

A photograph of a park scene featuring a large, active fountain in the center. The fountain has multiple jets of water spraying upwards. In the background, there are several large, mature trees and a paved path. A few people can be seen walking on the path. The overall atmosphere is peaceful and green.


Planning for Urban Forests

Carbon Offsets and the Urban Forest

Jeff Goldman, AICP
Principal, AECOM

U.C. Davis
June 6, 2012

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A photograph of a paved path in a park. The path is curved and leads into the distance. On the left side of the path, there are several trees with autumn-colored leaves. A person is riding a bicycle on the path. The background shows more trees and a building.

Planning for Urban Forests

- General Plans
- Specific Plans, Master Plans & Development Codes
- Community Forest Management Plans
- Urban Forest Management & Development Approval

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Community Character and Design

City of Gridley
2030 GENERAL PLAN

City of Live Oak
2030 General Plan

Community Development

General Plans and Urban Forests

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Cities / Counties with Urban Forest Management Plans*

➤ Policies related to urban forests may be found in:

- Land Use Element
- Open Space Element
- Conservation Element
- Park and Recreation Element
- Circulation / Mobility Element

*Planners Book of Lists (2010), Governor's Office of Planning & Research

	Year Adopted or Last Updated						Referenced in the Following Documents			
	1989-2004	2005	2006	2007	2008	2009	General Plan	Specific Plan	Local Ordinance	Local Hazard Mitigation Plan
Burlingame						X			X	
Carlsbad						X				not provided
Carmel	2000						X			
Carroll	2004						X	X		
Chico					X				X	
Claremont				X			X	X		
Davis	2002								X	
Del Mar	2001							X		
Diamond Bar	2001								X	
El Cajon	1997								X	
El Cerrito				X					X	
Encinitas				X					X	
Fairfax				X				X		
Fullerton	1992						X	X		
Garden Grove						In progress	X			
Glendale	1992					Updating		X		
Huntington Beach	2001							X		
Lakewood				X					X	
Lompoc	1991								X	
Millbrae				X						
Olaj				X						
Orange	1999						X	X		
Patterson				X					X	
Pleasanton				X					X	
Rancho Santa Margarita				X					X	
Richmond						X	X	X		
Sacramento	1998									
San Diego						In process	X			
San Dimas				X	X					
San Francisco										Draft prepared
San Ramon	2000									
Santa Ana	1999							X		
Santa Barbara						X				
Santa Monica	1999									
Solvay	1991								X	
South Lake Tahoe				X					X	
Thousand Oaks	1989						X			
Ukiah	1993						X			
Whittier				X					X	
Yountville				X					X	

Carbon Offsets and the Urban Forests

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City of San Diego General Plan

➤ Policy CE-J.1:

- Develop, nurture, and protect a sustainable urban / community forest
 - Seek resources and take actions needed to plant, care for, and protect trees in the public right-of-way and parks and those of significant importance in our communities
 - Plant large canopy shade trees, where appropriate, and with consideration of habitat and water conservation goals, in order to maximize environmental benefits
 - Seek to retain significant and mature trees
 - Provide forest linkages to connect and enhance public parks, plazas, recreation, and open space areas

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City of San Diego General Plan

➤ Policy CE-J.2:

- Include community street tree master plans in community plans
 - Prioritize community streets for street tree programs
 - Identify the types of trees proposed for those priority streets by species (with acceptable alternatives)
 - Integrate known protected trees and inventory other trees that may be eligible to be designated as a protected tree

City of San Diego Landscape Regulations

Landscape regulations (Municipal Code Chapter 14, Article 2, Division 4) are in place and designed to: minimize the erosion of slopes and disturbed lands through revegetation, conserve energy by the provision of shade trees over streets, sidewalks, parking areas and other paving, conserve water through low-water-using planting and irrigation design, reduce the risk of fire through site design and the management of flammable vegetation, and to improve the appearance of the built environment by increasing the quality and quantity of landscaping visible from public rights-of-way, private streets, and adjacent properties.

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City of San Diego General Plan

➤ Policy CE-J.4:

- Continue to require the planting of tree through the development permit process
- Consider tree planting as mitigation for air pollution emissions, stormwater runoff, and other environmental impacts as appropriate

➤ Policy CE-J.5:

- Support public outreach efforts to educate City staff, the business community, and the general public on the environmental and economic benefits of trees

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Design Guidance in General Plans

