion to previous Green Solution, multi-benefit projects, and analyzed over 10,000 public parcels to quantify the amount and locations of existing public lands potentially suitable for these projects.

The analysis posed and responded to the following questions:

- How much of Alameda County's land contributes runoff?
- Which pollutants can be cleaned up by Green Solution projects?
- How much land is needed for Green Solution projects to treat runoff from contributing areas?
- Which public lands are suitable for Green Solution projects?
- What percent of the MRP requirements in Alameda County could be met by converting or retrofitting suitable public parcels to "smart" Green Solution projects?

If Green Solution projects were implemented on all suitable public lands in Alameda County, polluted urban runoff from 172,000 acres could be captured and treated.

4. State Water Resources Control Board. http://www.swrcb.ca.gov/rwqcb2/water_issues/programs/TMDLs/

5. Pollution Facts, Save the Bay (San Francisco). <http://www.savesfbay.org/pollution-facts>

6. *ibid*

7. Gilbreath, A.N, and McKee, L.J, 2010. Estimates of hydrology in small (<80 km²) urbanized watersheds under dry weather and high flow conditions. San Francisco Estuary Institute.

8. Kenneth R. Weiss and Usha Lee McFarling, "Altered Oceans, A five-part series on the crisis in the seas," *Los Angeles Times*, July-August 2006.

9. *ibid*

Land Needed for Green Solution Projects

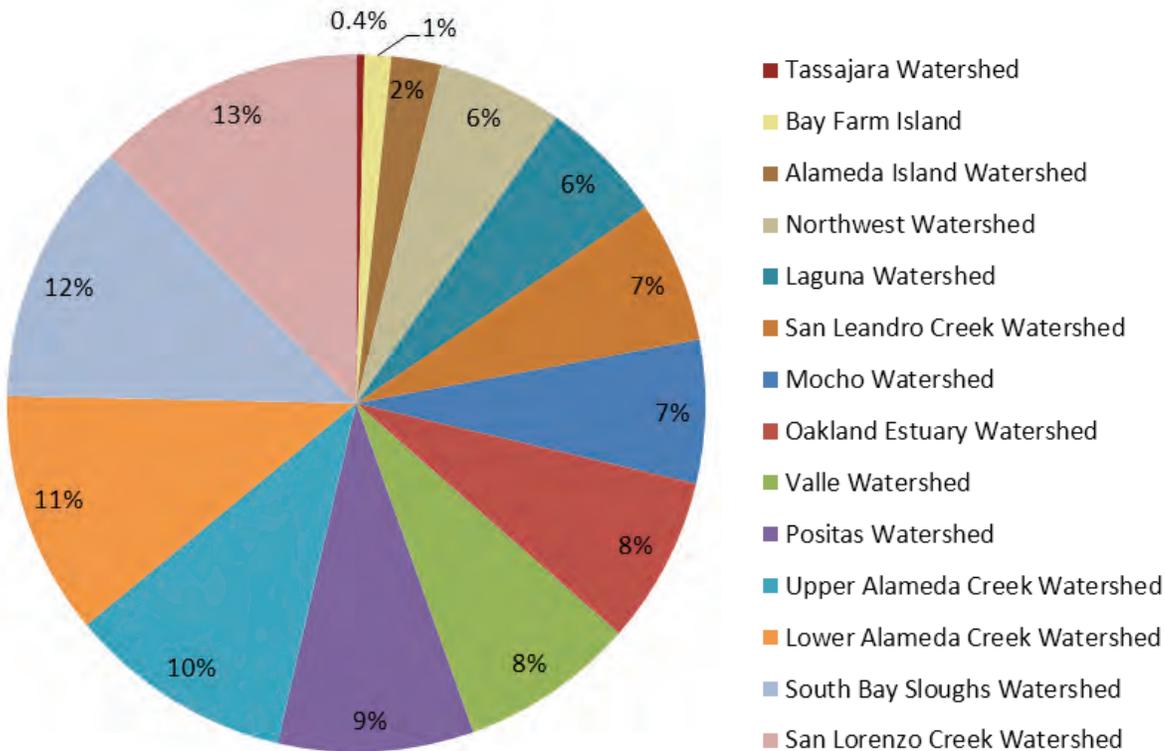
The amount of runoff produced in Alameda County depends on the extent of imperviousness in each watershed. The CCS team analyzed percent imperviousness by land use, and determined that there are 192,000 net acres contributing runoff in Alameda County, including runoff from both impervious and pervious areas. Figure 1 shows each watershed's contribution of runoff.

Pollutants of concern in Alameda County that can be addressed by Green Solutions are¹⁰:

- Bacteria
- Excessive nutrients: nitrates a fertilizer-based chemicals
- Heavy metals, including lead and copper
- Oil & grease
- Oxygen-demanding substances
- Sediment
- Trash & debris

The CCS Team's analysis determined that a total of 1,500 to 10,000 acres are needed for Green Solution projects to capture, filter, clean, and reduce pollutants carried by stormwater and dry weather runoff from watersheds throughout Alameda County. The average need is 6,000 acres. Figures 2 and 3 show the acreage needed by watershed.

Figure 1. Effective Drainage Area by Watersheds

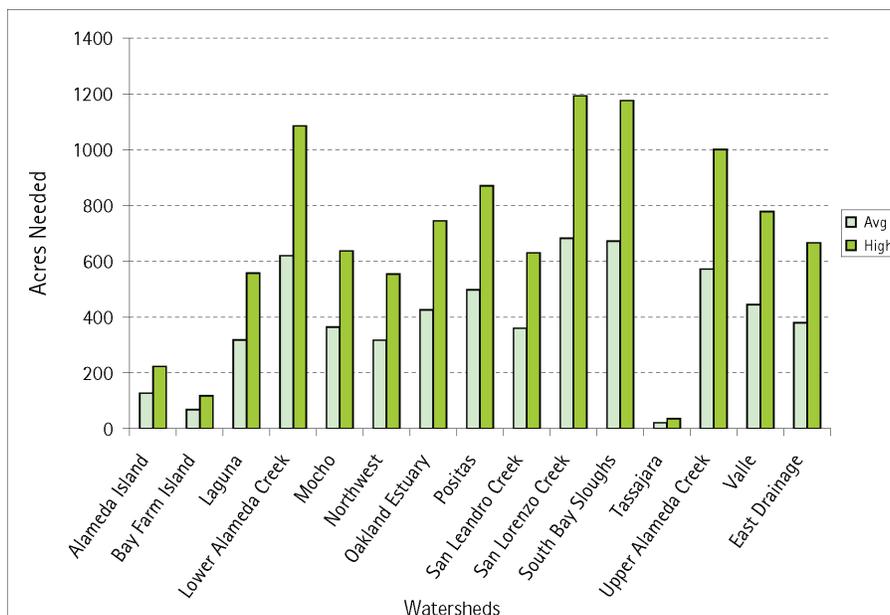


Five of 14 watersheds contribute over half the runoff produced in Alameda County.

