

American Public Works Association



Images provided by Nina Bassuk, Cornell University and Walt Warnier, Santa Monica

A Click, Listen & Learn Handout

A City of Palo Alto & Cornell University Presentation

Available at:

<http://www.apwa.net/Education/CLL/>

A City of Palo Alto Short Story using Structural Soils under Pavements

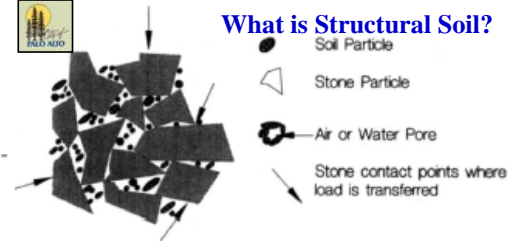
Prepared by Dave Dockter, Landscape Specialist, City of Palo Alto, USA

General Assumptions

- ❑ Trees that have difficulty surviving in an urban downtown environment surrounded by pavement live for an average of 7 years (Moll 1989) Those in parkway strip—32 years; lawn area behind sidewalk—60-200 years.
- ❑ City trees surrounded by pavement or concrete have the shortest lifespan and the smallest shading benefits.
- ❑ Soils that must support pavement are often too dense for root growth. Site grading crushes soil macro pores and it becomes denser. Literally, soil density becomes ‘dense as adobe clay bricks’.
- ❑ Support base under pavement is compacted to within 95 % of peak Proctor density. Proctor density or peak density test for compaction uses ASTM D-698 protocol.
- ❑ Consumers report they would be willing to pay, on average, 12% higher for products and linger longer in business districts with trees. Hardscape and parking areas without shade heighten the ambient heat island climate by several degrees. Unshaded parking and shopping districts reduces economic vitality.

Structural Soils (CU-Soil): How do they work?

- ❑ CU-Soil mixes are two part systems comprising a stone lattice for strength and soil for horticultural needs.
- ❑ CU-Soil depends on a load bearing stone lattice to support the pavement, providing stability through stone-to-stone contact while allowing interconnected voids available for root penetration, air and water movement.
- ❑ A strong wearing surface is installed on top of the mix (pavement, concrete, pervious pavers, landscape fabric, sand, soil, etc.) Thus, the area can serve dual purpose for parking/travel use and maximum potential for shade producing trees.



An engineered soil

Provides strength for load-bearing surfaces

Nutrient and water retention capability for tree growth



2002 Santa Monica, California



Structural Urban Tree Soil Mix



Tibco Campus, Hillview Avenue, Palo Alto 2002



A new planter is surrounded by parking spaces with the new lattice base material, providing the young London plane and Chinese pistache a larger root growing volume

Growth after **one year** in Structural Urban Tree Soil Mix



Image shows a 1/4-inch root leaving the original root ball, approximately 16-inches into the lattice soil medium



Pruneyard Towers, Campbell, CA 2002



Framed entry way with trees planted in CU-Soil



Pruneyard Towers, Campbell, CA 2002



London plane planted in CU-soil 1999.
3.5 Years after planting, these trees are full and over 30 feet tall.



Pruneyard Towers, Campbell, CA 2002



Trees from the same grow lot, from the same nursery, planted at the same time in conventional tree pits. These trees are not yet 20 feet tall and are developing at a much slower rate.