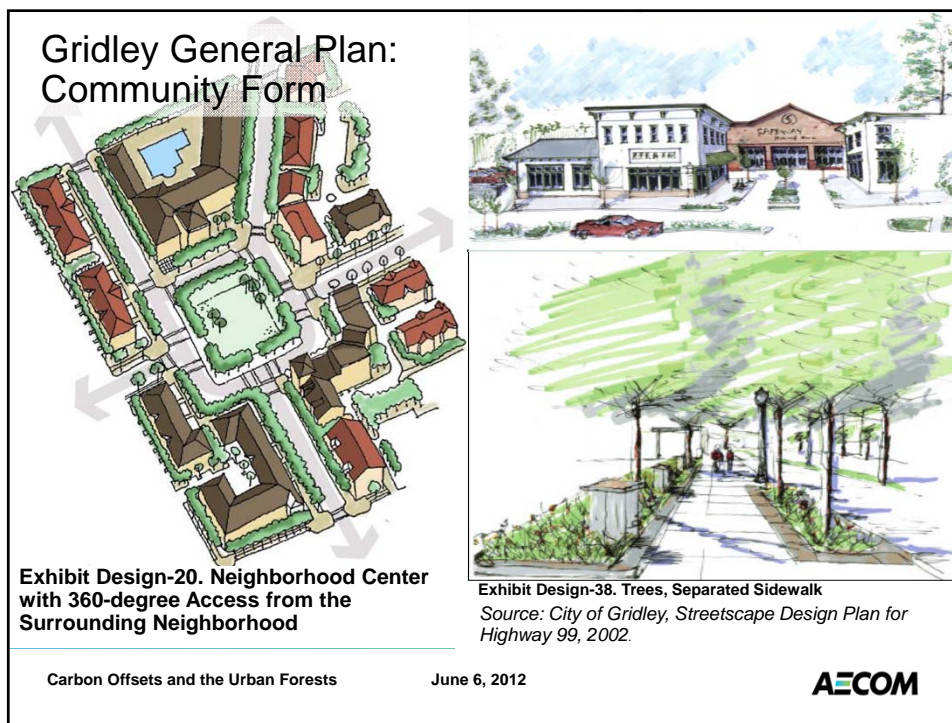
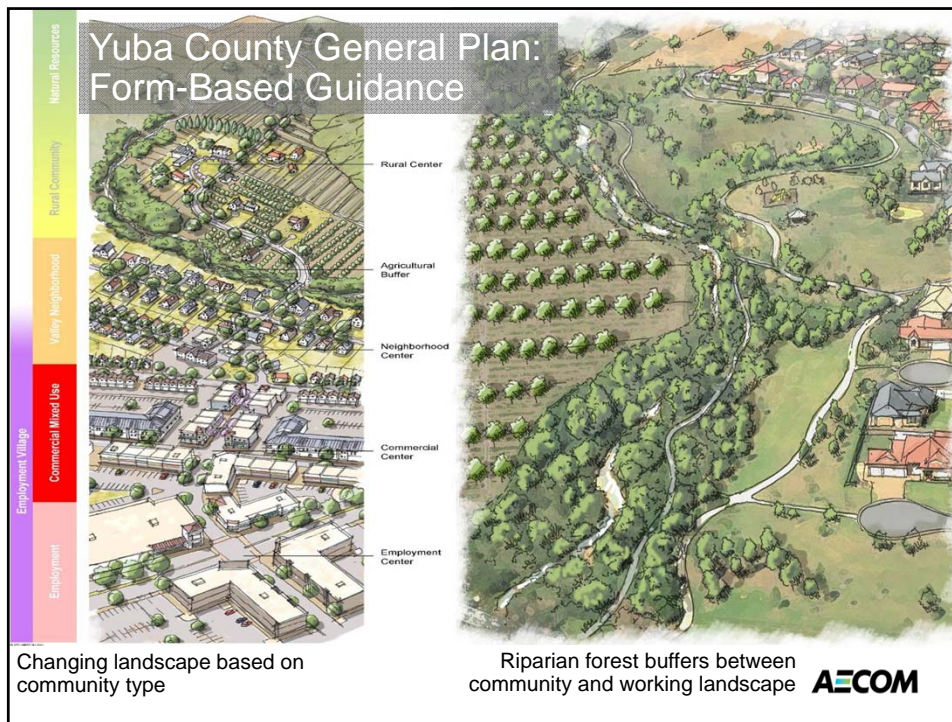
➤ Policies / design guidance:

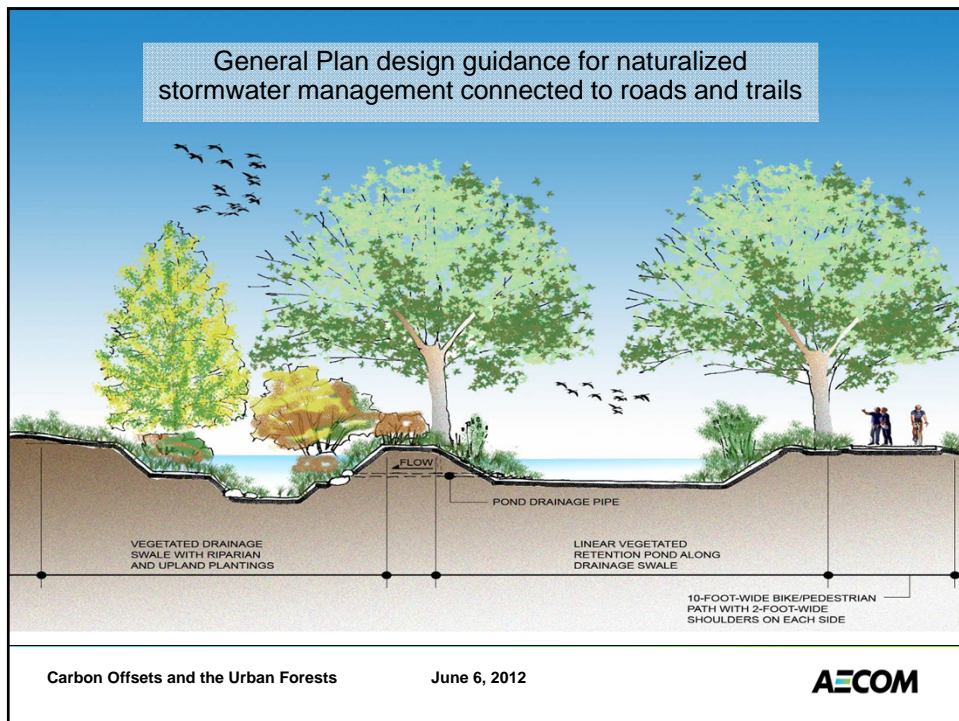
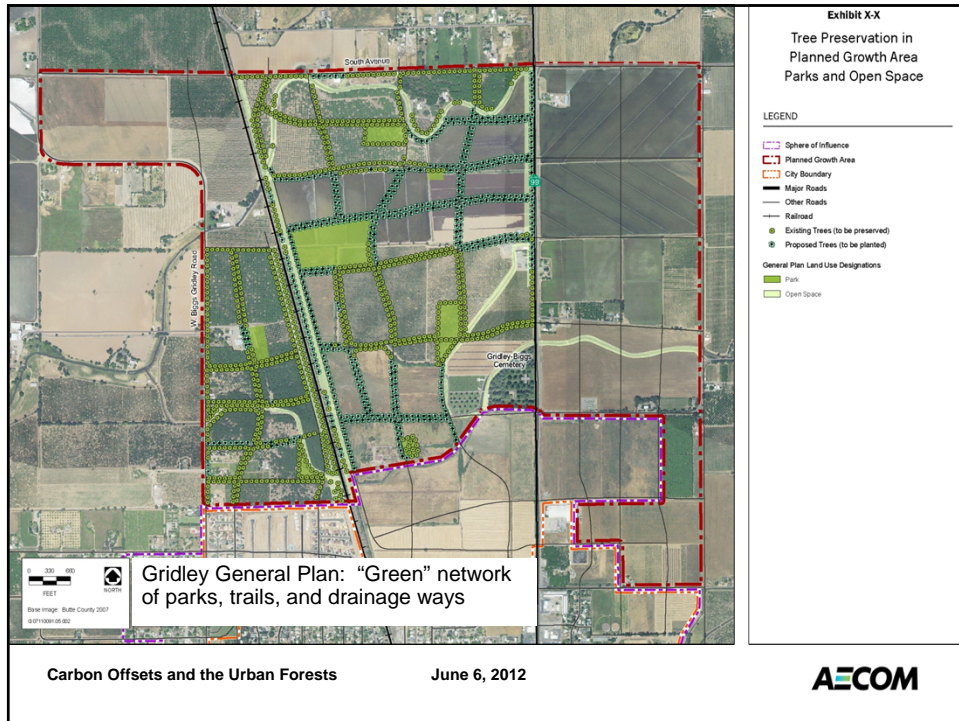
- General plans can provide guidance for community forests, tree planting, and habitat preservation
- Policies can direct preparation of community forest management plans
- Circulation / mobility policies can emphasize contribution of trees to walkable communities
- Climate action plans can reinforce urban forest policies and management plans