Figure 2. Acres Needed for Runoff Treatment

Watershed	Acres Needed for Runoff Treatment		
	Low	Average	High
Alameda Island	32	127	223
Bay Farm Island	17	68	118
Laguna	80	318	557
Lower Alameda Creek	155	620	1,085
Mocho	91	364	637
Northwest	79	317	554
Oakland Estuary	106	426	745
Positas	124	497	870
San Leandro Creek	90	360	630
San Lorenzo Creek	170	682	1,193
South Bay Sloughs	168	672	1,176
Tassajara	5	21	36
Upper Alameda Creek	143	572	1,001
Valle	111	445	778
East Drainage	95	380	666
TOTAL	1,467	5,867	10,268

FIGURE 3. Acres Needed for Runoff Treatment



Public Lands Suitable for Green Solution Projects

The following land uses were identified as being potentially suitable for Green Solution Projects:

- Developed Open Space
- Undeveloped Open Space
- Regional Parks
- Vacant
- Commercial Recreation
- Public Facilities
- Public Office Buildings
- Schools and Colleges
- Residential
- Rights-of-Way
- Powerlines
- Transportation
- Airports
- Waterways

Determining which public lands in Alameda County could be suitable for Green Solution projects included an evaluation of land use, size, slope, location, and portion of parcels suitable for either conversion or retrofit. Parcels less than 1/2 acre were not included. For each land use type, ranges (low to high) were determined for the percent of parcel area suitable for Green Solution projects. This includes conversion of paved, impervious surfaces to pervious surfaces and retrofit of existing pervious lands to provide more effective catchment, filtration or storage.

The CCS Team identified 2,559 opportunity public parcels in Alameda County – those that passed our rigorous screening and evaluation for Green Solution Project suitability – comprising a total land mass of over 53,000 acres. These parcels contain a net of between 6,800 and 16,000 acres of public land that are potentially suitable for Green Solution Projects, with an average of 11,500 acres. Figures 4 and 5 summarize these opportunity public parcels by watershed.

Figure 4. Opportunity Public Parcels, Total Parcel Acres and Acres Suitable for Green Solution Projects, by Watershed

Watershed	Opportunity Public Parcels	Total Parcel Acres	Acres Suitable for Green Solutions	
			Average	High
Alameda Island	78	5,004	632	992
Bay Farm Island	17	3,400	350	445
Laguna	190	21,668	1,163	1,626
Lower Alameda Creek	398	34,930	921	1,319
Mocho	80	35,623	259	363
Northwest	262	15,066	400	561
Oakland Estuary	313	18,590	322	447
Positas	157	46,139	1,039	1,486
San Leandro Creek	176	24,678	548	731
San Lorenzo Creek	323	43,264	545	759
South Bay Sloughs	412	37,136	922	1,318
Tassajara	14	1,738	84	120
Upper Alameda Creek	32	68,831	2,239	3,144
Valle	80	47,526	565	798
East Drainage	27	46,409	1,536	2,100
TOTAL	2,559	450,001	11,523	16,208

Implementing Green Solution projects on the 2,550 opportunity public parcels that CCS identified in this study could create up to 16,208 acres of new park, habitat, recreation and open space lands in Alameda County.

Figure 5. Opportunity Public Parcel Acreage Suitable for Green Solution Projects, by Watershed

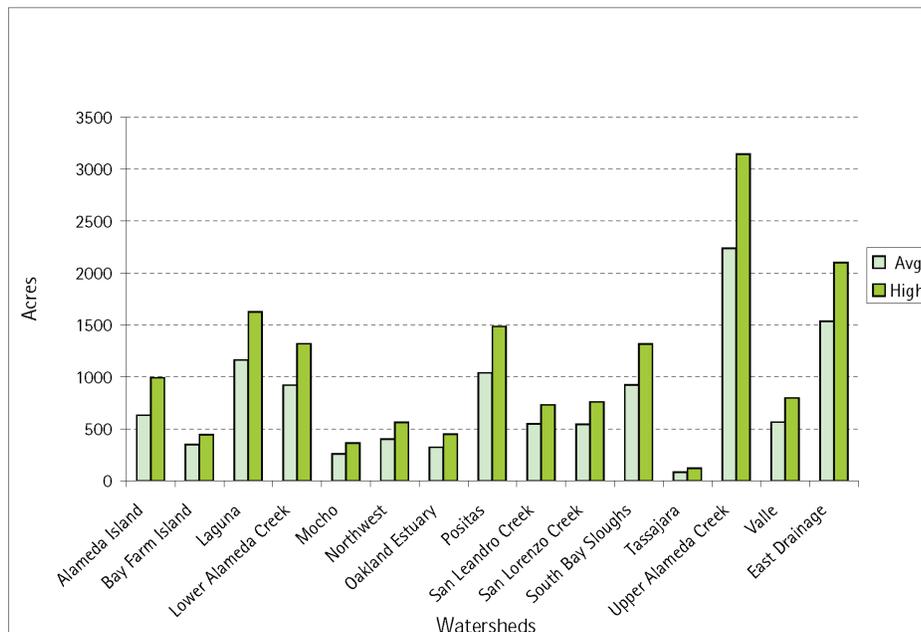
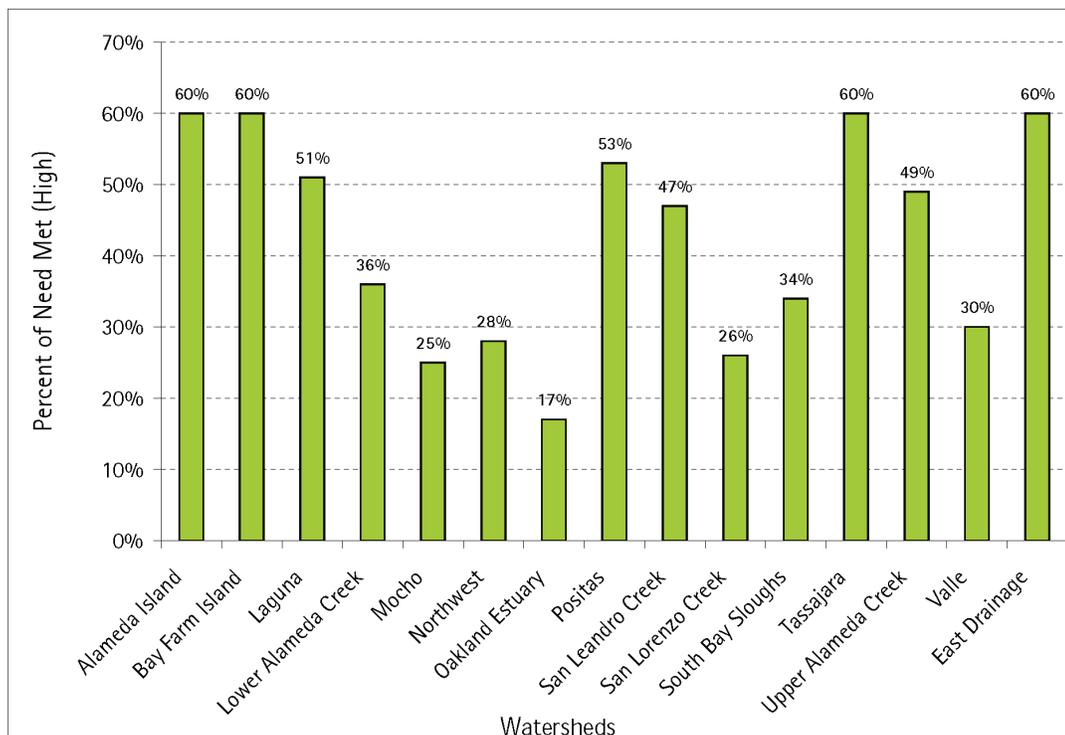