A Palo Alto Tour

of Projects Using

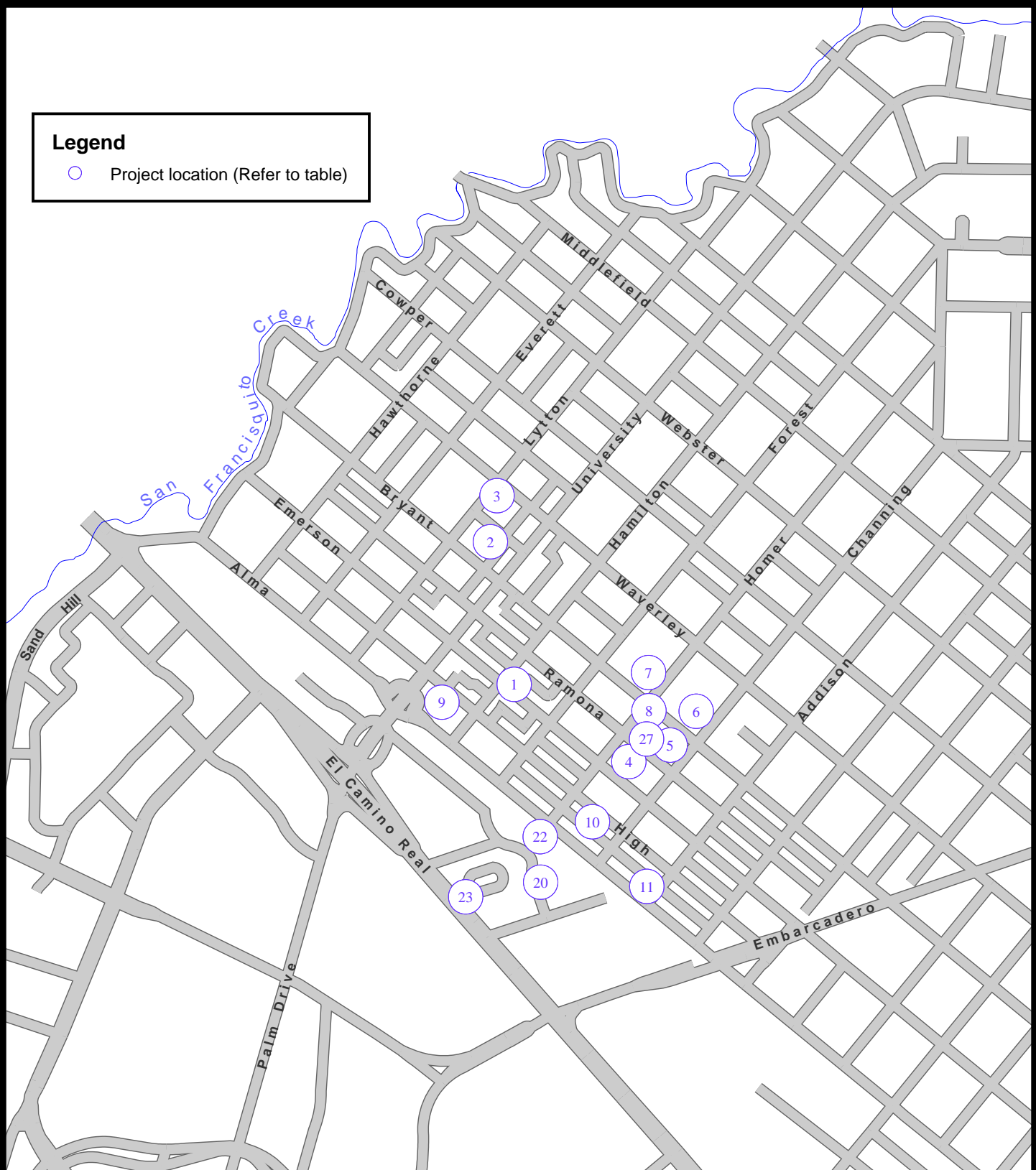
Structural Soil (CU-Soil) base course support for tree planting and/or Stormwater Management Design Technique

