

# Local Stormwater Capture

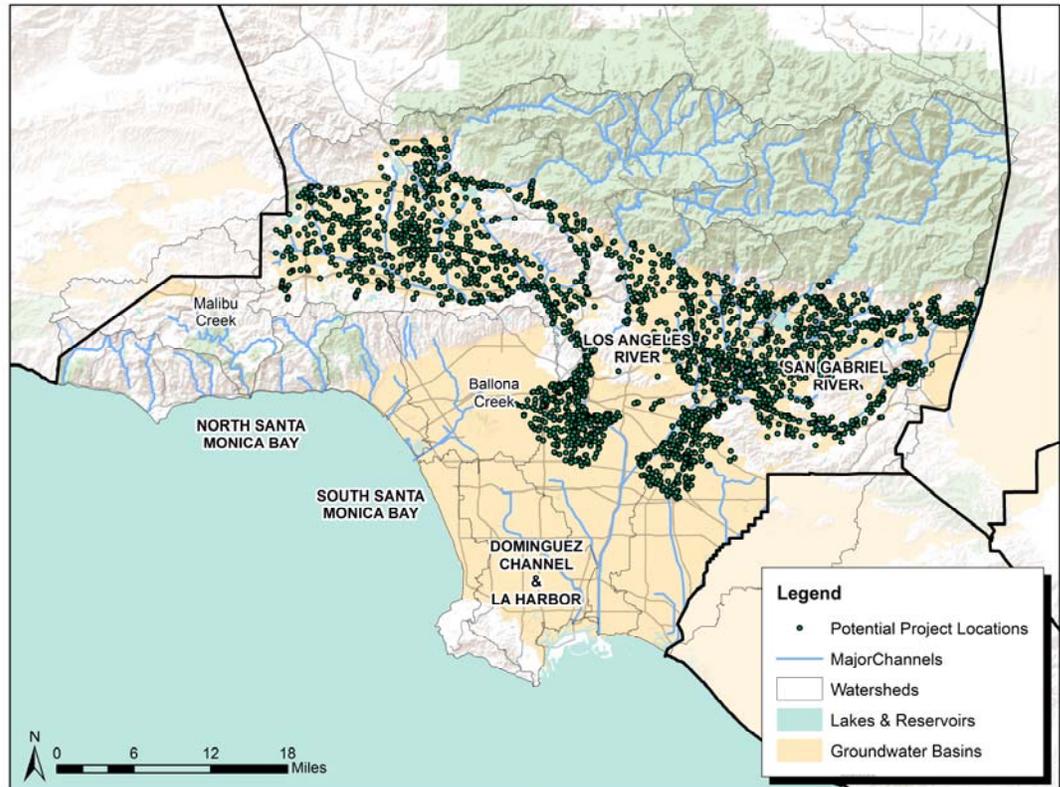
Los Angeles Basin  
Stormwater Conservation Study

## KEY FEATURES

- ▶ 3,009 local stormwater capture projects
- ▶ 31,100 AFY stormwater captured
- ▶ 266 acres of habitat
- ▶ 204 miles of recreational trails
- ▶ Project Cost: \$12,500/acre-feet

### Overview

The LA Basin Study is assessing the region's major water conservation and flood risk mitigation infrastructure to prepare for future drivers that may impact water supply, such as changes to climate and population. The study is a long-range planning effort that is evaluating the potential of the existing facilities and additional new stormwater capture concepts to increase the resiliency of local water supplies under an uncertain future. The Local Stormwater Capture Project Group improves stormwater conservation at the community level through capture and infiltration projects in favorable areas. Stormwater runoff is collected by storm drains and channels and is diverted to local stormwater facilities for infiltration and retention to help increase recharge, improve water quality, enhance the community, and facilitate habitat restoration. Favorable areas were identified based on: unconfined aquifer conditions, permeable soil types, and proximity to drains and channels. Potential project sites include government properties, parks, schools, golf courses, vacant parcels, and Caltrans right-of-way.



### Local Stormwater Capture Projects

A total of 3,009 potential project locations were identified. The Los Angeles River and San Gabriel River Watersheds offer the greatest potential to implement local stormwater capture projects. These stormwater capture projects could include green infrastructure such as infiltration chambers at parks, golf courses, and



Surface Infiltration Basin



Subsurface Infiltration Basin



# Local Solutions | Local Stormwater Capture

## Summary of Local Stormwater Capture Projects

Watershed	Watershed Area (acres)	No. of Projects	Right-of-Way (acres)
Ballona Creek	135,090	76	53.4
Dominguez Channel	70,428	2	-
Los Angeles River	533,840	1,772	1,426.6
Malibu Creek	129,825	0	-
San Gabriel River	434,475	1,159	1,175.4
<b>TOTAL</b>	<b>1,303,657</b>	<b>3,009</b>	<b>2,655.4</b>

## Multiple-Benefits & Partner Opportunities

In addition to stormwater conservation, complementary benefits of local stormwater capture projects include flood risk management, water quality, recreation, habitat/connectivity, and climate resilient actions. These other benefits could help to identify project partners as projects with multiple benefits can help to leverage funding. There are opportunities for collaboration and partnering between the County of Los Angeles and other cities within the watershed area. For example, the Municipal Separate Storm Sewer System (MS4) Permit for Los Angeles provides a compliance pathway through the development of Enhanced Watershed Management Programs (EWMPs) to evaluate opportunities within the participating Permittees' collective jurisdictional area in a watershed management area for collaboration among Permittees and other partners

## Implementation Challenges

Local stormwater capture projects would be individually planned and designed specifically for available parcels and constructed on public parcels. The local improvements require the acquisition of approximately 2,655 acres of right-of-way. This acquisition is based on private open space parcels that could be purchased for local stormwater capture and used as small scale infiltration areas. None of the local stormwater capture opportunities have any onerous permitting requirements which would preclude their implementation.

## Resiliency to Climate Change

The region is preparing for climate change in numerous ways, one of which is ensure a reliable future water supply. The Los Angeles County Flood Control District is investigating solutions to adapt to climate change and continue to further enhance its stormwater capture efforts. Resiliency to projected climate change means safeguarding the existing stormwater conservation system and improving upon it to make the most of stormwater when it is available, as well as storing it for later within deep groundwater reserves. Local stormwater capture solutions can enhance the resiliency of the region and help manage projected climate risks. Increased infiltration and stormwater retention from these projects can both replenish local groundwater reserves to provide a more reliable water supply and help mitigate some potential flooding impacts.

## Findings

Implementation of local stormwater capture projects could provide approximately 31,100 acre-feet of stormwater conservation per year (AFY) for the middle climate scenario, 34,592 acres of mitigation, 266 acres of habitat, and approximately 204 miles of recreational trails.

### Stormwater Conserved for Local Stormwater Capture

Watershed	Middle Projected Climate Scenario (AFY)
Ballona Creek	679
Dominguez Channel	3
Los Angeles River	18,663
Malibu Creek	-
San Gabriel River	11,778
<b>TOTAL</b>	<b>31,123</b>

# Low Impact Development

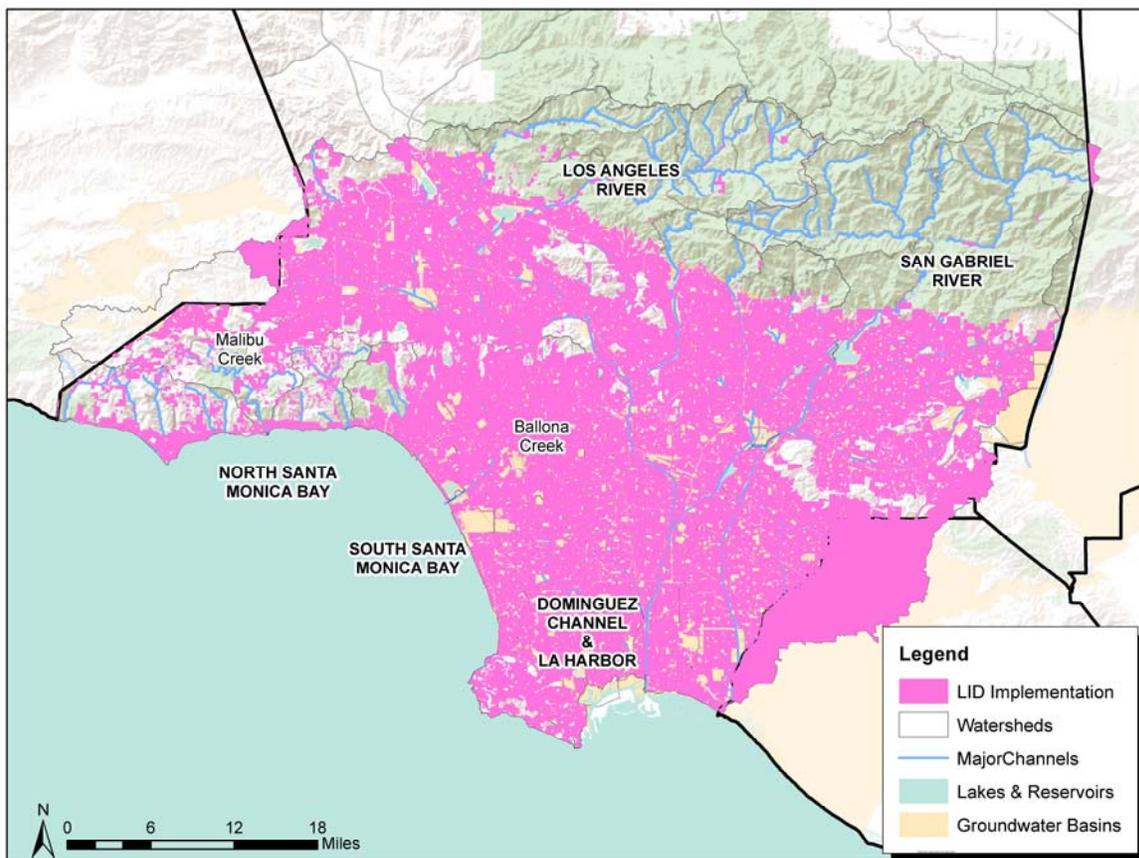
Los Angeles Basin  
Stormwater Conservation Study