Figure 6. Percent Need Met

Watershed	Total Land Acres	Effective Drainage Area	Percent of Green Solution Project Need Met		
			Low	Average	High
Alameda Island	5,004	3,182	30%	45%	60%
Bay Farm Island	3,400	1,692	30%	45%	60%
Laguna	21,668	7,958	26%	39%	51%
Lower Alameda Creek	34,930	15,494	18%	27%	36%
Mocho	35,623	9,094	12%	18%	25%
Northwest	15,066	7,921	14%	21%	28%
Oakland Estuary	18,590	10,647	8%	12%	17%
Positas	46,139	12,422	27%	40%	53%
San Leandro Creek	24,678	9,003	24%	35%	47%
San Lorenzo Creek	43,264	17,041	13%	19%	26%
South Bay Sloughs	37,136	16,793	17%	25%	34%
Tassajara	1,738	518	30%	45%	60%
Upper Alameda Creek	68,831	14,294	25%	37%	49%
Valle	47,526	11,117	15%	23%	30%
East Drainage	46,409	9,512	30%	45%	60%
TOTAL	450,001	146,687	19%	29%	38%

Figure 7. Percent Need Met



How Much Polluted Runoff Can Green Solution Projects Clean in Alameda County?

If Green Solution projects were implemented on all of the public lands deemed suitable, based on the treatment required in the MRP nearly 40% of the Green Solution project need county-wide could be met and runoff from 172,000 acres could be effectively captured and treated. The percentage of need met varies by watershed and depends on the amount of contributing drainage area, pollutant loading and available public land. The maximum percentage of Green Solution Project need met in Alameda County's watersheds ranges from 17% to 60%. Figures 6 and 7 show the percentage of need met by watershed.

High Priority Watersheds

The CCS Team's analysis determined that the watersheds with the greatest need for water quality improvement are Alameda Island, Bay Farm Island, Lower Alameda Creek, Oakland Estuary San Lorenzo Creek, and South Bay Slough. Within these high priority watersheds, we identified 1,541 opportunity public parcels totaling 20,000 acres. If Green Solution Projects were constructed on all of these parcels, up to 44,409 acres – or 70 square miles – of polluted runoff could be treated. The public agency owners who had some of the highest public parcel counts and acreage included the Alameda County Flood Control and Water Conservation District ("ACFCWCD"), the City of Oakland, and the East Bay Regional Park District ("EBRPD").

If Green Solution projects were implemented on all suitable public lands, nearly 40% of the Green Solution project need in Alameda County could be met.

CONCLUSION

This Green Solution approach provides a quantified, strategic road map to improving water quality, ensures wise investment of public funds, maximizes cleanup of polluted runoff and addresses conservation and community needs.



Community Conservation Solutions' **Green Solution Project Study** demonstrated that wide-spread opportunities exist on public lands in Alameda County to capture and treat off-site runoff in order to help solve the serious polluted runoff problems that endanger San Francisco Bay and harm human health and the environment. These Green Solution projects can naturally capture and clean significant volumes of polluted runoff flowing from developed, urbanized areas throughout the watersheds of Alameda County, while re-greening urbanized areas and creating new networks of park, recreation, habitat and other open space lands.

The CCS Team found that there are up to 16,000 acres of public lands suitable for Green Solution projects in Alameda County.

The CCS Team found that there are between 6,900 and 16,000 acres on 2,500 parcels of public lands currently suitable for **Green Solution projects** in all of the watersheds in Alameda County. Conversion or retrofit of these publicly-owned lands could address nearly 40% of the polluted runoff problems in the county that can be dealt with by Green Solutions — while also creating badly-needed park, habitat and other green open space amenities for surrounding communities. Polluted runoff from up to 270 square miles, or 172,000 acres, could be treated by these Green Solution projects.

Implementing Green Solution Projects on the identified suitable public lands could clean polluted runoff from up to 270 square miles.

As a result of decades of intensive growth and development, extensive development has resulted in the majority of Alameda County's urban areas being paved with concrete, asphalt and other non-porous or impervious substances that do not allow water to penetrate into the soil. Green Solution projects provide one of the most viable and effective means of permanently cleaning up polluted runoff because they restore the natural functions of soil and plants to capture, filter and clean contaminants from runoff before it reaches creeks, rivers, wetlands and the Bay.

CCS' innovative, quantified and analysis-based **Green Solution Project** presents a practical way to move forward efficiently and cost-effectively to select projects for implementation that can improve water quality in San Francisco Bay and throughout Alameda County. The Green Solution Project approach can be applied throughout the nine-county San Francisco Bay Area. The Green Solution Project methodology is useful in any area which needs to address pressing water quality problems due to polluted runoff and which needs the multiple benefits Green Solution Projects provide through creation of new habitat, park, recreation and other open space lands.



Photo by Dan Sullivan/Save The Bay



Photo by Russ Juskalian/Save The Bay

Recommendations for Next Steps

This study evaluated a large area, encompassing 703 square miles, fifteen watersheds, and tens of thousands of acres of opportunity public parcels. The scope and magnitude of the area studied necessitated certain assumptions and summarizing of data. Next steps should include refinement of the Phase I analysis, prioritizing for implementation the opportunity public parcels identified in this Phase I study, and selecting highest ranked parcels for project implementation.

Subsequent analysis should include integrating water quality, hydrology, pollutant loading, conservation priorities, community needs and open space deficit to rank and prioritize the identified opportunity public parcels in each watershed. Next steps should also focus on determining which of the opportunity public lands identified in this Phase I study could clean up the greatest volumes of polluted runoff while meeting the greatest number of conservation priorities and community needs.