Map ID	LOCATION	CONSTRUCTION/PLANTING	COMMENTS
1	200 Hamilton Avenue @ Ramona	RoW sidewalk with structured soil base	2002_Chanticleer Pears. Base stopped near the existing Fern Pines
2	445 Bryant Street @ Lytton	Public Parking Garage structured soil base under sidewalk for Yarwood London Planes and under public plaza with Idaho Locust 'Purple Robe' trees	2004
3	390 Lytton Street @ Waverley	(Ely Building) Structured soil base for sidewalk planted with Camphor and Australian Willows. 3' deep planter depth is over subgrade parking garage out to the curb.	1998
4	820 Ramona Street	New building and street trees with structured soil base	2006
5	845 Ramona Street	Oak Court Affordable Housing Project. Crepe Myrtle trees in the RoW with structured soil base and Frontier Elm along Channing Avenue with structured soil base.	2005
6	325 Channing @ Bryant	Woodmark. RoW sidewalk with structured soil base for Black Maples.	2004. SS install stopped in proximity of existing mature Southern Magnolia trees
7	315 Homer & Bryant Street	University Park Multi-family Homes. RoW sidewalk with structured soil base for new trees	2004
8	260 Homer Avenue	French Laundry - Historic and commercial buildings with public plaza	2006
9	258 Alma/High Street @ University	Public Parking Garage plaza with structured soil base for Maidenhair trees	2004
10	800 High Street @ Homer-Channing	New mixed-use project with structured soil base for new street trees	2006
11	999 Alma Street @ Addison	Anthropologie/Addison Antiques. Retrofit project using structured soil trench base under pervious pavers for new trees in parking lot.	2001
12	2475 Hanover @ California Ave	(Pillsbury Winthrop) RoW sidewalk with structured soil base for Moraine Ash and Maidenhair trees. Not installed in proximity of mature holly oak.	2004. Rear parking areas between tree islands is 2' deep x 15' wide. Note: at rear end of parking a Mono-pine Cell Tower can be viewed (NanoSystem, 2625 Hanover)

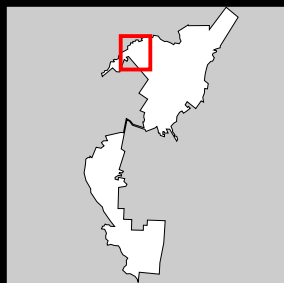
13	3180 Porter Drive	(Jazz Pharmaceuticals) Rear parking lot has large paver sections with a structured soil base for storm water detention.	2000
14	3160 Porter Drive	100% Storm water management site. This site is designed with maximum pervious area, with structured soil base for pavers, site design integrated many large mature tree resources, low branches allowed to remain growing to the ground, a unique pervious entry promenade—all with ADA compliance intact.	2001. This site is a five-star sustainable design model
15	3201 Hillview Avenue	Enter off Hansen Way. Rear parking lot incorporates structured soil base between Columbia Plane tree islands, and pervious paver sections over 2' deep structured soil base.	2000
16	3105 Hillview Avenue	(Tibco) Rear Hackberry (Celtis) trees are planted in diamond islands that are small but enabled by structured soil base for the asphalt wearing surface above. Broken curbs allow water into landscape.	2002
17	395 Page Mill Road @ Olive & Park Avenue	(Agilent Technologies) This site incorporates structured soil base for parking surfaces between mature pines and elms; pavers; includes passive landscape valleys for staged flood release and detention ponds.	2002. A model SWPPS site that functions as a 100% stormwater management site. Designer: DES Architecture, Redwood City. A must-see site for any design concept tour.
18	870 Charleston	SWPPS management features. Four detention basins 15' x 15' x 6' deep with structured soil/base rock covered by Rima stone pavers.	2005
19	3401 Hillview	A state-of-the-art green building 13 acre project using liberal SWPPS design technology; structured soil base material under pervious concrete, pavement and pavers; roof top gardens; edible trees and plantings and interactive and interpretive landscape components.	2007
20	630 Urban Lane	This Palo Alto Medical Foundation street transports over garage podium. Yarwood London Planes are planted in an alee fashion.	2001
21	Briones School Grounds	(Palo Alto Unified School District)	2004
22	Homer Tunnel	Public RoW; Planted Chanticleer Pear	2005
23	795 El Camino Real	(PAMF) RoW sidewalk with structured soil base; Planted London Planes	
25	El Camino Real @ El Camino Way	(Starbucks) RoW sidewalk with structured soil base; Planted London Planes	2005
26	2825 El Camino Real	Old Pro-RoW sidewalk with structured soil base; Planted London Planes	Planned
27	819 Ramona	Old Zion Church-RoW sidewalk with structured soil base; Elegant Tristania	2007
28	2701 El Camino Real	(Sunrise Assisted Living) RoW sidewalk with structured soil base; Planted London Planes	2006
29	901 San Antonio	(Campus for Jewish Life) RoW sidewalk with SS base	Planned