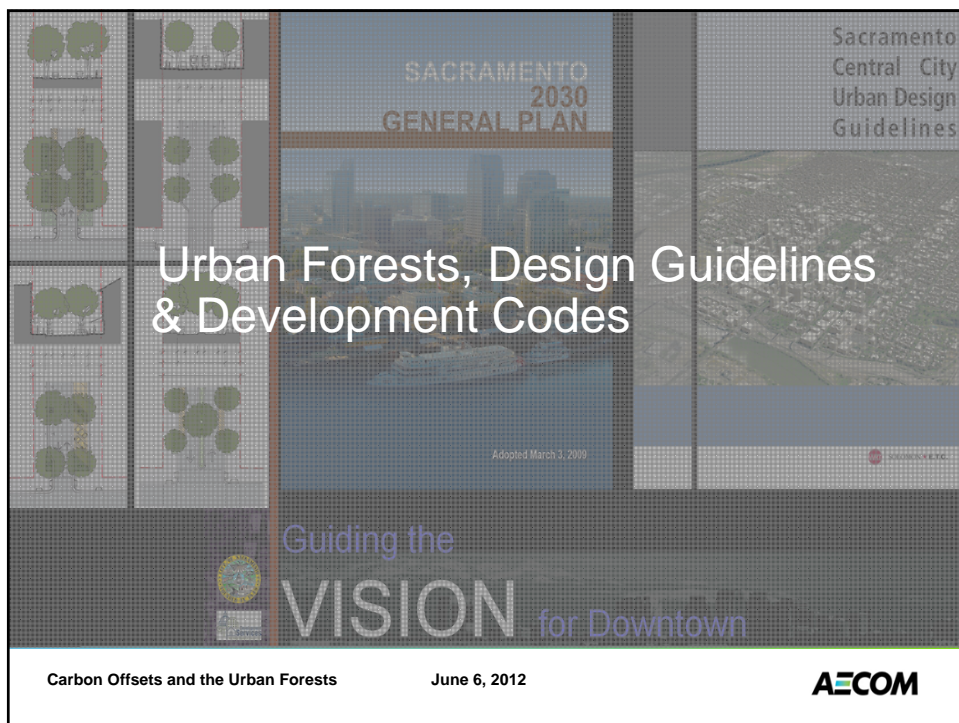
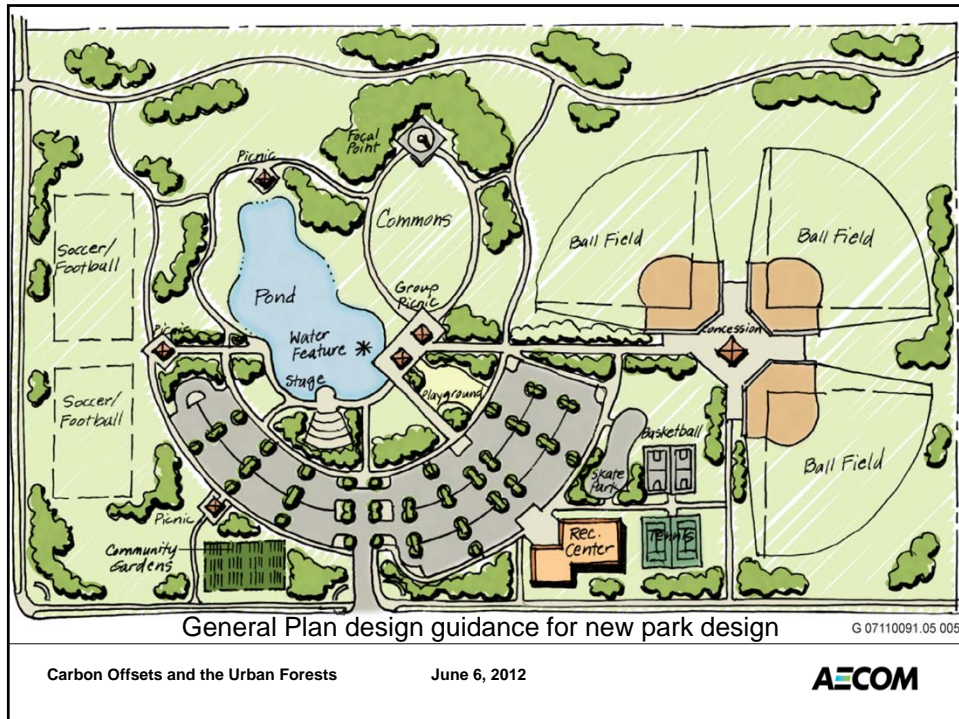
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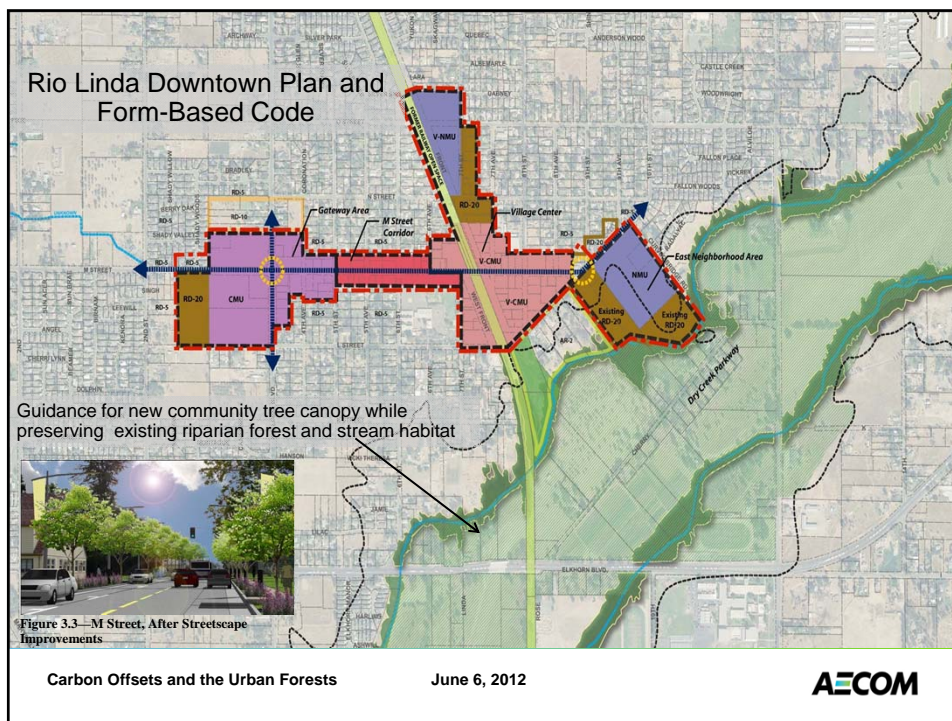
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North Highlands Town Center Code Sacramento County