In order to narrow the necessary Phase I assumptions, future phases should focus on specific land uses, public agency owners or specific watersheds to more accurately analyze a targeted subset for project implementation. Specific land uses and watersheds should be selected for a targeted, refined analysis, with a focus on those land uses that can provide the greatest multiple benefits and which provide opportunities for replication throughout the county.

Water quality, land, conservation and community need and demographic information that should be researched and quantified include the following:

Water Quality Improvement Factors

- Proximity to storm drains and storm drain size
- Pollutant loading and runoff quantity
- Size of drainage area to be treated

Land Conservation Factors

Proximity to existing parks & open space

- Potential for trail linkages
- Habitat conservation priorities
- Habitat restoration potential

Community Need Factors

- Park & open space deficit
- Youth density
- Population density
- Income
- Other demographics

Top-ranked, specific sites should then be selected for development of Green Solution projects, with the goal of creating the greatest possible benefits to both water quality, natural and human communities.

If it is not possible to conduct a Phase II analysis that prioritizes and ranks, by watershed, the over 2,500 potential opportunity public parcels identified in this study, specific sites could still be selected for further design and implementation from the identified parcels, based on non-quantified and non-integrated selection factors such as proximity to waterways, proximity to storm drains, community needs, conservation priorities or general availability.

For a complete copy of the Green Solution Project report, go to www.conservationsolutions.org/greensolution.html



ATTACHMENTS



Assessment of Achievement of Project's Purposes and Objectives

This Green Solution Project analysis for the watersheds of Alameda County successfully identified and quantified the existing public lands in Alameda County that are suitable for potential Green Solution projects. The study results provide a strategic road map for local and regional agencies in Alameda County to reduce water pollution in San Francisco Bay and in wetlands, creeks, rivers and lakes of the county. This Green Solution Project approach provides a quantified, rational method for selecting projects that can convert impervious surfaces to pervious lands and/or retrofit existing pervious surfaces to naturally capture and treat polluted urban and stormwater runoff in all watersheds of the county – while helping meet needs for new and restored parks, recreation areas and wildlife habitat.

The study quantified the runoff-contributing area by watershed; identified target runoff constituents of concern that can be treated by Green Solution projects in Alameda County; quantified the acreage needed for Green Solution Best Management Practices to address polluted runoff clean-up needs, by watershed; summarized the number, size, land use type and ownership type of suitable opportunity public parcels; and described polluted runoff treatment needs to meet San Francisco Bay water quality improvement objectives.

This Green Solution Project study also identified five representative sites on publicly owned lands in five land use categories (commercial/industrial, secondary school, developed open space, agriculture/rangeland, and public office building) and developed conceptual examples of multiple-benefit Green Solutions for each land use type.

About The Community Conservation Solutions (CCS) Team

The Green Solution Project Team consisted of Community Conservation Solutions, Psomas and GreenInfo Network. CCS provided the vision, direction and overall project management, evaluation of research, data and technical analyses, and production of project materials. Psomas, a leading consulting engineering firm committed to the advancement and implementation of sustainable stormwater solutions, conducted the technical research and analysis and prepared the Technical Report. GreenInfo Network specializes in complex data analysis and use of integrated Geographic Information Systems mapping technology; GreenInfo Network analyzed and developed all data and prepared all maps.

COMMUNITY CONSERVATION SOLUTIONS

Community Conservation Solutions (CCS) specializes in tackling the complex and challenging problems created by the interaction of people and nature. CCS develops innovative solutions by combining long-range vision with the focused planning needed to transform ideas into reality. CCS seeks solutions that combine the protection and restoration of natural lands and waters with compatible community uses and permanent public benefits, including cultural, educational, and economic opportunities.

CCS works on diverse projects in urban and rural areas that help both natural habitats and people. CCS' projects range from parks and beaches to wilderness and watersheds, and from recreational sites to mixed-use developments. CCS is dedicated to working in areas with exceptional unmet needs: where natural habitats have been degraded; where communities have been neglected; and where recreation, education, cultural and economic opportunities are significantly lacking.

PSOMAS

Psomas is a leading consulting engineering firm serving clients in the water/wastewater; transportation; and public, institutional and private land development markets. Ranked as one of Engineering News Record (ENR) magazine's Top 100 Pure Design Firms in the United States, Psomas offers civil engineering, land surveying, planning and entitlements, program/construction management, natural resources, GIS consulting, and Special District Financing services to the public and private sector. Founded over 60 years ago, Psomas provides services from offices throughout California, Arizona, and Utah.

Psomas specializes in delivery of sustainable storm water management consulting and design solutions to municipalities, public and quasi-public organizations, and private sector clients. Their projects range from studies to constructed solutions; challenging infill development to city and county-wide initiatives; and from integrated low impact development measures to purpose-built treatment wetland systems.