## KEY FEATURES

- ▶ 115,509 acres (40%) of mitigated impervious area
- ▶ 94,500 AFY stormwater captured
- ▶ Over 670 acres of new habitat
- ▶ Project Cost: \$9,100/acre-feet

## Overview

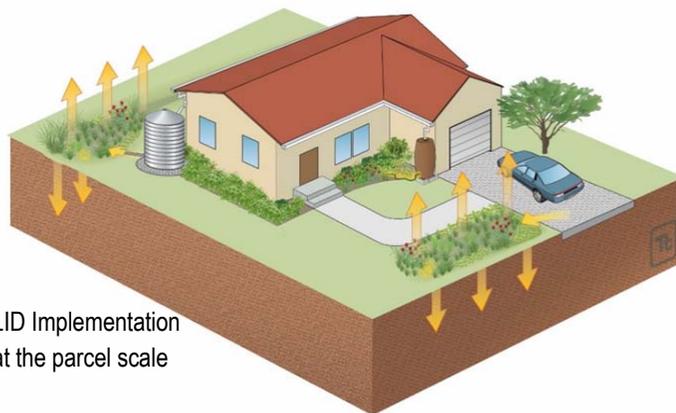
The LA Basin Study is assessing the region's major water conservation and flood risk mitigation infrastructure to prepare for future drivers that may impact water supply, such as changes to climate and population. The study is a long-range planning effort that is evaluating the potential of the existing facilities and additional new stormwater capture concepts to increase the resiliency of local water supplies under an uncertain future. The Low Impact Develop Project Group provides stormwater capture through low impact development (LID) measures in residential, commercial, industrial, and institutional areas. Projects include bioretention, permeable pavement, and other infiltration and direct use Best Management Practices (BMPs). For this project group, 115,509 acres of land was modeled as implementing LID.



## Low Impact Development

Implementation of LID projects help mitigate the increase of impervious surface resulting from development on both private and public parcels. The most likely LID projects to be built are listed below.

- ▶ “Urban acupuncture” (Many small projects over the basin)
- ▶ Construct distributed BMPs upstream of lower efficiency spreading grounds
- ▶ Rain gardens
- ▶ Parking lot storage and connectivity
- ▶ Green roofs



LID Implementation at the parcel scale



# Local Solution | Low Impact Development

## Summary of Low Impact Development Projects

Watershed	Watershed Area (acres)	Total Impervious Area Excluding Streets (acres)	Implementation Area (acres)	Implementation Ratio of Impervious Area
Ballona Creek	135,090	37,585	13,368	36%
Dominguez Channel	70,428	29,825	13,136	44%
Los Angeles River	533,840	119,149	48,063	40%
Malibu Creek	129,825	5,092	1,761	35%
San Gabriel River	434,475	94,778	39,181	41%
<b>TOTAL</b>	<b>1,303,657</b>	<b>286,430</b>	<b>115,509</b>	<b>40%</b>

## Multiple-Benefits & Partner Opportunities

In addition to stormwater conservation, complementary benefits of local stormwater capture projects include water quality, aesthetics, habitat, and heat island mitigation. Compared to local stormwater capture projects that are larger and provide multi-benefits for various stakeholders, LID projects would be implemented in vast numbers at a distributed scale. The LID projects would either be the responsibility of private homeowners, or each individual jurisdiction where the LID project is located. There may be opportunities for collaboration on the development of a residential LID program that incentivizes homeowners to install LID BMPs on residential land (e.g., rain tanks, hardscape removal, etc.).

## Implementation Challenges

LID implementation is driven by ordinances in individual cities. To achieve the project level of LID implementation, a framework will have to be in place to promote widespread implementation over the next century, and significant development and redevelopment would be required. None of the low impact development opportunities have any onerous permitting requirements which would preclude their implementation.

## Resiliency to Climate Change

The region is preparing for climate change in numerous ways, one of which is ensure a reliable future water supply. The Los Angeles County Flood Control District is investigating solutions to adapt to climate change and continue to further enhance its stormwater capture efforts. Resiliency to projected climate change means safeguarding the existing stormwater conservation system and improving upon it to make the most of stormwater when it is available, as well as storing it for later within deep groundwater reserves. Low Impact Development solutions can enhance the resiliency of the region and help manage projected climate risks. Increased infiltration and stormwater retention from these projects can replenish local groundwater reserves to provide a more reliable water supply.

## Findings

Implementation of LID projects could result in approximately 94,500 acre-feet of stormwater conservation per year (AFY) for the middle climate scenario, and 115,509 acres of mitigated impervious surface, representing 40 percent of the overall impervious land use.

### Stormwater Conserved for Low Impact Development

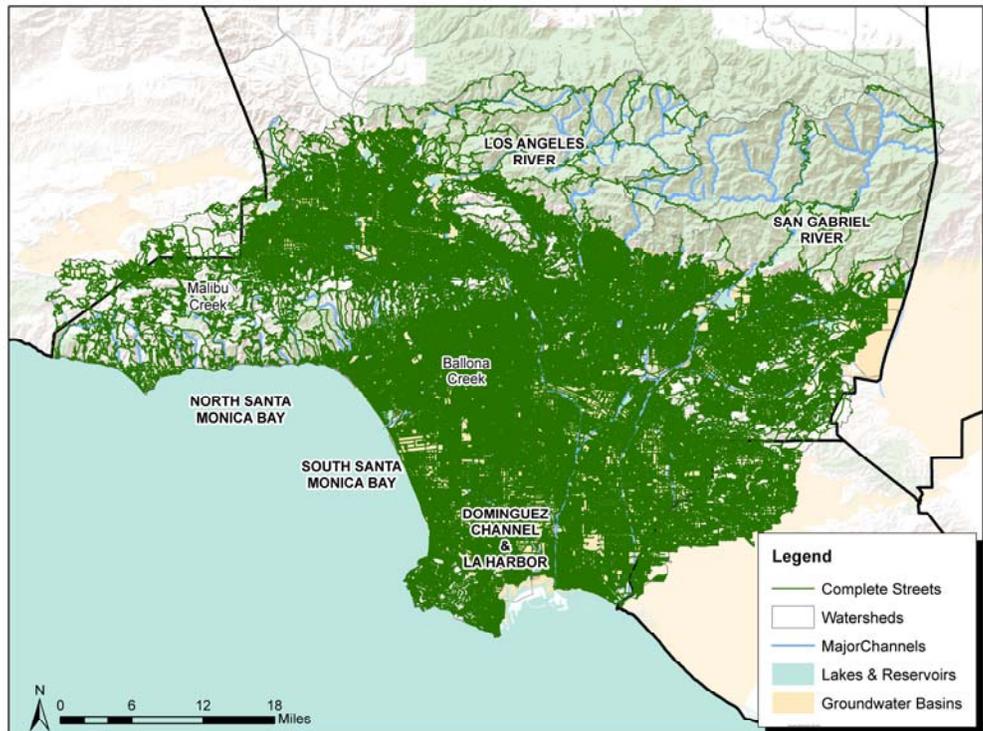
Watershed	Middle Projected Climate Scenario (AFY)
Ballona Creek	9,598
Dominguez Channel	8,400
Los Angeles River	40,112
Malibu Creek	1,327
San Gabriel River	35,097
<b>TOTAL</b>	<b>94,533</b>

## KEY FEATURES

- ▶ 60,400 acres (61%) of mitigated impervious area
- ▶ 31,500 AFY stormwater captured
- ▶ 614 miles of recreational trails
- ▶ Over 720 acres of new habitat
- ▶ Project Cost: \$15,800/acre-feet

## Overview

The LA Basin Study is assessing the region's major water conservation and flood risk mitigation infrastructure to prepare for future drivers that may impact water supply, such as changes to climate and population. The study is a long-range planning effort that is evaluating the potential of the existing facilities and additional new stormwater capture concepts to increase the resiliency of local water supplies under an uncertain future. The Complete Streets Project Group utilizes the complete streets initiative to implement stormwater treatment and management. Complete Streets could provide a plan to ensure the safety, accessibility, and convenience of all transportation users, including pedestrians, bicyclists, transit riders, and motorists. This alternative implements stormwater capture and infiltration practices on transportation related land uses, resulting in approximately 60,400 acres of mitigation.



## Complete Streets Projects

There is approximately 100,000 acres of transportation related impervious area within the Los Angeles Basin. Complete Streets could provide opportunities for stormwater treatment and management by providing on-site retention, filtration, and infiltration. These projects are typically implemented as bioretention/biofiltration Best Management Practices (BMPs) installed parallel to roadways to supplement parkway landscaping. These BMP systems receive runoff from the gutter via curb cuts. Permeable pavement could also be implemented as part of Complete Streets. Complete Streets projects could include:

- ▶ Green streets and stream tributaries stormwater capture
- ▶ Parkways and road medians stormwater capture
- ▶ Under street infiltration



## Summary of Complete Streets Projects

Watershed	Watershed Area (acres)	Total Impervious Street Area (acres)	Implementation Area (acres)	Implementation Ratio of Impervious Area
Ballona Creek	135,090	17,942	10,945	61%
Dominguez Channel	70,428	10,258	6,309	62%
Los Angeles River	533,840	46,295	28,371	61%
Malibu Creek	129,825	986	609	62%
San Gabriel River	434,475	23,064	14,192	62%
<b>TOTAL</b>	<b>1,303,657</b>	<b>98,546</b>	<b>60,427</b>	<b>61%</b>

## Multiple-Benefits & Partner Opportunities

In addition to stormwater management, Complete Streets also provide pedestrian safety and traffic calming, habitat, street tree canopy and heat island effect mitigation, increased property values, and a boost in economic activity and visibility of storefront businesses. There are opportunities for the various cities, organizations, and other agencies within the study area to collaborate on a green infrastructure-related streets program. Other street programs could be considered to include other cities, universities, and non-governmental organizations.