- **Street Trees Standards:**
 - Consistent theme for each district
 - Variety of trees with large broad canopies that reflect climate and minimize water consumption
 - Adequate planter area and irrigation source
- **Tree Preservation:**
 - Retain existing street trees of significant value
 - Consult with arborist to reduce loss of healthy trees
 - Add new street trees consistent with existing tree patterns
 - Provide additional spaces on sidewalks to lessen concrete-root conflicts



**NORTH HIGHLANDS TOWN CENTER
DEVELOPMENT CODE**
Adopted 4-23-08

Zoning Code of Sacramento County
Title 5
Chapter 4

Sacramento County, California
Planning and Community Development Department
827 7th Street, Room 200
Sacramento, CA 95814
sacplan@sacounty.net



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Sutter Pointe Specific Plan (Sutter County)

- Enhance community safety and pedestrian environment by creating streets with regularly spaced trees in the parkway strip
- Plant the parkway area to create a shady tree canopy that will buffer sidewalks from the street
- Street trees should be selected to provide a shady canopy, while remaining within the scale of the street
- A detailed Streetscape Plan for all major highways and arterials will be established for Sutter Pointe
- Street tree plantings should consist of tall, high-canopied trees that grow to a height of at least 40 feet at maturity



Canopy trees in landscaped parkways and on-street parking with bulb-outs at intersections along local streets provide a safe and comfortable environment for pedestrians



Open space buffers provide a transition from agricultural to residential uses and create a visual amenity

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Community Forest Management Plans

CITY OF CARLSBAD CALIFORNIA

Community Forest Management Plan

the VILLAGE of CARLSBAD

April 2002

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Davis Urban Forest Management Plan

- Improve the quality of the Community Forest to optimize environmental, economic, habitat, and food
- Promote planting, preservation and protection of the existing Community Forest
- Maintain the City's trees in a safe, healthy condition as cost effectively as possible
- Facilitate collaboration among City departments on issues and projects involving trees
- Promote awareness and education on the importance of the Community Forest, tree planting and care, and participation in tree planting and stewardship
- Adopt the Community Forest Management Plan to guide long-term tree planting and maintenance



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Davis Tree Ordinance (Ch. 37 of Municipal Code)



