Summer 2006

California Shade

A Newsletter From The California Department of Forestry and Fire Protection Urban Forestry Program

Right Tree Right Place

A citizen tree care workshop was held at the City of San Luis Obispo's Corporation Yard facility in San Luis Obispo on October 15, 2005. The event was hosted by the Central Coast Urban Forest Council and organized by Ron Coombs, City Arborist for San Luis Obispo, to provide a forum for community education and involvement as well as networking opportunities. More than 30 people attended the workshop, which combined classroom lectures with outdoor demonstrations from a variety of experienced speakers.

The workshop was sponsored by: Central Coast Regional Urban Forest Council, City of San Luis Obispo, Solid Oak Tree Management, CDF, Cal Poly Urban Forest Ecosystems Institute and Pacific Gas and Electric.

Ron Coombs demonstrates how to plant a tree at the Citizen Tree Care Workshop in San Luis Obispo. Participants were shown how to choose healthy nursery stock and the proper way to unbind the roots before planting container-grown trees.

Hot Topics

Proposition 12
Grants have been revised

Look for new simplified grant applications at the UFEI web site at www.ufei.org. Grants for 2006 include: "Green Trees for The Golden State" for community tree planting, and Leaf-It-To-Us for tree planting projects at California schools.

Leaf-It-To-Us

The campus of Sisson School in Mt. Shasta encompasses several large open playfields that have historically been used for soccer, softball and other recreational activities. The largest of these fields lies in a very visable and scenic location adjaent to Sisson School and boasts an outstanding view of Mt. Shasta and the surrounding mountains. The school and the local recreation district have both been involved in restoring this playfield and Sisson School used their CDF-sponsored Leaf-It-To-Us grant to plant more trees around its periphery for shade, windscreening, educational opportunities and aesthetic enhancement. *See photo at right.*

The project planted 43 deciduous and conifer trees around the playfield. The trees were planted by teachers and 7th and 8th-grade students at Sisson School in conjunction with a landscape contractor, a landscape architect/arborist, a project coordinator, parents, recreation district workers and community volunteers. Educational presentations were made to Sisson School students before the trees were planted to teach them about the different types of trees, why they were selected, their benefits, how to plant them correctly and their maintenance needs.

Coleman Elementary School in San Rafael, is a newly reconstructed four-acre elementary school . As part of the new landscaping plans, this Leaf-It-To-Us grant enabled the school to plant four shade trees that their budget would otherwise not have been able to fund. The school chose Bigleaf Maple, Scarlet Oak, Valley Oak and Coast Redwood, all selected for their beauty, shade-giving utility and their ability to thrive in the San Rafael area. All but the Scarlet Oak are California natives and the Coast Redwood is one of California's state trees, the other being the Giant Sequoia.

The objective was to plant large-canopied trees to provide shade to the classrooms, ease the load on air conditioning systems, enhance the aesthetic beauty of the school grounds and teach the students about the beauty and functional value of trees in the urban environment. *See left and below.*

Trees and Pavement Damage

By Bruce W. Hagen, Urban Forester

One of the most costly and perplexing problems confronting municipal arborists and urban foresters today is repairing tree root-damaged pavement—sidewalks, curbs, and gutters. Not only is repairing damaged infrastructure a major expense, but it is a serious liability issue. The cause is largely attributable to inappropriate tree selection, lack of space to accommodate the expanding roots and trunk, soil compaction or engineering methods.

"A survey taken several years ago of 18 California cities indicated that approximately $70.7 million was spent annually statewide due to conflicts between street tree root growth and sidewalks, curbs, gutters, and street pavement. The largest single expenditure was for sidewalk repair ($23 million), followed by curb and gutter repair ($11.8 million), and trip and fall payments and legal staff time ($10.1 million). Property owners paid 39% and 17% of tree-related sidewalk and curb and gutter repair costs, respectively. Substantial funds were invested to remove and replace trees in conflict with hardscaping ($6.8 million), and for inspection and repair administration programs ($5.9 million). Root pruning and root barriers were the most important mitigation and prevention measures." *Greg McPherson, USDA Urban Forestry Research Center in Davis, CA*

In most cases, the soil beneath paved surfaces has been mechanically compacted to prevent settling and subsequent pavement failure. Soil compaction destroys the soil's natural porosity by eliminating the pore spaces, which allow for water movement, gaseous exchange and root penetration within the soil. Thus, compacted soil contains little air, holds little available water, and is harder and more resistant to water and root penetration. Soil compaction leaves the soil beyond the planting pit or strip largely inhospitable for root growth. Thus, root growth is restricted to the small volume of backfill soil immediately around the root ball, or where conditions are more favorable, e.g., the sand/gravel base material under the pavement, the soil/pavement interface or the coarse backfill in nearby utility trenches under the pavement.