## Implementation Challenges

Municipalities within the region have adopted ordinances to incorporate green infrastructure requirements for streets projects. These types of programs and ordinances represent the initial stages of developing a comprehensive program. The Complete Streets concept does not have any onerous permitting requirements that could prevent their implementation.

## Resiliency to Climate Change

The region is preparing for climate change in numerous ways, one of which is ensure a reliable future water supply. The Los Angeles County Flood Control District is investigating solutions to adapt to climate change and ways to further enhance its stormwater capture efforts. Resiliency to future climate change means safeguarding the existing stormwater conservation system and improving upon it to make the most of stormwater when it is available, as well as storing it for later within deep groundwater reserves. Complete Streets solutions could enhance the resiliency of the region and help manage projected climate risks. Increased infiltration and stormwater retention from these projects could replenish local groundwater reserves to provide a more reliable water supply.

## Findings

Implementation of Complete Streets projects could result in approximately 31,500 acre-feet of stormwater conservation per year (AFY) for the middle climate scenario, and 60,427 acres of mitigated impervious surface, representing 61 percent of the overall impervious street area.

### Stormwater Conserved for Complete Streets

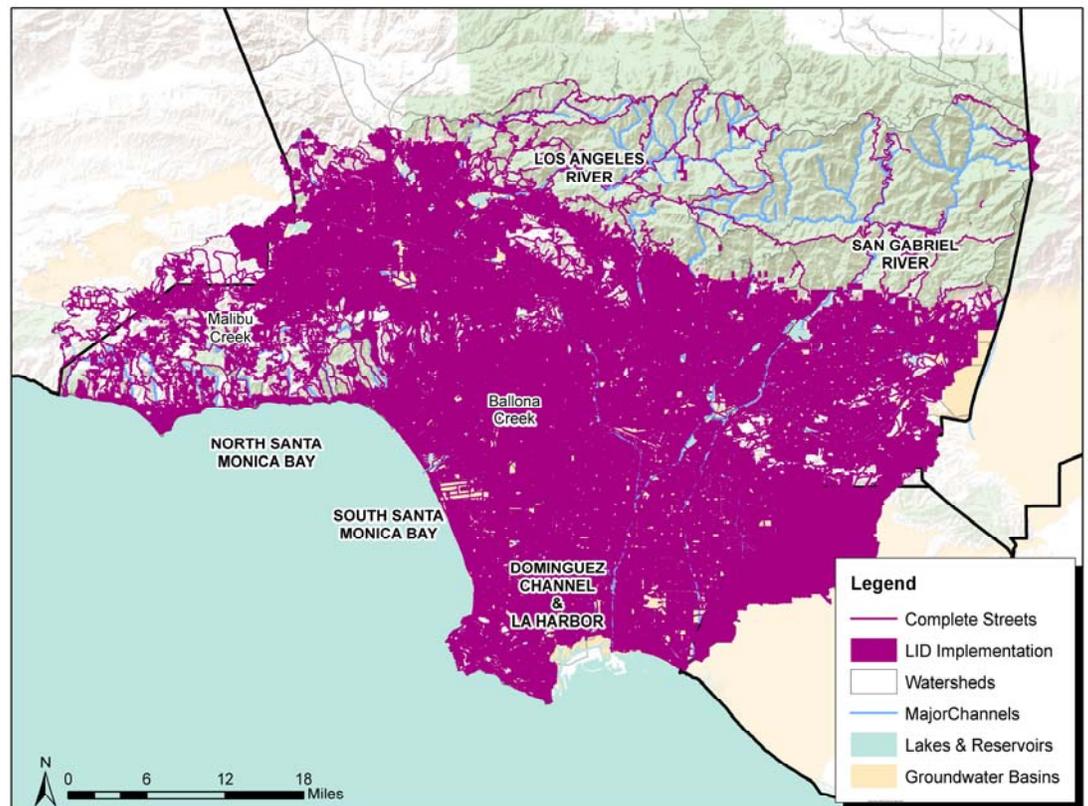
Watershed	Middle Projected Climate Scenario (AFY)
Ballona Creek	4,996
Dominguez Channel	2,556
Los Angeles River	15,855
Malibu Creek	283
San Gabriel River	7,787
<b>TOTAL</b>	<b>31,477</b>

## KEY FEATURES

- ▶ 229,414 acres (60%) of mitigated impervious area
- ▶ 191,100 AFY stormwater captured
- ▶ 768 miles of recreational trails
- ▶ Over 1,700 acres of new habitat
- ▶ Project Cost: \$9,200/acre-feet

## Overview

The LA Basin Study is assessing the region's major water conservation and flood risk mitigation infrastructure to prepare for future drivers that may impact water supply, such as changes to climate and population. The study is a long-range planning effort that is evaluating the potential of the existing facilities and additional new stormwater capture concepts to increase the resiliency of local water supplies under an uncertain future. The Stormwater Policies Project Group encourages stormwater conservation through policy and improved regulations. Policies could include incentives or requirements for greater implementation rates and enhanced maintenance to increase performance. Stormwater Policies assume a combination of the Low Impact Development (LID) and Complete Streets local solutions, and increases the stormwater conservation through various changes in stormwater policy. This management solution is estimated to implement decentralized projects over approximately 229,414 acres of impervious area.



## Stormwater Policies Projects

Several different changes to policy and regulations can be improved upon such as:

- ▶ Utilizing EWMPs for the dual-purpose of water conservation
- ▶ Align regulatory and environmental plans with water conservation/supply goals
- ▶ Use advanced rainfall-hydrology modeling to quantify pre-storm capture
- ▶ Streamline requirements for maintenance of existing infrastructure
- ▶ Remove invasive “water thirsty” plants in water conservation system
- ▶ Develop “feed in tariff” for groundwater infiltration



## Summary of Stormwater Policies Projects

Watershed	Watershed Area (acres)	Total Impervious Area (acres)	Implementation Area (acres)	Implementation Ratio of Impervious Area
Ballona Creek	135,090	55,528	31,997	58%
Dominguez Channel	70,428	40,083	25,175	63%
Los Angeles River	533,840	165,444	99,519	60%
Malibu Creek	129,825	6,079	3,171	52%
San Gabriel River	434,475	117,842	69,552	59%
<b>TOTAL</b>	<b>1,303,657</b>	<b>384,975</b>	<b>229,414</b>	<b>60%</b>

## Multiple-Benefits & Partner Opportunities

In addition to stormwater conservation, complementary benefits of LID and Complete Streets include water quality, aesthetics, habitat, and heat island mitigation. The strategy of Enhanced Watershed Management Programs (EWMPs) has been to take a collaborative approach to comply with the Los Angeles County Municipal Separate Storm Sewer System (MS4) permit through a watershed management group. A similar collaborative approach could be taken for stormwater conservation to involve multiple stakeholders within a watershed management area.

## Implementation Challenges

Potential implementation challenges and permitting requirements for Low Impact Development and Complete Streets local solutions would apply. LID implementation is driven by ordinances in individual cities. To achieve the project level of LID implementation, a framework will have to be in place to promote widespread implementation over the next century, and significant development and redevelopment would be required. Cities within the region have adopted ordinances to incorporate green infrastructure requirements for streets projects. These types of programs and ordinances represent the initial stages of developing a comprehensive program.

## Resiliency to Climate Change

The region is preparing for climate change in numerous ways, one of which is ensure a reliable future water supply. The Los Angeles County Flood Control District is investigating solutions to adapt to climate change and continue to further enhance its stormwater capture efforts. Resiliency to projected climate change means safeguarding the existing stormwater conservation system and improving upon it to make the most of stormwater when it is available, as well as storing it for later within deep groundwater reserves. Stormwater policies that increase LID and Complete Streets implementation could enhance the resiliency of the region and help manage future climate risks. Increased infiltration and stormwater retention from these projects could replenish local groundwater reserves to provide a more reliable water supply.

## Findings

Implementation of stormwater policies could result in approximately 191,100 acre-feet of stormwater conservation per year (AFY) for the middle climate scenario, and 229,400 acres of mitigated impervious surface, representing 60 percent of the overall impervious land use.

### Stormwater Conserved for Stormwater Policies

Watershed	Middle Projected Climate Scenario (AFY)
Ballona Creek	24,576
Dominguez Channel	17,430
Los Angeles River	84,286
Malibu Creek	2,559
San Gabriel River	62,246
<b>TOTAL</b>	<b>191,096</b>

# Green Infrastructure Programs

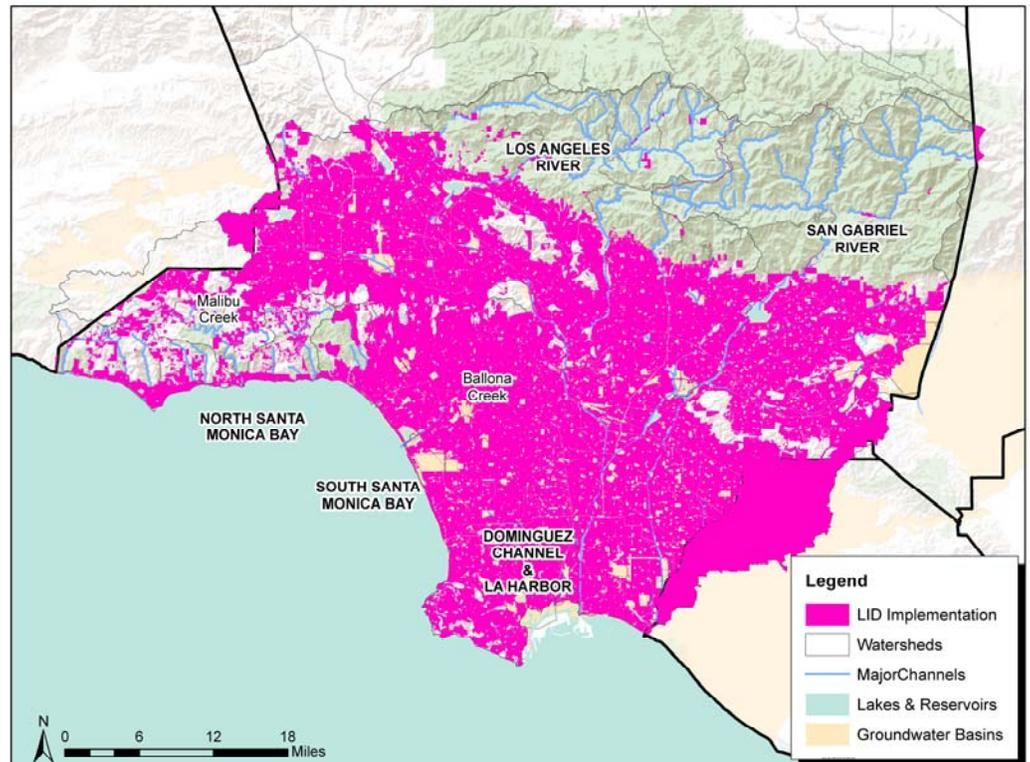
Los Angeles Basin  
Stormwater Conservation Study