	New Planting	Tree Work Associated With a Building Permit or Discretionary Review Process	Tree Work NOT Associated With a Building Permit or Discretionary Review Process
Landmark Trees	Process: Requires review and approval by the Planning and Building Department. Case may be referred to the Parks Director, City Arborist, and/or Tree Commission.	Process: Requires review and approval by the Planning and Building Department. Case may be referred to the Parks Director, City Arborist, and/or Tree Commission. A Tree Preservation Plan, approved by the City Arborist is required prior to commencement of any work (Sec. 37.05.010). Contact: Planning and Building 757-5610	Process: Requires review and approval by the Parks and Community Services Department. Case may be referred to the City Arborist, the Tree Commission, or both. Contact: Parks and Community Services 757-5626
Trees of Significance	Process: Requires review and approval by the Planning and Building Department. Case may be referred to the Parks Director, City Arborist, and/or Tree Commission. A Tree Preservation Plan, approved by the City Arborist is required prior to commencement of any work (Sec. 37.05.010).	Process: Requires review and approval by the Planning and Building Department. Case may be referred to the Parks Director, City Arborist, and/or Tree Commission. A Tree Preservation Plan, approved by the City Arborist is required prior to commencement of any work (Sec. 37.05.010). Contact: Parks & Community Services / City Arborist 757-5626	Process: Tree Modification Permit required for substantial pruning or removal on all properties except single family or duplex. Contact: Parks & Community Services / City Arborist 757-5626
Street Trees	Process: City street tree planting required of subdividers, developers and property owners (Sec 37.02.010). Contact: Parks & Community Services / City Arborist 757-5626 Planning & Building 757-5610	Process: Street tree planting may be required as a condition of project improvements. Any removal or modification will require an application and approved permit(s). May be referred to the Tree Commission. Contact: Parks & Community Services / City Arborist 757-5626 Planning & Building 757-5610	Process: Removal requests or Tree Modification Applications are submitted to Arborist & reviewed by Tree Commission. City Arborist shall be contacted regarding Street Tree planting or replacement. Contact: Parks & Community Services / City Arborist 757-5626

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Albany Climate Action Plan: Green Infrastructure improves community quality of life

➤ Implement Albany's Urban Forestry Program

- Plant 500 trees per year (5,000 by 2020)
- Encourage tree planting and other carbon sequestering landscaping
- Underground utilities to allow more trees
- Develop Green Streets program

Green infrastructure includes the urban forest... Green infrastructure benefits the City by improving local energy security, stormwater and waste management, and public health

Green Infrastructure Strategy

Enhance natural assets that improve community quality of life.

Total GHG Emissions Reduced:
130 Metric Tons

Objectives:
GI-1: Expand and Enhance City's Green Infrastructure - 100%

0.8%

Green infrastructure refers to a wide variety of natural features that, when integrated within an urban environment, provide valuable ecosystem services to the community. In Albany, green infrastructure includes the urban forest, bayshore and riparian habitat areas, and other natural stormwater-absorbing landscapes. Green infrastructure benefits the City by improving local energy security, stormwater and waste management, and public health. The measures contained within this strategy describe green infrastructure improvements capable of reducing GHG emissions or sequestering carbon within plant biomass.

Measure GI 1.1: Enhance the community's urban forest and other landscapes to maximize carbon sequestration, reduce stormwater runoff, and augment neighborhood aesthetics.

	Ongoing	Urban Forestry
C Plant 500 new trees per year.		Urban Forestry
D Develop outreach program to encourage residents and businesses to plant additional trees and other carbon sequestering landscapes on private property.	Before July 31, 2011	Urban Forestry Environmental Resources
E Explore potential for underground utility lines to facilitate planting of larger species of street trees.	Before December 31, 2012	Urban Forestry Public Works
F Develop a Green Streets Program to identify priority streets for pilot green street retrofit projects.	Before July 31, 2014	Public Works Urban Forestry Environmental Resources

Progress Indicators

	Target
i Number of trees planted per year.	500 trees per year
ii Number of total trees planted.	5,000 by 2020

Carbon Offsets and the Urban Forests **June 6, 2012** **AECOM**

Albany Climate Action Plan: Green Infrastructure improves community quality of life

Tree species is another important factor that determines the GHG reduction capacity of Albany's urban forest. Large species achieve significantly more sequestration capacity than smaller species. Additionally, trees with larger canopies and denser foliage provide more shade than other species. Large, deciduous species are ideal for reducing building energy as they provide shade in summer, but allow winter sunlight into buildings for passive solar gain in cooler weather.

Objective GI-1: Expand and Enhance the City's Green Infrastructure



Expanding green infrastructure in Albany will provide a wide range of benefits. The urban forest and other landscapes will sequester carbon and contribute to the achievement of the City's emissions reduction goals. The improvements will also benefit other community sustainability objectives, including stormwater management, and streetscape enhancement.

Measure GI-1.1: Enhance the community's urban forest and other green infrastructure to maximize carbon sequestration, reduce stormwater runoff, and augment neighborhood aesthetics.

The City will facilitate the expansion of the community's urban forest and other green infrastructure in the community. The City will prepare a Green Albany Plan to evaluate all potential "growing areas", including parks, streets, rights-of-way, parking lots, and rooftops, for carbon sequestration. The City will seek additional funding for the Urban Forestry Program to increase both tree planting and maintenance capacity, and will seek volunteer assistance to implement the program. In order to achieve the estimated GHG reductions, 1,000 new trees should be planted between 2010 and 2020. The City will set a goal to plant 500 new trees per year during this 10-year timeframe. Additional outreach to property owners and neighborhood organizations will be an important component in achieving this target. The City will encourage planting species known to provide high levels of sequestration.