GREENINFO NETWORK

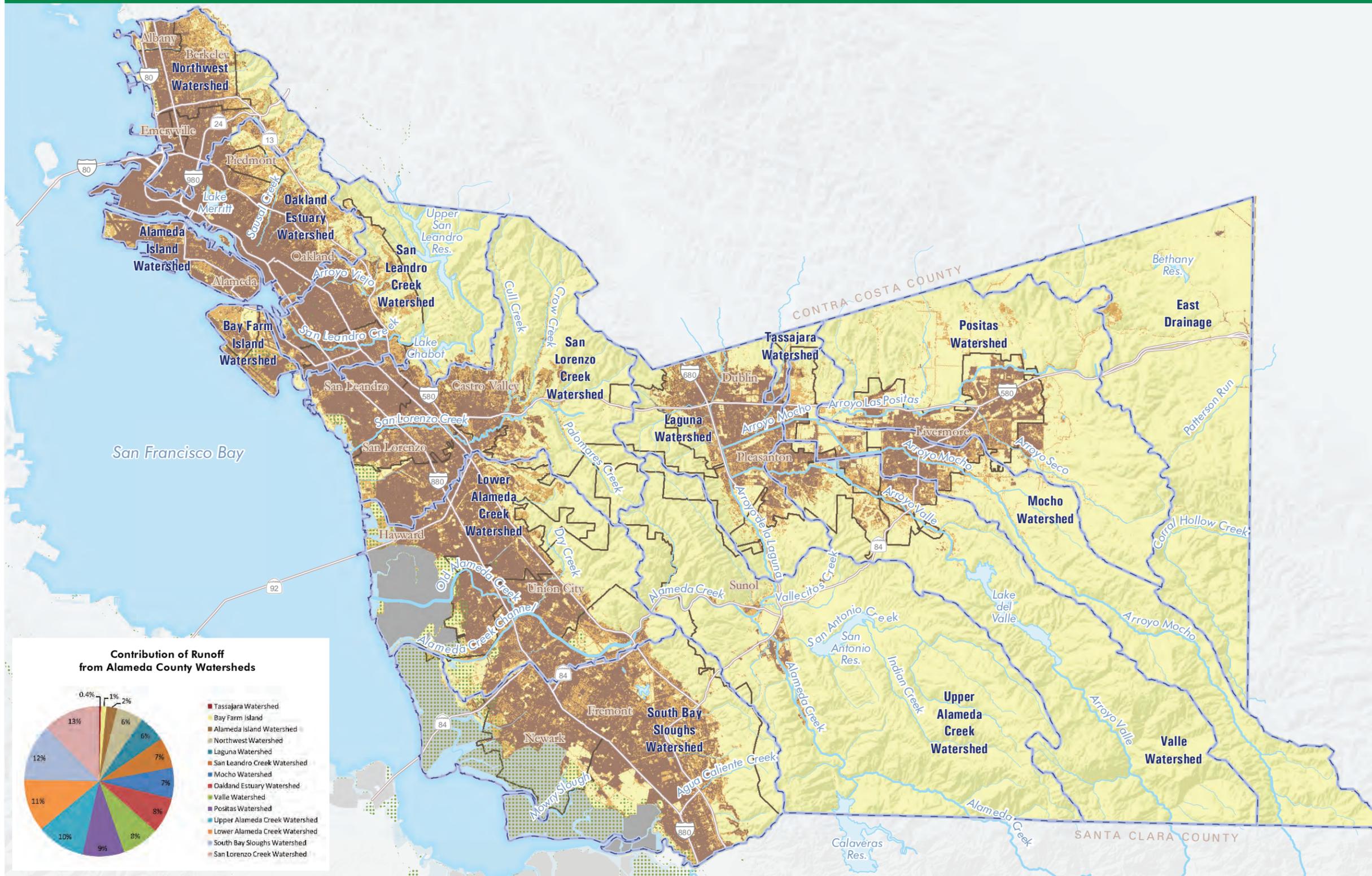
Over the past 10 years, GreenInfo Network (www.greeninfo.org) has provided Geographic Information System (GIS) and related technology support to a wide range of water, land conservation and many other types of projects throughout California and the U.S. A non-profit, GreenInfo Network assists other public interest groups and agencies working at local, regional and national scales, providing them with services including data creation and acquisition, geospatial analyses, geographic modeling, conservation and land use planning, watershed-based planning and modeling, database development, and high quality communications design and cartography. GreenInfo Network's staff is highly skilled in effective, efficient and creative use of information technology to help clients more effectively understand and communicate the relationships between issues, people and places.



MAPS

GREEN SOLUTION PROJECT: Alameda County, Phase I

Impervious Lands Map



IMPERVIOUS LANDS

Dark Brown	50 - 100%	High
Orange	20 - 50%	↑
Light Yellow	< 20%	Low

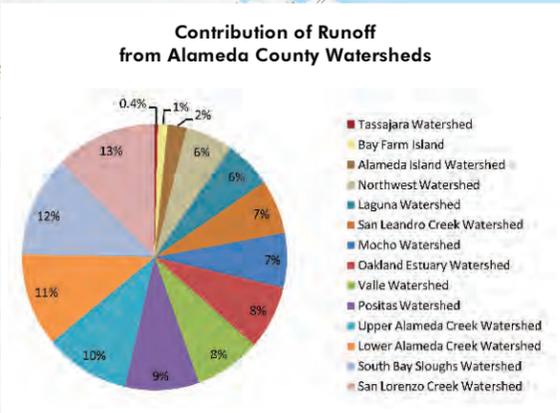
Impervious land percentage determines the generation of urban and stormwater runoff. Percent impervious land cover is based on the U.S. Geological Survey National Land Cover Database 2001.

WATER FEATURES

- Blue line: Watershed Boundary
- Green dotted pattern: Wetland
- Green solid pattern: Wetland / Under Restoration
- Black irregular shape: Active Salt Pond
- Blue wavy line: River, Stream or Channel
- Blue irregular shape: Lake or Reservoir

ADMINISTRATIVE FEATURES

- Red line: Highway
- Black line: City Boundary
- Yellow dashed line: County Boundary



PSOMAS

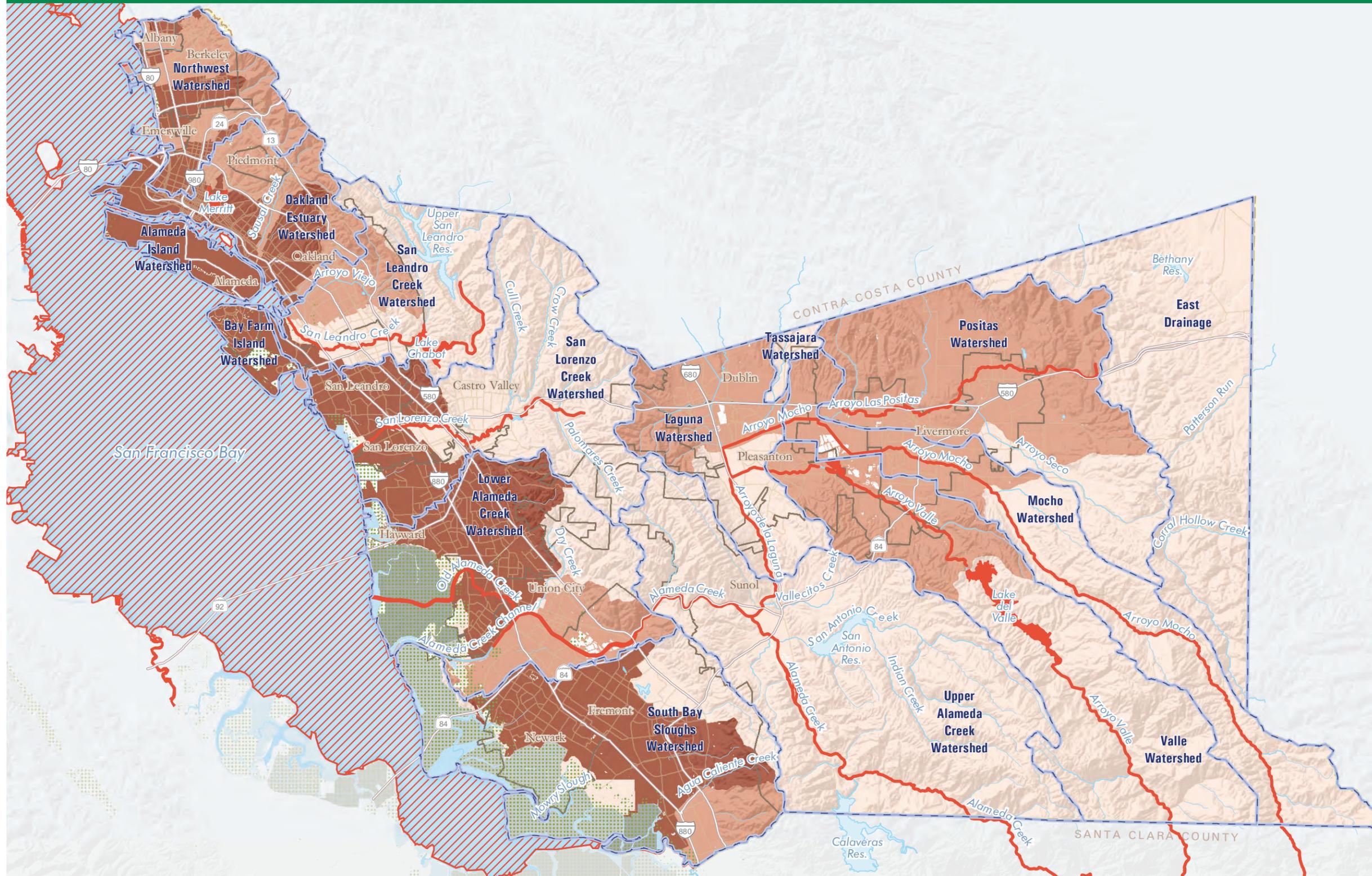
Map created by GreenInfo Network
www.greeninfo.org, July 2011