Legend

- Project location (Refer to table)



The City of
Palo Alto

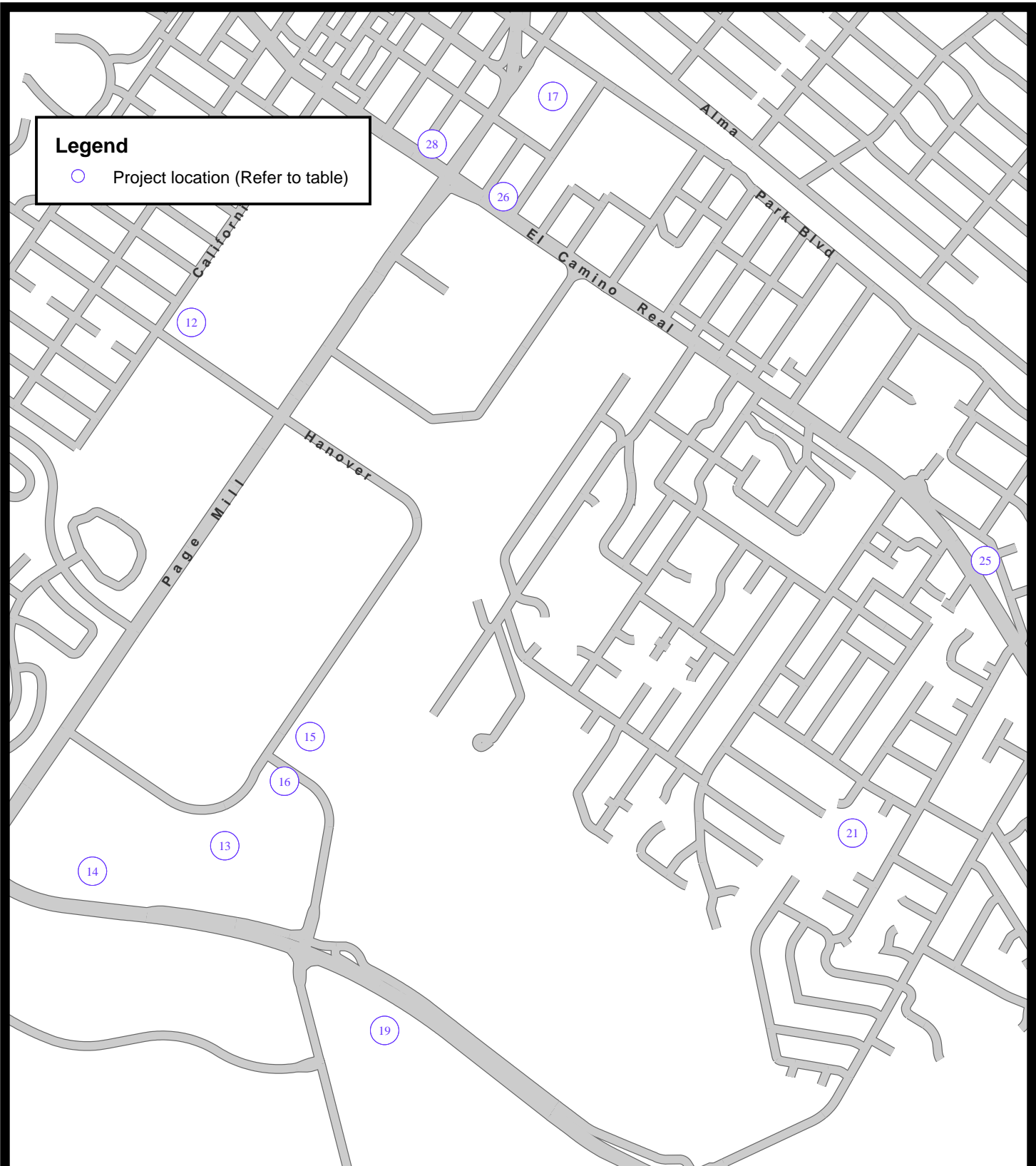


Structural Soil Locations Downtown Palo Alto

Map prepared by: Bridget Ryan Approved by: Dave Dockter

This map is a product of the
City of Palo Alto GIS



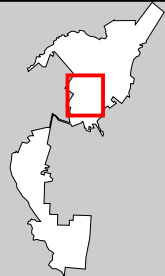


Legend

○ Project location (Refer to table)



The City of
Palo Alto



**Structural Soil Locations
Stanford Research Park and
Other City Locations**

Map prepared by: Bridget Ryan Approved by: Dave Dockter

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Title:	Engineered Structural Soils	© 2006 American Public Works Association
Date(s):	May 4, 2006	
Schedule:	8:00a - 10:00a Pacific 9:00a - 11:00a Mountain	10:00a - 12:00p Central 11:00a - 1:00p Eastern
Location:	Audio/Web Broadcast	
Cost:	Members: \$150.00 per site Non Members: \$200.00 per site	
Register by:	Wednesday, May 03, 2006 <i>After this date, please contact Carrie Merker at (800) 848-2792 or education@apwa.net.</i>	
	REGISTER ONLINE! Fax registration form: Registration form.pdf	
Description:	<p>Any trees unfortunate enough to be planted near sidewalks and pavements suffer from inadequate water, nutrients, and oxygen. That's because the soils under sidewalks and pavements must be compacted to meet load-bearing standards and are, therefore, too dense to support tree growth.</p> <p>Engineered structural soils are able to bear pavement loads after compaction and still allow root penetration and healthy tree growth. These soils also guide roots away from the pavement, thereby eliminating sidewalk heaving. Does this sound like the answer to your future design needs?