The City will also establish a Green Streets program that works to reduce and/or eliminate concrete, asphalt, and other impermeable surfaces. The program will improve tree health, reduce stormwater pollution, and enhance the aesthetics of the community's neighborhoods. The City will establish guidelines for retrofitting existing streets into green streets and will identify priority streets for pilot projects. Green street efforts must be coordinated with sewer system repairs to avoid further infiltration and inflow into Albany's wastewater treatment system.

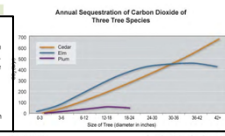
GHG Reduction Potential (MT CO ₂ e)	Cost to City	Cost Per Metric Ton	Private Cost
130	\$11,000	\$160	No

Action	Timeline	Responsibility
A. Prepare a Green Albany Plan to evaluate all potential areas (e.g. parks, streets, rights-of-way, parking lots, and rooftops) for carbon sequestration.	Before December 31, 2012	Urban Forestry Environmental Resources
B. Seek Urban Forestry Program funding to support increased tree planting and maintenance capacity.	Before July 31, 2010	City Council Urban Forestry

Background

Albany's Urban Forest

The City recognizes trees as a valuable asset. Albany has established an Urban Forestry Program to plant and maintain trees on public lands and rights-of-way. Trees beautify neighborhoods, increase property values, reduce noise and air pollution, keep buildings cool in the summer, create privacy, and establish habitat for bird species. Importantly, the urban forest also sequesters carbon as the trees grow.



Considerable variations in tree canopy coverage are found in different portions of the City. Areas with moderate canopy coverage include the Albany Hill area, parks, and in residential neighborhoods in the eastern and southeastern portions of Albany. Canopy coverage is generally lacking along San Pablo Avenue and in adjacent neighborhoods. This and many other areas of the City would benefit from additional tree plantings.



The City estimates that the Urban Forestry Program currently plants approximately 120 trees per year. Program staff have identified that a large number of potential tree planting sites exist within the City, and that with additional funding, Albany's urban forest could be considerably enhanced.

Urban Forest Carbon Sequestration and GHG Reductions

Trees can help the City achieve its GHG reduction target by sequestering carbon and by reducing building energy-related emissions. The capacity of a tree to reduce GHG emissions is dependent on its age and species. As trees mature, their canopies increase in size and provide higher levels of shade and greater levels of building cooling in hot weather. Additionally, trees gain carbon-capturing biomass as they grow. In Albany's coastal ocean-moderated climate, carbon sequestration can be expected to provide the majority of a tree's GHG reduction capacity. As summertime temperatures increase as a result of climate change, the building energy savings potential of the urban forest may become increasingly important.

The City recognizes trees as a valuable asset

Trees can help the City achieve GHG reduction by sequestering carbon

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Albany Climate Action Plan: Implementation

Green Infrastructure

Measure GI-1.1: Enhance the Urban Forestry/Urban Plants Program to maximize carbon sequestration on all public and private lands, including rooftops. Prepare a Green Albany Plan to evaluate all potential "growing areas", including parks, streets, rights-of-way, parking lots, and rooftops, for carbon sequestration.

This measure is based on the CO₂ sequestration rates of 500 trees planted in the City each year from 2010 to 2019. Carbon sequestration rates specific to the species and age of the planted trees were used calculate the annual sequestration potential of the trees from 2009 to 2020. The City's forester stated that with additional funding, Albany could plant 500 street trees per year over the next ten years.

Total value of measure: 130 MT/year

Sources of information:

The Center for Urban Forest Research Tree Carbon Calculator. Available: <<http://www.fs.fed.us/ccrc/topics/urban-forests/>>

USDA Forest Service, Pacific Northwest Research Station. "California Study Shows Shade Trees Reduce Summertime Electricity Use." Science Daily 7 January 2009. 20 February 2009 <<http://www.sciencedaily.com/releases/2009/01/090105150831.htm>>.