Scale: 0 to 5 Miles

Figure ES.1

GREEN SOLUTION PROJECT: Alameda County, Phase I

Impaired Waters and Catchment Prioritization Index Map



POLLUTED RUNOFF CLEANUP PRIORITY Score, Catchment Prioritization Index (CPI)

High	4-5
Moderate	3
Low	1-2

CPI is an indicator of polluted runoff treatment need. CPI scores are based on land use, estimated runoff pollutant concentrations and average precipitation.

Prioritization is based on methodology from: Geosyntec Consultants, (2006). Los Angeles County-wide Structural BMP Methodology

IMPAIRED WATERS

in violation of federal and state health standards*

- Impaired River or Coastline
- Impaired Water Body
- Impaired Bay

* Impaired waters shown here are those listed as impaired by the State Water Resources Control Board, pursuant to the Federal Clean Water Act.

WATER FEATURES

- Watershed Boundary
- Wetland
- Wetland / Under Restoration
- Active Salt Pond
- River, Stream or Channel
- Lake or Reservoir

ADMINISTRATIVE FEATURES

- Highway
- Major Road
- City Boundary
- County Boundary

Impaired (303(d)-listed) water body data provided by the State Water Resources Control Board, 2006. Geographic representations of affected waters are estimates only.



PSOMAS

Map created by GreenInfo Network
www.greeninfo.org, July 2011

0 1 2 3 4 5 Miles

Figure ES.2

GREEN SOLUTION PROJECT: Alameda County, Phase I

Opportunity Public Parcel Maps

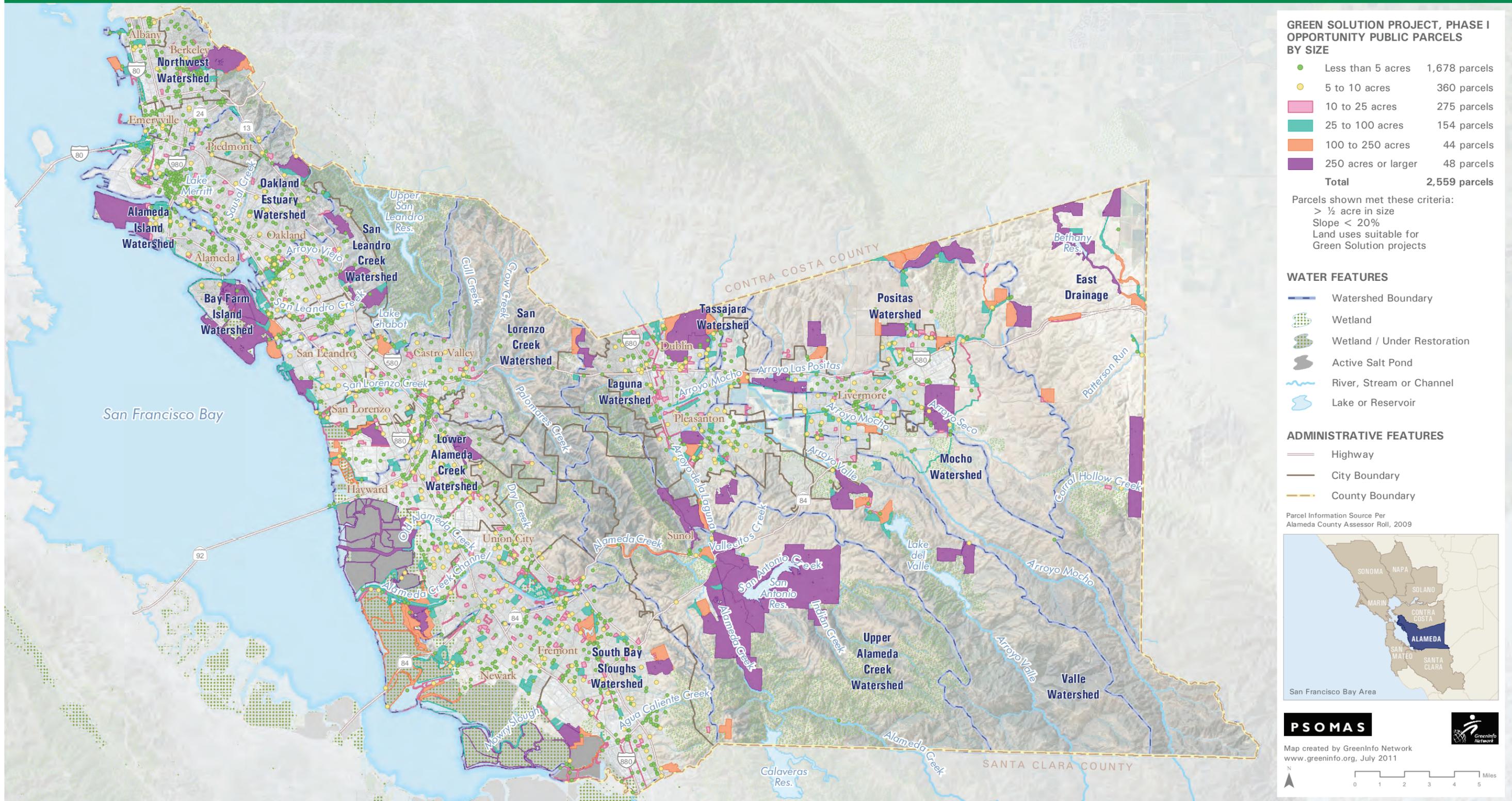
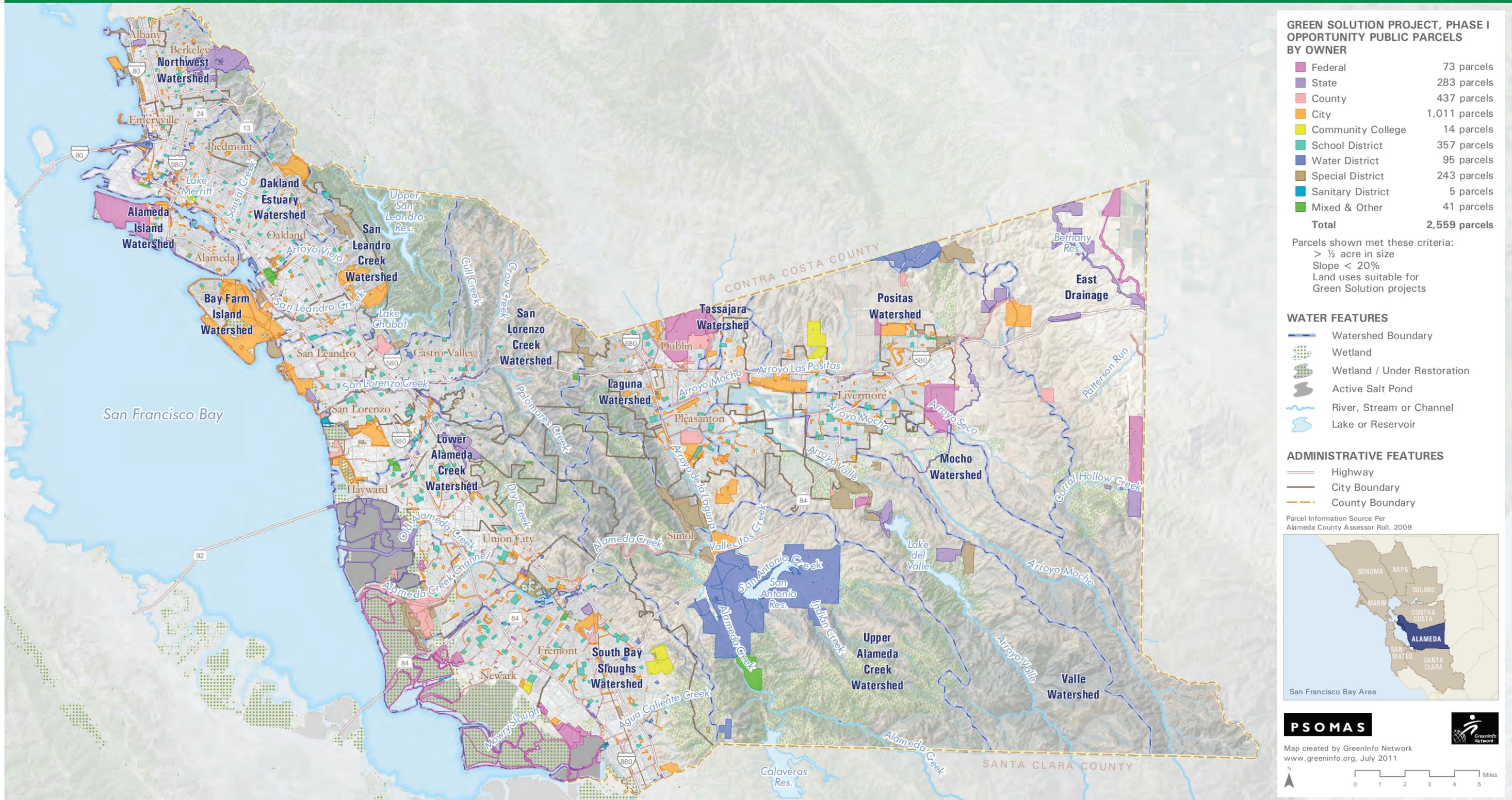


Figure ES.3

GREEN SOLUTION PROJECT: Alameda County, Phase I

Opportunity Public Parcel Maps



GREEN SOLUTION PROJECT, PHASE I OPPORTUNITY PUBLIC PARCELS BY OWNER

Federal	73 parcels
State	283 parcels
County	437 parcels
City	1,011 parcels
Community College	14 parcels
School District	357 parcels
Water District	95 parcels
Special District	243 parcels
Sanitary District	5 parcels
Mixed & Other	41 parcels
Total	2,559 parcels

Parcels shown met these criteria:
 > 1/2 acre in size
 Slope < 20%
 Land uses suitable for Green Solution projects

- #### WATER FEATURES
- Watershed Boundary
 - Wetland
 - Wetland / Under Restoration
 - Active Salt Pond
 - River, Stream or Channel
 - Lake or Reservoir