## KEY FEATURES

- ▶ 151,194 acres (53%) of mitigated impervious area
- ▶ 123,500 AFY stormwater captured
- ▶ Over 850 acres of new habitat
- ▶ Project Cost: \$8,800/acre-feet

## Overview

The LA Basin Study is assessing the region's major water conservation and flood risk mitigation infrastructure to prepare for future drivers that may impact water supply, such as changes to climate and population. The study is a long-range planning effort that is evaluating the potential of the existing facilities and additional new stormwater capture concepts to increase the resiliency of local water supplies under an uncertain future. The Green Infrastructure Programs Project Group encourages implementation of LID through green infrastructure programs. When deployed across the basin, LID projects could make significant impact on stormwater capture. Green Infrastructure Programs assume increases in stormwater conservation through green infrastructure programs.



## Green Infrastructure Programs Projects

The MS4 Permit and local ordinances require significant development and redevelopment projects to incorporate LID concepts into their site design. Existing residential parcels could also provide an important opportunity for LID implementation. Runoff from residential parcels often flow directly to a curb and gutter or other conveyance system on the street. A well-designed residential LID program can engage individual homeowners to reduce their contribution to stormwater runoff. Potential solutions to implement additional green infrastructure could include:

- ▶ Low Impact Development/Best Management Practices for Stormwater
- ▶ Increase permeable space to balance water conservation goals
- ▶ Increase urban permeability
- ▶ Emphasize residential infiltration in high-density locations
- ▶ Encourage residential land changes for promoting infiltration

Many of the programs could reduce the time it takes to reach full-scale implementation, but may not increase the final value. However, programs focused on residential land uses may encourage homeowners to willingly participate in LID implementation.



# Management Solutions | Green Infrastructure Programs

## Summary of Green Infrastructure Programs Projects

Watershed	Watershed Area (acres)	Total Impervious Area Excluding Streets (acres)	Implementation Area (acres)	Implementation Ratio of Impervious Area
Ballona Creek	135,090	37,585	19,180	51%
Dominguez Channel	70,428	29,825	15,877	53%
Los Angeles River	533,840	119,149	63,052	53%
Malibu Creek	129,825	5,092	2,547	50%
San Gabriel River	434,475	94,778	50,537	53%
<b>TOTAL</b>	<b>1,303,657</b>	<b>286,430</b>	<b>151,194</b>	<b>53%</b>

## Multiple-Benefits & Partner Opportunities

In addition to stormwater conservation, complementary benefits of LID projects include water quality, aesthetics, habitat, and heat island mitigation. Compared to local stormwater capture projects that are larger and provide multi-benefits for various stakeholders, LID projects could be implemented wide-scale. The LID projects would be the responsibility of land owners, or the LID jurisdiction. There could be opportunities for collaboration on the development of a residential LID program that incentivizes homeowners to install LID BMPs on residential land (rain tanks, hardscape removal, etc.).

## Implementation Challenges

LID implementation is driven by individual cities. To achieve widespread LID implementation, an LID framework would have to be in place. In addition to the County requirements, owners/developers of some project sites may be subject to the Industrial General Permit and/or the Construction General Permit. None of the LID opportunities have any onerous permitting requirements which would preclude their implementation.

## Resiliency to Climate Change

The region is preparing for climate change in numerous ways, one of which is to ensure a reliable future water supply. The Los Angeles County Flood Control District is investigating solutions to adapt to climate change and continue to further enhance its stormwater capture efforts. Resiliency to future climate change means safeguarding the existing stormwater conservation system and improving upon it to make the most of stormwater when it is available, as well as storing it for later within deep groundwater reserves. Green infrastructure programs could enhance the resiliency of the region and help manage projected climate risks. Increased infiltration and stormwater retention from these projects could replenish local groundwater reserves to provide a more reliable water supply.

## Findings

Implementation of green infrastructure programs could result in approximately 123,500 acre-feet of stormwater conservation per year (AFY) for the middle climate scenario, and 151,194 acres of mitigated impervious surface, representing 53 percent of the overall impervious land use.

### Stormwater Conserved for Green Infrastructure Programs

Watershed	Middle Projected Climate Scenario (AFY)
Ballona Creek	13,765
Dominguez Channel	10,180
Los Angeles River	52,570
Malibu Creek	1,923
San Gabriel River	45,073
<b>TOTAL</b>	<b>123,510</b>

# Regional Impact Programs

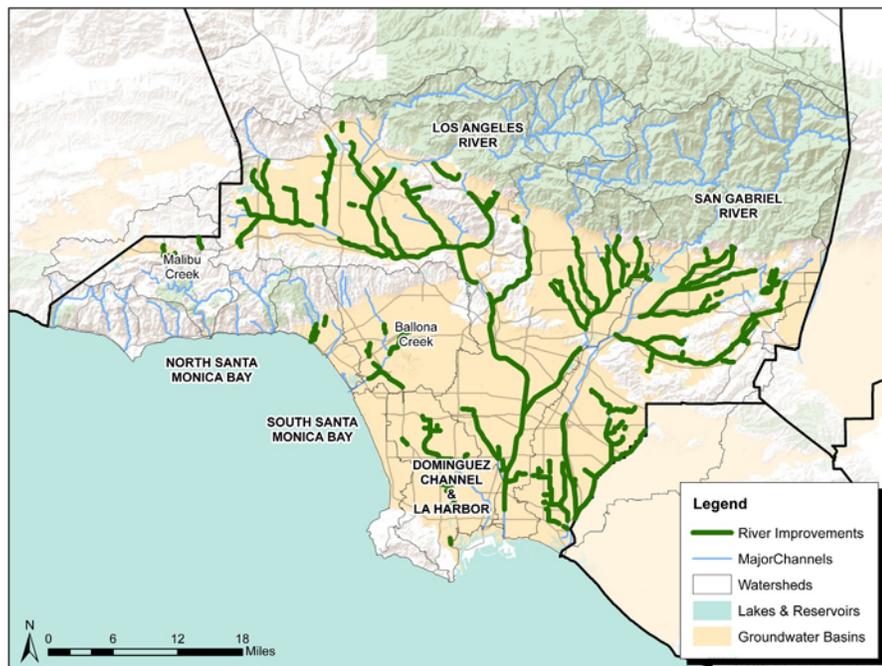
Los Angeles Basin  
Stormwater Conservation Study

## KEY FEATURES

- ▶ 3,009 Regional Impact Programs Projects
- ▶ 145,000 AFY stormwater captured
- ▶ 5,200 acres of habitat
- ▶ 527 miles of recreational trails
- ▶ Project Cost: \$27,500/acre-feet

### Overview

The LA Basin Study is assessing the region's major water conservation and flood risk mitigation infrastructure to prepare for future drivers that may impact water supply, such as changes to climate and population. The study is a long-range planning effort that is evaluating the potential of the existing facilities and additional new stormwater capture concepts to increase the resiliency of local water supplies under an uncertain future. The Regional Impact Programs Project Group encourages local stormwater capture solutions through regional programs that will have a large-scale impact. Local stormwater capture concepts are comprised of facilities that receive large volumes of stormwater runoff from upstream areas for infiltration and stormwater retention. A significant component of the Regional Impact Programs is implementation of a long term floodplain buy-back program. Aside from increasing recharge, local stormwater capture projects can provide recreation areas, improve water quality, enhance the community, and facilitate habitat restoration.



### Regional Impact Programs Projects

Regional Impact Programs could include the following strategies:

- ▶ Promote and value open space for its stormwater benefits
- ▶ Utilize government parcels first for stormwater capture, storage, and infiltration
- ▶ Implement a long-term floodplain buy-back study/program
- ▶ Investigate recharge along river embankments
- ▶ County-wide parcel fee with mitigation rebate



Typical Section of restored waterway from implementing a floodplain buy-back program.