California Energy Commission [CEC] 2005. Electricity Usage During Peak Periods. Available:

<http://www.energy.ca.gov/electricity/peak_loads.html>

California Energy Commission [CEC] 2007. Impact Analysis 2008 Update to the California Energy Efficiency Standards for Residential and Nonresidential Buildings

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Albany Climate Action Plan: Quantification

Table 1-1 Summary of CAP Measures - Quantified Reductions							
Objective TL-2: Make Public Transit More Accessible and User-Friendly							
Measures	GHG Reduction Potential (MT CO ₂ e)	Percentage of Total GHG Reductions Achieved	Average Annual Cost	Cost per metric ton	Private Cost	Applies to New/Existing Development	
TL-2.2 Work with AC transit to provide bus stops with safe and convenient bicycle and pedestrian access and essential improvements such as shelters, route information, benches, and lighting.	115	0.7%	\$20,000	\$200	No	-	-
TL-2.3 Provide passes and shuttles to transit to encourage use of alternative transportation by City employees.	11	0.1	\$9,000	\$820	No	-	-
Objective TL-3: Promote Pedestrian- and Transit-Oriented Development							
Measures	GHG Reduction Potential (MT CO ₂ e)	Percentage of Total GHG Reductions Achieved	Average Annual Cost	Cost per metric ton	Private Cost	Applies to New/Existing Development	
TL-3.1 Provide public education about benefits of well-designed, higher-density housing and relationships between land use and transportation.	70 (combined total for all education programs)	0.5%	\$2,700	\$40	No	-	-
TL-3.2 Update planning documents to promote high-quality, mixed-use, pedestrian- and transit-oriented development in the San Pablo/Solano Commercial districts.	790	5.0%	\$3,800	\$5	No	-	-
TL-3.3 Evaluate GHG emissions associated with development proposals and work with applicants to reduce emissions during project review and incentive projects that generate low levels of GHG emissions.	Supporting measure (TL-3.2)	-	\$1k-45k	-	Yes	-	-
Objective TL-4: Reduce Vehicle Emissions and Trips							
Measures	GHG Reduction Potential (MT CO ₂ e)	Percentage of Total GHG Reductions Achieved	Average Annual Cost	Cost per metric ton	Private Cost	Applies to New/Existing Development	
TL-4.1 Work with ABAG and neighboring cities to improve the jobs-housing balance within the City and regional transit corridors.	225	1.4%	\$1,300	\$6	No	-	-
TL-4.2 Improve fuel efficiency of the City vehicle fleet by purchasing low- or zero-emission vehicles when vehicles are retired from service.	19	0.1	\$72,800	\$3,800	No	-	-
TL-4.4 Create and implement a voluntary transportation demand management (TDM) program to reduce weekday peak period single occupancy commute and school trips.	1,140	7.3%	\$10,000	\$9	Yes	-	-
Strategy Subtotal	4,665	29.8%					
Waste Reduction Strategy - Minimize waste.							
Objective WR-1: Become a Zero-Waste Community							
Measures	GHG Reduction Potential (MT CO ₂ e)	Percentage of Total GHG Reductions Achieved	Average Annual Cost	Cost per metric ton	Private Cost	Applies to New/Existing Development	
WR-1.1 Establish a citywide zero-waste target for 2030.	2,210 (2004 to 2020)	14.1%	\$1,300	\$1	No	-	-
Strategy Subtotal	2,210	14.1%					
Green Infrastructure Strategy - Enhance natural assets that improve community quality of life.							
Objective GI-1: Expand and Enhance the City's Green Infrastructure							
Measures	GHG Reduction Potential (MT CO ₂ e)	Percentage of Total GHG Reductions Achieved	Average Annual Cost	Cost per metric ton	Private Cost	Applies to New/Existing Development	
GI-1.1 Enhance the community's urban forest and other landscapes to maximize carbon sequestration, reduce stormwater runoff, and augment neighborhood aesthetics.	130	0.8%	\$21,000	\$160	No	-	-
Strategy Subtotal	130	0.8%					
Water Conservation Strategy - Celebrate water as an essential community resource							
Objective WC-1: Conserve Water in Existing Buildings/Landscapes							

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Urban Forests and Development Design

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Concept Design for California Indian Heritage Center (West Sacramento)



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Township Nine (City of Sacramento)

➤ Riverfront Park

- Preserve and protect the American River; improve open space and trails along the river thereby increasing access for all Sacramento
- Planned as a linear park located between the American River open space and riparian preserve
- Riverfront Park will be landscaped mostly with large native trees and lawn
- The existing Two Rivers Trail connect to a network of walkways within the park with access to parking along Riverfront Drive

TOWNSHIP NINE

FEBRUARY 11, 2010



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Creating Urban Forests (Stapleton, Denver)



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Visionary projects can preserve and enhance the urban forest, provide natural habitat AND achieve many other community co-benefits that reduce the urban carbon footprint

Capitol Towers, Sacramento

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A photograph of a park with a pond, trees, and a fountain. The fountain is spraying water into the air. The pond is in the foreground, and there are trees and a car in the background.

Planning for Urban Forests

Carbon Offsets and the Urban Forest

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