- #### ADMINISTRATIVE FEATURES
- Highway
 - City Boundary
 - County Boundary

Parcel Information Source Per Alameda County Assessor Roll, 2009



PSOMAS

Map created by GreenInfo Network
 www.greeninfo.org, July 2011

Scale: 0 1 2 3 4 5 Miles

Figure ES.4

GREEN SOLUTION PROJECT: Alameda County, Phase I

Opportunity Public Parcel Maps

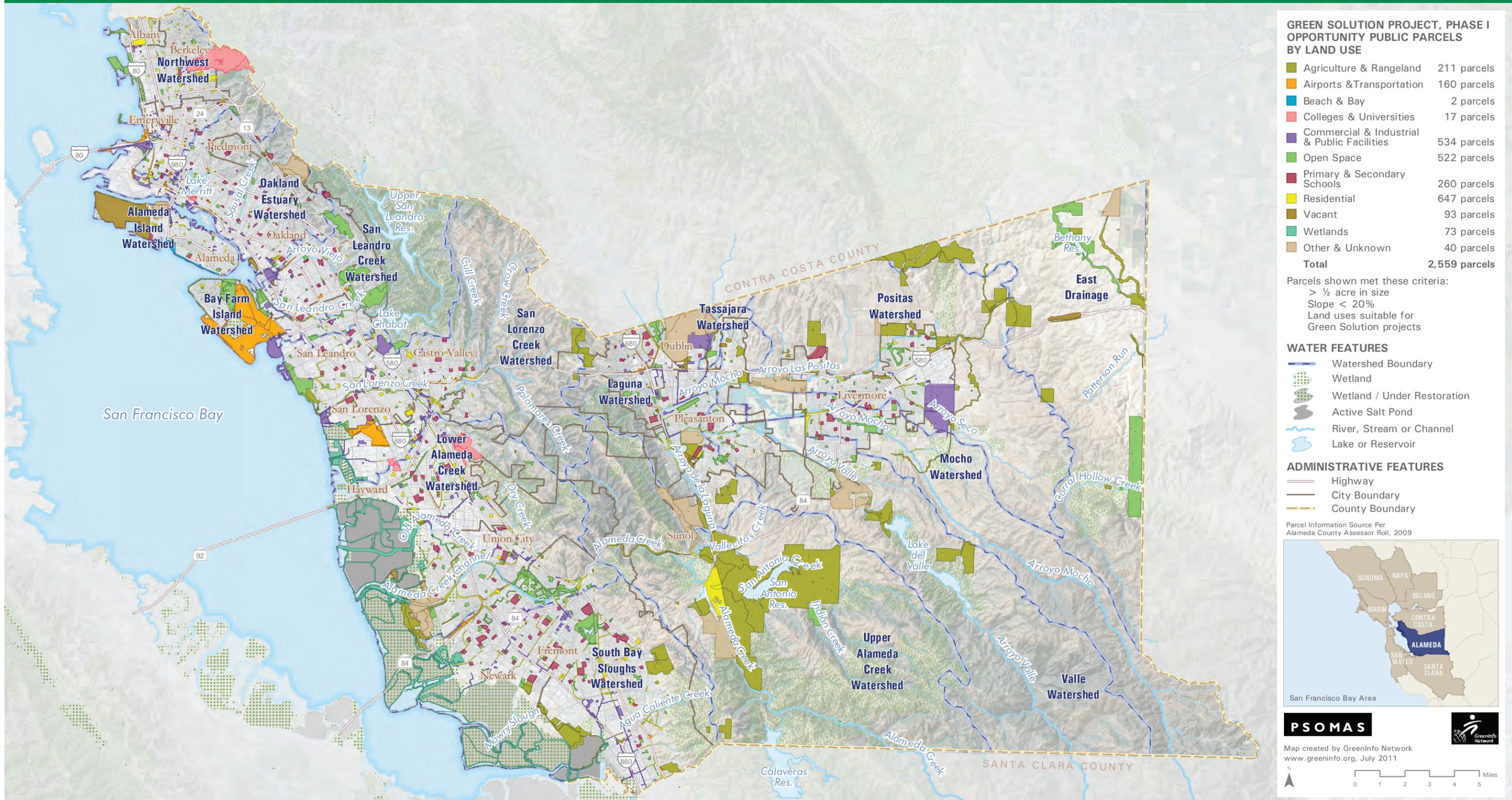


Figure ES.5

GREEN SOLUTION PROJECT: Alameda County, Phase I

Priority Impaired Watersheds and Opportunity Parcels Map

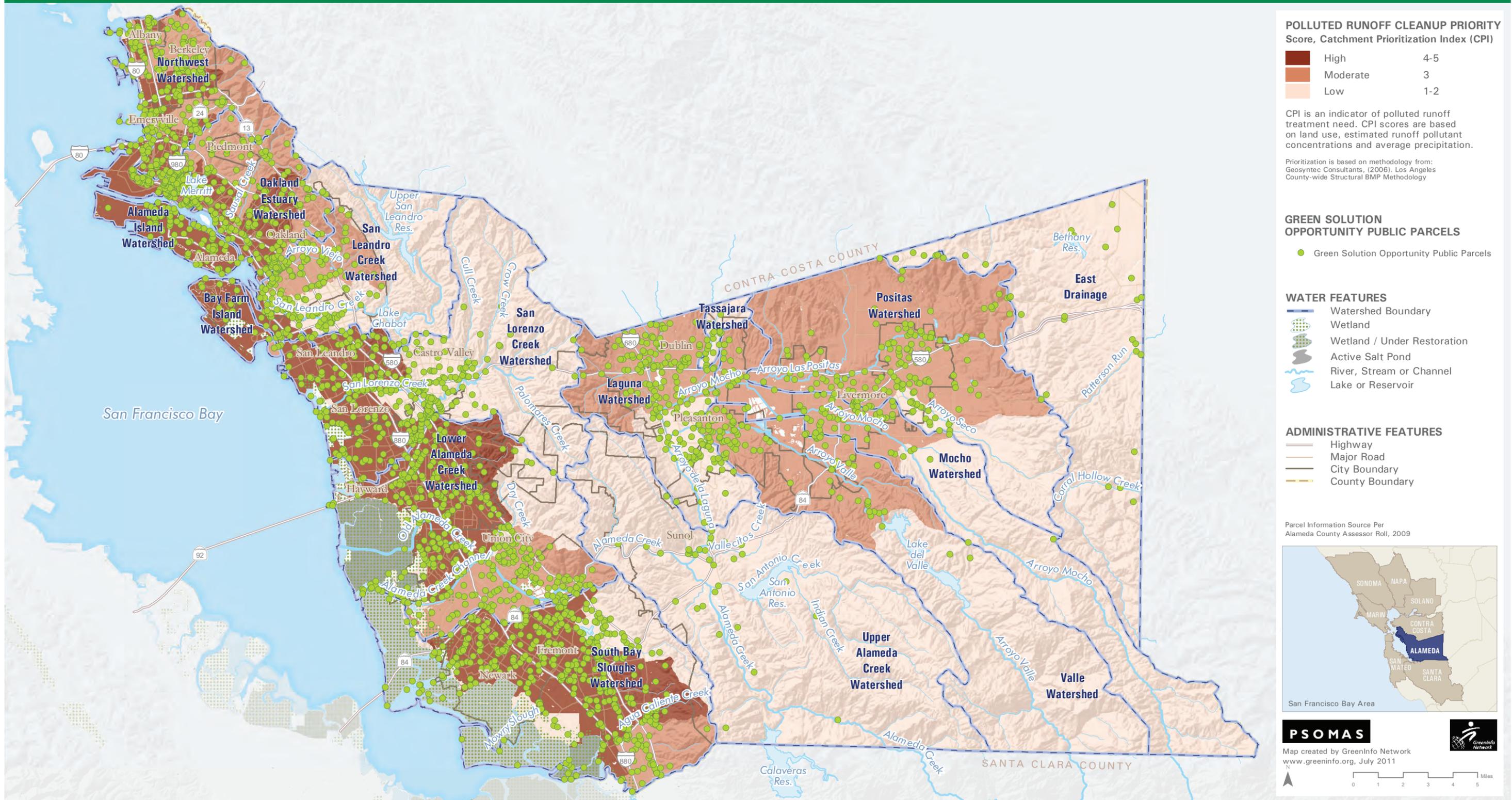


Figure ES.6

For a complete copy of this report, go to
www.conservationsolutions.org/greensolution.html

For more information, contact us at:
2554 Lincoln Boulevard, Suite 223 Los Angeles, CA 90291 (310) 398-8584