# Management Solutions | Regional Impact Programs

**Summary of Regional Impact Programs**

Watershed	Watershed Area (acres)	Number of Projects	River Improvements (miles)	Right-of-Way (acres)	
				Infiltration Projects	River Improvement
Ballona Creek	135,090	76	14.0	53.4	146
Dominguez Channel	70,428	2	16.5	-	131
Los Angeles River	533,840	1,772	191.7	1,426.6	3,238
Malibu Creek	129,825	-	2.9	-	11
San Gabriel River	434,475	1,159	125.9	1,175.4	1,415
<b>TOTAL</b>	<b>1,303,657</b>	<b>3,009</b>	<b>351.0</b>	<b>2,655</b>	<b>4,941</b>

## Multiple-Benefits & Partner Opportunities

In addition to stormwater conservation, complementary benefits of local stormwater capture projects include flood risk management, water quality, recreation, habitat/connectivity, and climate resilient actions. These other benefits could help to identify project partners as projects with multiple benefits can help to leverage funding. There are opportunities for collaboration and partnering between the County of Los Angeles and other cities within the watershed area. For example, the Municipal Separate Storm Sewer System (MS4) Permit for Los Angeles provides a compliance pathway through the development of Enhanced Watershed Management Programs (EWMP) to evaluate opportunities within the participating Permittees' collective jurisdictional area for collaboration among Permittees and other partners on multi-benefit regional

## Implementation Challenges

The local improvements could require the purchase of approximately 7,600 acres of right-of-way. This acquisition is based on private open space parcels that could be purchased for local stormwater capture and used as small scale infiltration areas and is based on acquisition of river adjacent parcels for a long term flood plain buyback program. Local stormwater capture projects would likely be individually planned and designed specifically for available parcels and constructed on public parcels. None of the local stormwater capture opportunities or regional impact programs have any onerous permitting requirements which would preclude their implementation. A flood plain buyback program would require a long term planning, design, property acquisition, permitting effort coordinated across the region.

## Resiliency to Climate Change

The region is preparing for climate change in numerous ways, one of which is ensure a reliable future water supply. The Los Angeles County Flood Control District is investigating solutions to adapt to climate change and continue to further enhance its stormwater capture efforts. Resiliency to projected climate change means safeguarding the existing stormwater conservation system and improving upon it to make the most of stormwater when it is available, as well as storing it for later within deep groundwater reserves. Local stormwater capture projects and regional impact programs can enhance the resiliency of the region and help manage future climate risks. Increased infiltration and stormwater retention from these projects can both replenish local groundwater reserves to provide a more reliable water supply and help mitigate some potential flooding impacts.

## Findings

Regional impact programs could result in approximately 145,395 acre-feet of stormwater conservation per year (AFY) for the middle climate scenario, 52,926 acres of mitigation, 5,200 acres of habitat, and 527 miles of recreational trails.

**Stormwater Conserved for Regional Impact Programs**

Watershed	Middle Projected Climate Scenario (AFY)
Ballona Creek	1,083
Dominguez Channel	115
Los Angeles River	117,162
Malibu Creek	9
San Gabriel River	27,026
<b>TOTAL</b>	<b>145,395</b>

# Regional Stormwater Capture

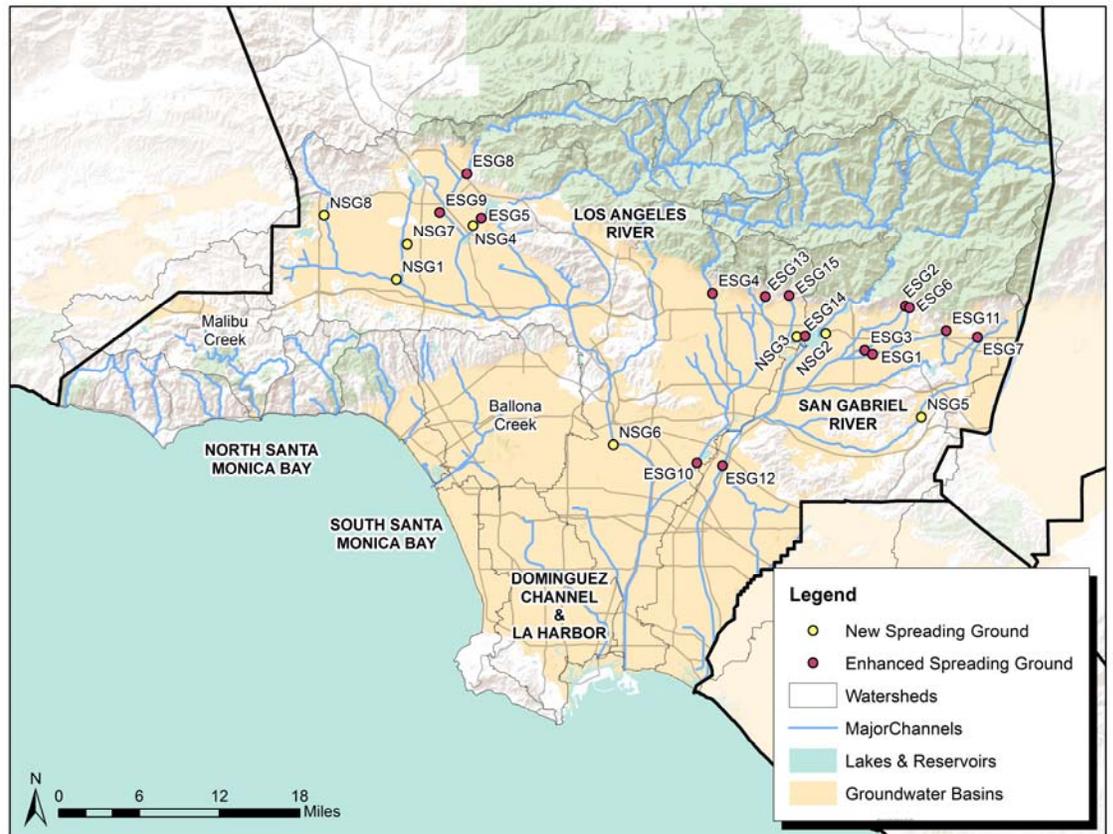
Los Angeles Basin  
Stormwater Conservation Study

## KEY FEATURES

- ▶ Eight new spreading grounds with 10 percent dedicated habitat and trails
- ▶ 15 enhanced spreading grounds using soil management practices
- ▶ Average 43,300 AFY stormwater captured
- ▶ 42 acres of new habitat
- ▶ Over 12 miles of recreational trails
- ▶ Project Cost: \$1,300/acre-feet

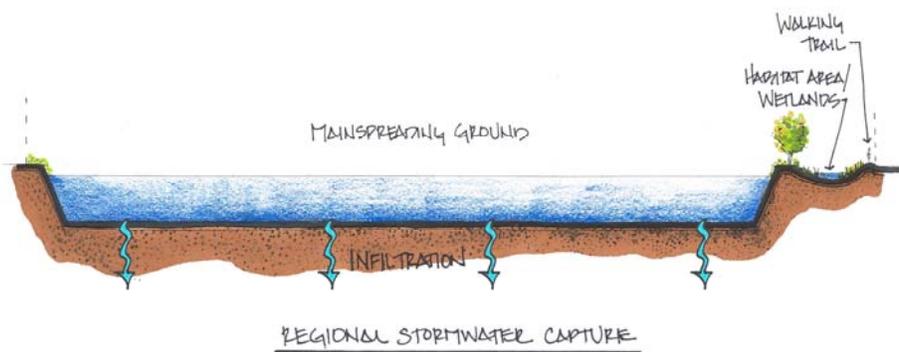
## Overview

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## Regional Stormwater Capture Projects

Potential locations for new spreading basins were identified based on previous reports and a search of vacant properties near main channel features in recharge areas. Existing gravel pits in favorable areas were assumed to be repurposed as spreading basins where appropriate. Task 4 of the study ranked the existing spreading grounds based on performance levels. Of the 25 Existing spreading grounds analyzed in Task 4, 16 were identified as candidates for increasing maintenance to enhance recharge capacity.



## Multiple-Benefits & Partner Opportunities

Given the regional benefits of these stormwater capture projects, there could be potential opportunities for collaboration and partnering among the County of Los Angeles, groundwater water management agencies, and water purveyors, as well as Los Angeles County Sanitation District for recycled water projects. In addition, other parties with interests related to the multi-benefit components of the project could be other potential project partners. 10-percent of new basins were assumed dedicated to habitat.

## Implementation Challenges

Significant land acquisition would be required to construct the eight new recharge basins. Construction of the new basins would require acquisition of 682 acres of right-of-way.

Additional permitting requirements would be required for new basins located downstream of waste water treatment plant outfalls. Flow in the Los Angeles River below Sepulveda Dam contains tertiary treated effluent, and basins located downstream of Sepulveda Dam would need to comply with the latest Regulations for Groundwater Replenishment Using Recycled Water.

None of the other basins are expected to have permitting requirements that would preclude their implementation.

## Resiliency to Climate Change

The region is preparing for climate change in numerous ways, one of which is ensure a reliable future water supply. The Los Angeles County Flood Control District is investigating solutions to adapt to climate change and continue to further enhance its stormwater capture efforts. Resiliency to future climate change means safeguarding the existing stormwater conservation system and improving upon it to make the most of stormwater when it is available, as well as storing it for later within deep groundwater reserves. Regional stormwater capture solutions could enhance the resiliency of the region and help manage future climate risks. Increased infiltration and stormwater retention from these projects could both replenish local groundwater reserves to provide a more reliable water supply and help mitigate some potential flooding impacts. The Regional Stormwater Capture Projects are intended to capture and infiltrate stormwater which will help promote groundwater recharge and provide resiliency when more water is available .

### New and Enhanced Basins

ID	Location
New Basins	
NSG1	Miller Pit
NSG2	New Tujunga Spreading Grounds
NSG3	Rock Pit No. 3
NSG4	Sepulveda Dam
NSG5	Spadra Basin
NSG6	LA Forbay Spreading Ground
NSG7	Bull Creak Area Spreading Grounds
NSG8	Browns Creak Area Spreading Grounds
Enhanced Basins	
ESG1	Ben Lomond
ESG2	Big Dalton
ESG3	Citrus
ESG4	Eaton Wash
ESG5	Hansen/Tujunga
ESG6	Little Dalton
ESG7	Live Oak
ESG8	Lopez
ESG9	Pacoima
ESG10	Rio Hondo
ESG11	San Dimas
ESG12	San Gabriel Coastal
ESG13	Santa Anita
ESG14	Santa Fe
ESG15	Sawpit

## Findings

Implementation of Regional Stormwater Capture projects could provide approximately 43,300 acre-feet of stormwater conservation per year (AFY) based on average for the results from the middle climate scenario, 42 acres of wetland habitat, and over 12 miles of recreational trails.