</p> <p>Don't miss this opportunity to learn about:</p> <ul style="list-style-type: none"> • The component mixes of structural soils for various conditions • Which projects are most suitable for using a structural soil mix • The potential costs of implementing this technique • When to advocate for structural soils in the development review process <p>Links to specifications and permanent resources will be provided in this program</p> <p>Who should attend? Public works professionals, arborists and urban forestry specialists, urban designers, architects and planners will all benefit from this program.</p> <p>This program has been approved for .2 CEUs or 2 PDHs. The form to request these credits is included in the handouts for this program.</p>	
Speaker:	Nina Bassuk, Ph.D.	
	Nina Bassuk, Ph.D., is currently professor and program leader of Cornell University's Urban Horticulture Institute. Her work focuses on the physiological problems of plants grown in urban environments, including plant selections, site modification, and transplanting technology. One of her major research projects has been the development and testing of 'CU-Structural Soil' and the refinement of specifications to make it more cost-effective.	
Speaker:	Dave Dockter, APA	
	Dave Dockter, APA, is employed as Managing Arborist for the City of Palo Alto, California Department of Planning and Community Environment. His experience includes landscape and site-planning design; park and open space development, and tree management. Dave spearheaded the City of Palo Alto's foray into the use of structural soils beginning in 1998. Palo Alto expects a reduction in sidewalk and hazard repair costs and enhancement of its streetscape quality and shade tree cover.	
Contact:	Carrie Merker : (800) 848-2792 (phone) (816) 472-0406 (fax) education@apwa.net	



Moderator:
Phillip S. Estes

Project Manager,
City of Olathe, Kansas



Nina Bassuk, Ph.D.



Dave Dockter, APA