### Stormwater Conserved for Regional Stormwater Capture

Recharge Basin	Middle Projected Climate Scenario (AFY)
Existing and Enhanced Basins	13,381
Expanded and New Basins	29,930
<b>NET CHANGE</b>	<b>43,311</b>

# Regional Solutions Stormwater Conveyance Systems

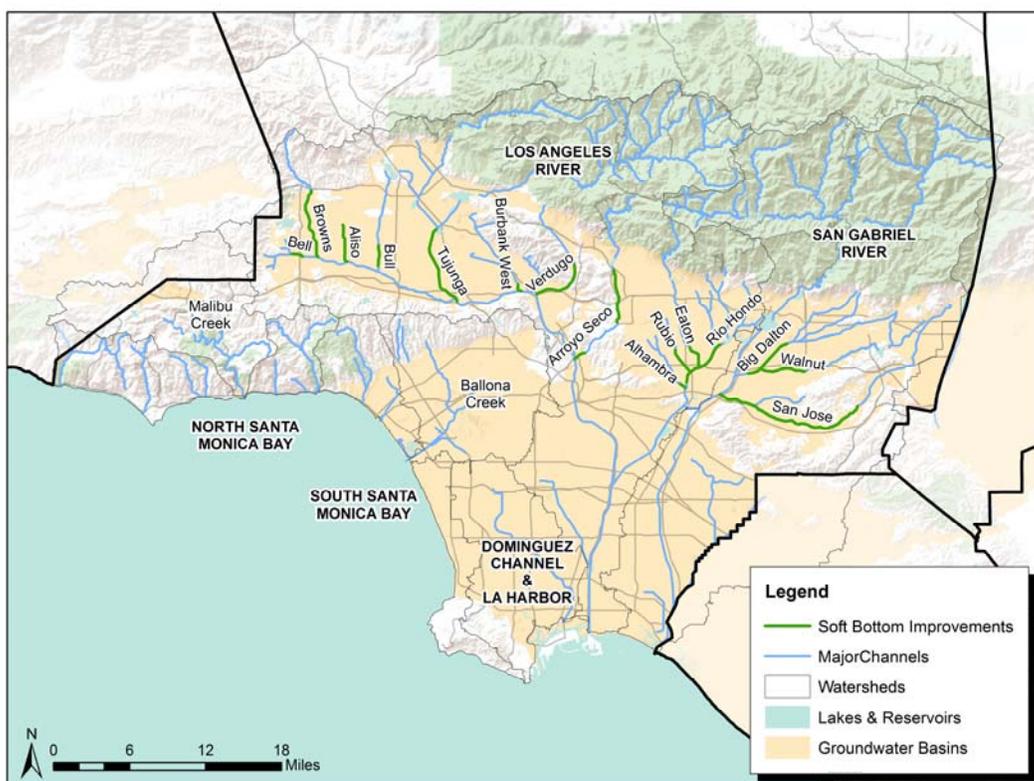
Los Angeles Basin  
Stormwater Conservation Study

## KEY FEATURES

- ▶ Over 57 miles of soft bottom or side pond improvements along 15 different channels
- ▶ Average 9,200 AFY stormwater captured
- ▶ Over 3 miles of recreational trails
- ▶ Over 8 acres of habitat
- ▶ Project Cost: \$46,300/acre-feet

## Overview

The LA Basin Study is assessing the region's major water conservation and flood risk mitigation infrastructure to prepare for future drivers that may impact water supply, such as changes to climate and population. The study is a long-range planning effort that is evaluating the potential of the existing facilities and additional new stormwater capture concepts to increase the resiliency of local water supplies under an uncertain future. The Stormwater Conveyance Systems Project Group could improve stormwater conservation through soft bottom channel modifications. There are many concrete lined channels in Los Angeles County, and converting some to soft bottom could improve groundwater recharge, improve water quality, and provide opportunities for recreational trails, parkways, and riparian habitat corridors. However, the region's need for increased stormwater capture must still balance the dual goal of flood risk management.



## Stormwater Conveyance Systems Projects

The proposed projects targeted for soft bottom conversion focus on tributary reaches with larger channels that have favorable soil conditions for recharging stormwater. Two approaches were evaluated to enhance short term stormwater detention within existing or converted soft bottom channels areas. "River speed bumps", small in-channel earthen detention structures, were assumed for all modified channel reaches. Channel side ponds were considered where easements or land appears available for their installation.



# Regional Solutions | Stormwater Conveyance Systems

## Multiple-Benefits & Partner Opportunities

Potential opportunities for collaboration and partnering could be with the County of Los Angeles, groundwater water management agencies, and water purveyors, as well as Los Angeles County Sanitation District for recycled water projects. In addition, other parties with interests related to the multi-benefit components of the project (local city departments for example) are other potential project partners. Multiple-benefit opportunities including habitat and recreational improvements could be incorporated into these projects.

## Implementation Challenges

The region's need for increased stormwater capture must still balance the dual goal of flood risk management. The channel modifications would need to preserve existing flood protection and flow capacity. Significant permitting challenges are associated with the proposed channel modifications. Detailed hydrology and hydraulics studies would need to be performed to confirm the modified channels provide adequate flood mitigation, and coordination among local governments, the Army Corps of Engineers, and the Los Angeles County Flood Control District (LACFCD) would be required.

Additionally, most of the land adjacent to the existing tributary channels is developed and there is limited opportunity for right-of-way acquisition for more extensive pond networks or habitat improvements. 31 acres of right-of-way acquisition would be required to accommodate the channel side ponds.

## Resiliency to Climate Change

The region is preparing for climate change in numerous ways, one of which is to ensure a reliable future water supply. The LACFCD is investigating solutions to adapt to climate change and continue to further enhance its stormwater capture efforts. Resiliency to future climate change means safeguarding the existing stormwater conservation system and improving upon it to make the most of stormwater when it is available, as well as storing it for later within deep groundwater reserves. Stormwater conveyance system solutions could enhance the resiliency of the region and help manage future climate risks. Increased infiltration and stormwater retention from these projects could both replenish local groundwater reserves to provide a more reliable water supply and help mitigate some potential flooding impacts. The channel modifications will promote groundwater recharge and provide resiliency when more water is available.

**Stormwater Conveyance System Channel Modifications**

Channel	Total Modified Length (ft)
Alhambra Wash	2,707
Aliso Creek	15,448
Arroyo Seco Channel	28,764
Bell Creek	4,590
Big Dalton Wash	16,162
Browns Creek	30,032
Bull Creek	8,034
Burbank Western System	3,132
Eaton Wash	10,882
Rio Hondo	22,321
Rubio Wash	11,638
San Jose Creek	64,072
Tujunga Wash	34,988
Verdugo Wash	22,664
Walnut Creek Channel	24,415
<b>TOTAL</b>	<b>299,849</b>

## Findings

Implementation of Stormwater Conveyance Systems projects could provide approximately 9,200 acre-feet of stormwater conservation per year (AFY) for the middle climate scenario, 8 acres of habitat improvements, and over 3 miles of recreational trail.

**Stormwater Conserved for Stormwater Conveyance Systems**

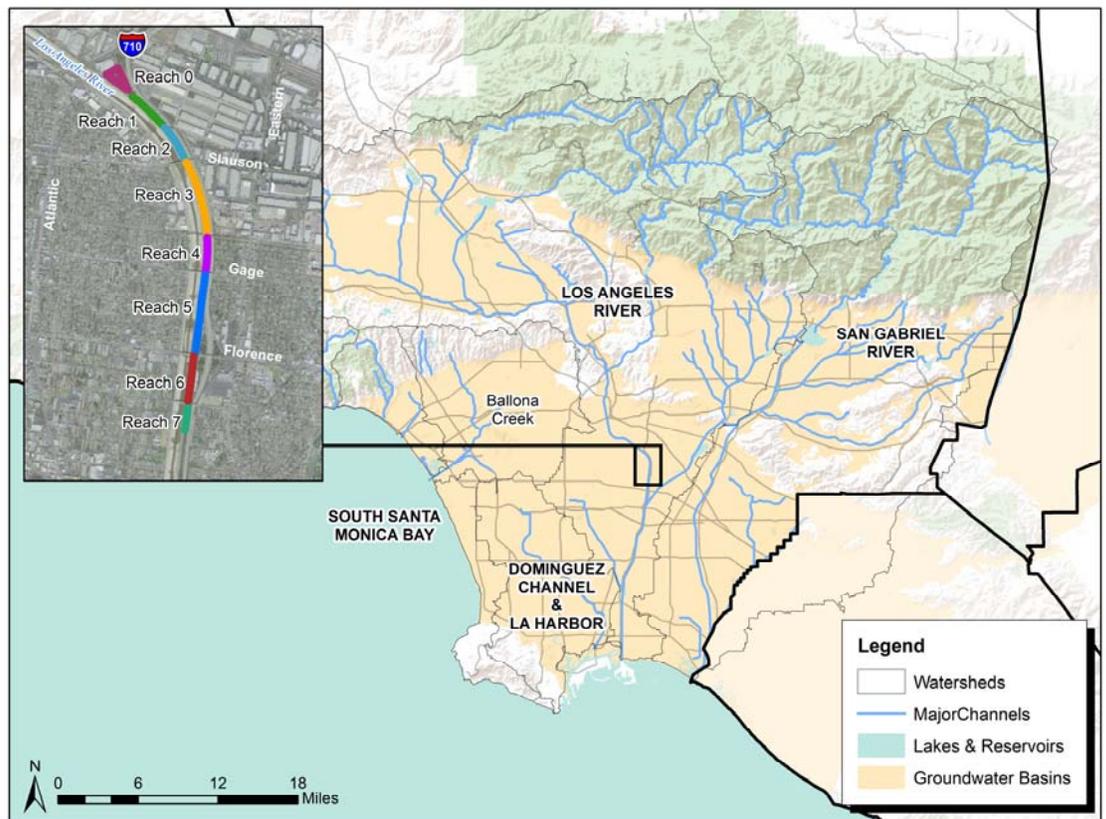
Channel	Middle Projected Climate Scenario (AFY)
Alhambra Wash	73
Aliso Creek	401
Arroyo Seco Channel	932
Bell Creek	118
Big Dalton Wash	487
Browns Creek	601
Bull Creek	257
Burbank Western System	81
Eaton Wash	220
Rio Hondo	740
Rubio Wash	291
San Jose Creek	2,389
Tujunga Wash	1,076
Verdugo Wash	947
Walnut Creek Channel	575
<b>TOTAL</b>	<b>9,188</b>

## KEY FEATURES

- ▶ Eight stretches of shallow aquifer recharge ponds to provide soil aquifer treatment
- ▶ 24 extraction and 48 injection wells to pump treated water into aquifer
- ▶ Approximately 20 acres of total infiltration area
- ▶ 5,600 AFY of stormwater captured
- ▶ Over 2 miles of recreational trails
- ▶ 2 acres of Habitat
- ▶ Project Cost: \$1,700/acre-feet

## Overview

The LA Basin Study is assessing the region's major water conservation and flood risk mitigation infrastructure to prepare for future drivers that may impact water supply, such as changes to climate and population. The study is a long-range planning effort that is evaluating the potential of the existing facilities and additional new stormwater capture concepts to increase the resiliency of local water supplies under an uncertain future. The Alternative Capture Project Group could improve stormwater capture through seven new recharge ponds along the Los Angeles River. Currently, there are no groundwater recharge facilities in the Los Angeles Forebay region of Central Basin due to limited land availability.



## Alternative Capture Project

The Water Replenishment District (WRD) Groundwater Basin Master Plan estimates up to 5,000 AFY of stormwater could be captured in the Los Angeles forebay region of Central Basin through an Aquifer Recharge and Recovery Facility. This type of facility could provide stormwater capture as well as soil aquifer treatment and injection/recovery opportunities. Alternative Capture consists of a series of eight shallow aquifer recharge basins which would be located within the existing power line easement along the Los Angeles River. The aquifer recharge basins could perform soil aquifer treatment which is a natural filtration process to remove nitrates, pathogens, and micro-pollutants. Extraction wells along the perimeter of the basins could extract the treated groundwater and inject into a production aquifer. Infrastructure required for the concept includes 24 extraction wells, 48 injection wells, and intake structures. For the project group, 2 miles of trails could be created for recreational use. Additional features could be incorporated including trees, bike paths, and pocket parks.



# Regional Solutions | Alternative Capture

Summary of Alternative Capture Projects

Reach No.	Infiltration Area (acres)	No. of Extraction Wells	No. of Injection Wells	Reach Length (ft)	Right-of-Way (acres)	Habitat (acres)	Recreation Trails (ft)
0	3.8	4	8	1,300	6.3	0.4	1,300
1	1.5	2	4	1,255	2.5	0.2	1,255
2	2.4	2	4	1,230	4.0	0.2	1,230
3	5.1	6	12	2,530	8.5	0.5	2,530
4	2.7	4	8	1,170	4.5	0.3	1,170
5	2.5	2	4	2,600	4.2	0.3	2,600
6	1.4	2	4	1,355	2.3	0.1	1,355
7	0.7	2	4	1,355	1.2	0.1	1,355
<b>TOTAL</b>	<b>20.1</b>	<b>24</b>	<b>48</b>	<b>12,795</b>	<b>33.5</b>	<b>2.0</b>	<b>12,795</b>

## Multiple-Benefits & Partner Opportunities

Given the regional benefits of this proposed capture project, there could be potential opportunities for collaboration and partnering among the County of Los Angeles, groundwater water management agencies, and water purveyors, as well as the Los Angeles County Sanitation District for recycled water projects. In addition, other parties with interests related to the multi-benefit components of the project, such as local and city departments, could be other potential project partners.

## Implementation Challenges

Additional permitting would be required for the project. Flow at the project site would contain tertiary treated effluent from the Tillman Water Reclamation Plant, so the project would need to comply with the latest Regulations for Groundwater Replenishment Using Recycled Water, including associated design studies and reporting and monitoring requirements. Approximately 34 acres of right-of-way would be required to construct the project.

## Resiliency to Climate Change

The region is preparing for climate change in numerous ways, one of which is ensure a reliable future water supply. The Los Angeles County Flood Control District is investigating solutions to adapt to climate change and continue to further enhance its stormwater capture efforts. Resiliency to future climate change means safeguarding the existing stormwater conservation system and improving upon it to make the most of stormwater when it is available, as well as storing it within deep groundwater reserves for later use. Alternative capture solutions could enhance the resiliency of the region and help manage future climate risks. Increased infiltration and stormwater retention from these projects could both replenish local groundwater reserves to provide a more reliable water supply .

## Findings

Implementation of the Alternative Capture project group could provide approximately 5,600 acre-feet of stormwater conservation per year (AFY) for the middle climate scenario and create more than 2 miles of recreational trail. Additional habitat and recreational features, including parks, trees, and wildlife areas, could be considered.

Stormwater Conserved for Alternative Capture

Channel	Middle Projected Climate Scenario (AFY)
Los Angeles River	5,587

# Storage Solutions LACFCD Dams

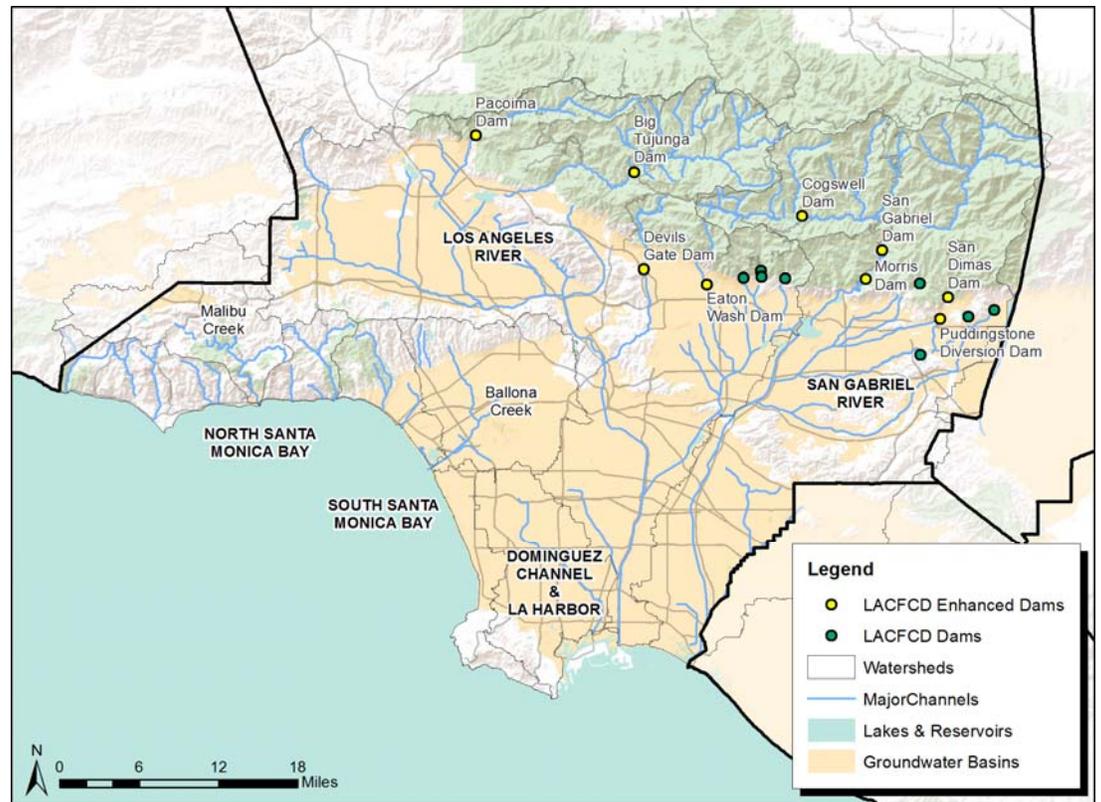
Los Angeles Basin  
Stormwater Conservation Study

## KEY FEATURES

- ▶ 14 existing Los Angeles County Flood Control District (LACFCD) owned dams evaluated
- ▶ 9 Los Angeles County owned dams modified for increased storage
- ▶ Average increase of 150,000 AFY of stormwater capture
- ▶ Project Cost: \$183/acre-foot

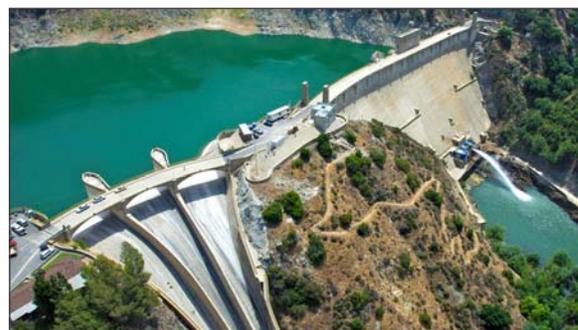
## Overview

The LA Basin Study is assessing the region's major water conservation and flood risk mitigation infrastructure to prepare for future drivers that may impact water supply, such as changes to climate and population. The study is a long-range planning effort that is evaluating the potential of the existing facilities and additional new stormwater capture concepts to increase the resiliency of local water supplies under an uncertain future. The LACFCD Dams Project Group improves stormwater capture and storage at 9 of the region's 14 water conservation dams. The LACFCD Dams make a major contribution to the local water supply of the Los Angeles Basin by capturing and storing stormwater flows from the mountains above the Basin and releasing it later to downstream spreading grounds. The dams also play a crucial role in Los Angeles County's flood risk management by slowing flows in the downstream drainage system. This project group proposes to install additional operational controls at 9 of the existing Dams to increase capacity to temporarily capture and store stormwater.



## LACFCD Dams

LACFCD Dams serve a dual purpose of stormwater capture and flood risk management by temporarily capturing and storing stormwater. Fourteen existing LACFCD dams were evaluated and 9 were selected for modifications which would include construction of additional operable controls at the outflow structures.



Visit the Study at [tiny.cc/LABasinStudy](http://tiny.cc/LABasinStudy)

## Multiple-Benefits & Partner Opportunities

By increasing the capture and storage of stormwater, this project group offers opportunities for increased flood risk management and may also increase the existing water quality benefit of the dams. This project group also provides opportunities for partnering between flood control, groundwater management, and local government agencies.

## Implementation Challenges

Implementation of this project group would involve significant permitting considerations. Detailed investigations of changes to the flood risk management and water conservation functions of the dams will need to be performed. Potential impacts on the seismic and structural stability of the dams will also need to be investigated, as well as potential environmental impacts.

## Resiliency to Climate Change

The region is preparing for climate change in numerous ways, one of which is ensure a reliable future water supply. The Los Angeles County Flood Control District is investigating solutions to adapt to climate change and continue to further enhance its stormwater capture efforts. Resiliency to future climate change means safeguarding the existing stormwater conservation system and improving upon it to make the most of stormwater when it is available, as well as storing it for later within groundwater reserves. Local stormwater capture solutions can enhance the resiliency of the region and help manage future climate risks. Increased infiltration and stormwater retention from these projects can both replenish local groundwater reserves to provide a more reliable water supply and help mitigate some potential flooding impacts. Sediment loading to the reservoirs behind the dams under the climate scenarios was not evaluated explicitly, but is expected to increase under wet climate scenarios. Periodic sediment removal from the reservoirs will be necessary to maintain the stormwater storage capacity and climate resiliency of this project group

## Findings

Construction of additional operable controls at the outflow structures of the 9 dams could increase their capacity to temporarily capture and store stormwater for release later to downstream spreading grounds where it could infiltrate into groundwater reserves. The average annual stormwater conservation benefit for the middle climate scenario is approximately 150,000 acre-feet of stormwater conservation per year (AFY).

**Stormwater Conserved for  
LACFCD Dams**

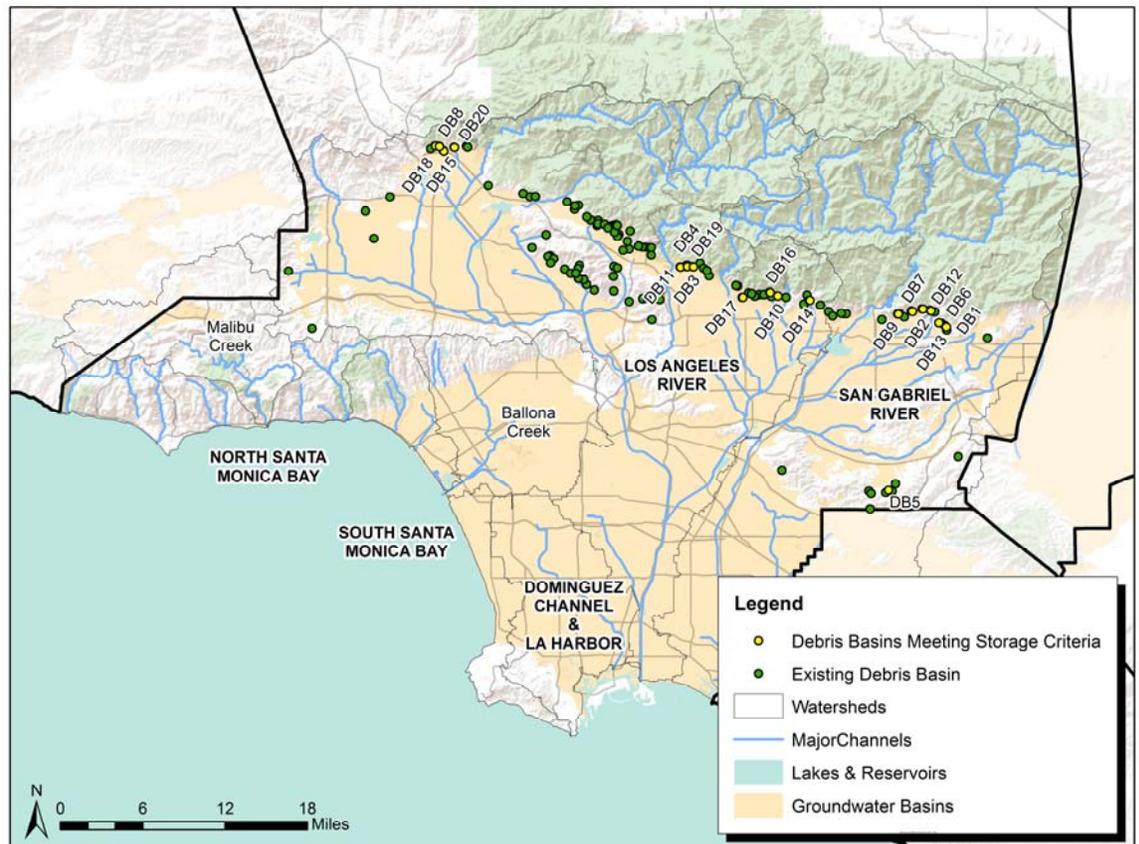
LACFCD Dam	Median Future Climate Scenario (AFY)
Big Tujunga	11,786
Cogswell	11,762
Devil's Gate	9,747
Eaton Wash	1,277
Morris	71,853
Pacoima	1,259
Puddingstone Diversion	888
San Dimas	2,041
San Gabriel	39,404
<b>TOTAL</b>	<b>150,015</b>

## KEY FEATURES

- ▶ 121 existing debris basins evaluated
- ▶ 20 debris basins modified for storage
- ▶ Total 552 ac-ft storage capacity
- ▶ Average of 145 AFY of stormwater capture
- ▶ Sediment loading may limit climate resiliency
- ▶ 1 mile of recreation trails
- ▶ Project Cost: \$20,500/acre-feet

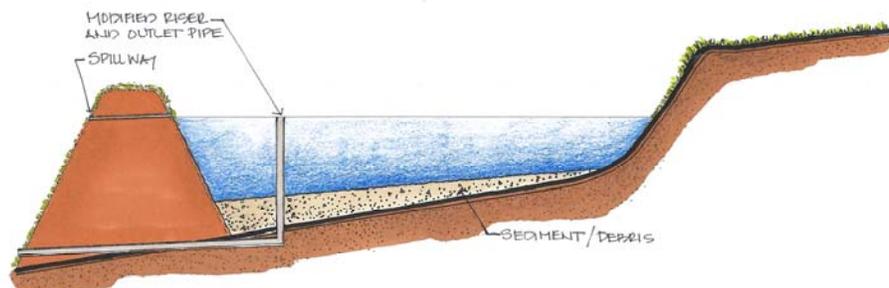
## Overview

The LA Basin Study is assessing the region's major water conservation and flood risk mitigation infrastructure to prepare for future drivers that may impact water supply, such as changes to climate and population. The study is a long-range planning effort that is evaluating the potential of the existing facilities and additional new stormwater capture concepts to increase the resiliency of local water supplies under an uncertain future. The Debris Basins Project Group could improve stormwater capture and storage beyond the operation of the region's major water conservation dams. Debris basins play a crucial role in Los Angeles County's flood risk management by capturing and preventing sediment, gravel, boulders, and other debris from damaging the downstream drainage system. This project group proposes to install controlled outflow works at 20 existing debris basins to store and release stormwater to downstream spreading grounds serving a dual purpose for stormwater capture.



## Debris Basins

Debris basins could temporarily store and release stormwater to downstream spreading grounds and serve a dual purpose for stormwater capture in addition to flood risk management. Over 120 existing debris basins were evaluated and a total of 20 locations were selected. Modifications would include construction of a controlled outflow structure.



## Stormwater Conserved for Debris Basin Projects

Watershed	No. of Basins Modified
Los Angeles River	12
San Gabriel River	8
<b>TOTAL</b>	<b>20</b>



## Multiple-Benefits & Partner Opportunities

Opportunities for partnering occur between flood control, groundwater management, and local government agencies. This project group also includes approximately 1 mile of recreational trails built around a portion of the modified basins. However, habitat improvements are not appropriate because no new right-of-way is included in this project group and maintenance for these facilities requires frequent sediment removal.

## Implementation Challenges

No significant permitting obstructions are envisioned. The primary purpose of debris basins is to capture debris before it can impact the downstream drainage system. Therefore, regular maintenance to remove sediment and other debris is needed to maintain the flood control and debris capture function. More frequent sediment removal events than currently performed will be required to maintain storage capacity for stormwater conservation. No additional right-of-way is needed for this alternative, as the project will take place in existing debris basins.

## Resiliency to Climate Change

The region is preparing for climate change in numerous ways, one of which is ensure a reliable future water supply. The Los Angeles County Flood Control District is investigating solutions to adapt to climate change and continue to further enhance its stormwater capture efforts. Resiliency to future climate change means safeguarding the existing stormwater conservation system and improving upon it to make the most of stormwater when it is available, as well as storing it for later within deep groundwater reserves. Debris Basin solutions could enhance the resiliency of the region and help manage future climate risks. Increased infiltration and stormwater retention from these projects could both replenish local groundwater reserves to provide a more reliable water supply and help mitigate some potential flooding impacts. Sediment loading to the basins under the climate scenarios was not evaluated explicitly, but sediment loading is expected to increase under wet climate scenarios, which may limit the surface water storage capacity and climate resiliency of this project group

## Findings

Modifications at the 20 debris basins could provide a storage capacity of approximately 552 acre-feet which could be infiltrated at the downstream spreading grounds. The average annual stormwater conservation benefit for the middle climate scenario could be 145 acre-feet of stormwater conservation per year (AFY).

## Stormwater Conserved for Debris Basin Projects

Watershed	Middle Projected Climate Scenario (AFY)
Los Angeles River	48
San Gabriel River	97
<b>TOTAL</b>	<b>145</b>