The growth of most street trees is further constrained by the pavement at the edge of the planting pit or strip. As trees grow their expanding trunk bases and large buttress roots often lift or displace nearby pavement. The result is sidewalks, curbs and other paved surfaces that are unsightly and unsafe for pedestrians. Many cities are plagued by tree/pavement conflicts and much of their limited tree budgets are used for infrastructure repairs and pedestrian injury ("trip and fall") lawsuits. Other cities, though, have experienced less serious problems. Although these differences are often attributed to the tree species used, and/or to the size of the planting pit or strip, other factors may be involved.

Soil texture and structure are two soil characteristics that influence rooting depth. Soil texture, (the relative composition of sand, silt and clay), determines in large measure soil aeration, drainage, water-holding capacity and relative fertility. Soil structure, the arrangement of soil particles into larger aggregates, is perhaps the most critical element influencing rooting depth because it provides soil porosity needed for root penetration, adequate aeration, drainage and water-holding capacity. *The loss of soil porosity due to soil compaction is a leading cause of shallow rooting and poor growth in urban trees*. Impenetrable layers, e.g., rock, hardpan, or a perched or high water table, as well as excessive irrigation nearby may also account for some of the variability. Many older neighborhoods have experienced little or only moderate damage

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because developers were required to allocate more space for trees, and because building codes back then required less soil compaction.

In residential areas, street tree roots are typically found exploiting the soil on the abutting property where the soil conditions are more favorable. Although some roots grow diagonally downward, most grow laterally under the sidewalk in the base material just above the compacted soil layer. Most cities require a 4-inch thick layer of granular material as the subbase under the pavement. The base material and soil directly beneath are relatively moist due to condensation that occurs in response to warming and cooling of the pavement. The increased moisture, improved soil aeration and ease of root penetration, encourages root proliferation in this area. For trees to survive in compacted soils, they must 'break out' of their restrictive planting spaces and exploit a greater volume of soil capable of providing adequate water, nutrients, and soil porosity for gaseous exchange.

Current methods of managing pavement damage

Municipal response to pavement displacement usually involves temporary asphalt patches (wedges) or in more severe cases, removal of buckled pavement followed by root pruning (cutting off the 'offending' roots) or in some cases, 'shaving' the topside of the root causing displacement before repaving. (*This involves cutting the root tangentially along its axis to reduce its thickness. The idea, ostensibly, is to maintain some root function and anchorage. Drawbacks include: increased potential for severe root decay and vigorous callusing near the edges of the wound, which can quickly displace the repaired pavement*).

Some managers cut roots to a pre-determined depth at the edge of the sidewalk using a stump router or similar devise, while others remove the pavement and excavate by hand or with an air compressor tool to determine which roots need to be cut, and which ones can be left intact. The latter method is more labor intensive, but typically causes less root damage. When it's necessary to cut many large buttress roots close to the trees most municipalities favor tree removal rather than root pruning. Such root pruning can increase the risk of windthrow or cause dieback or even death. Many cities, fearing a recurrence of pavement damage, replant with small growing species, e.g., crape myrtle, trident maple, flowering plum, etc.

Best management practices

Most cities remove the damaged pavement, prune the offending root(s) close to the tree, install root 'deflectors' and then repave. Several more innovative cities are pruning the buttress roots at or near the zone of 'rapid' taper, which minimizes destabilizing the tree. Deflectors are then installed outside where the roots were cut. The new pavement is then in a meandering, curvilinear fashion around the tree, causing less damage, while giving the trees more space. The main drawback with this option is obtaining easements from neighboring property owners.

Root pruning can be avoided in some situations, by 'ramping' over the exposed roots with fill soil and then installing metal-reinforced concrete pavement. This, of course, is not a permanent fix as the roots will continue growing, but the reinforced 'ramp' is somewhat flexible and moves largely as a unit. Thus, there are no individual raised panels to trip pedestrians. One refinement to this system is to place a section of firm yet compressible foam over the root(s) so as the root continues to expand it will compress the foam and not raise the pavement. Bridging over shallow roots with arched, preformed concrete panels is another method to avoid cutting roots.

A number of cities are currently experimenting with rubberized pavers (shown above) to replace pavement that has been damaged by tree roots. The flexible pavers can be easily lifted to cut new problematic roots and then be replaced. When bonded together they are displaced as a unit so that individual pavers are not lifted by new root growth thereby avoiding a trip liability. Larger sections can be poured in place.

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Another option to avoid having to replace large panels of pavement is the use of landscape pavers set in sand instead of a monolithic panel of concrete. This allows displaced pavers to be easily removed and replaced after accessing the offending root. Where pedestrian traffic is not a big issue and high value trees are involved, sidewalks can also be eliminated and replaced with a porous, yet compactable fill like decomposed granite. This can prevent having to severe roots.

Expansion joints are installed in concrete panels to prevent cracking for soil subsidence. One advantage is that also they typically crack at the joint when displaced by roots. This helps to limit the size of pavement that must be replaced. So, another option would be to install the joints closer - say every 24 inches rather than 48 inches.

Root pruning

Root pruning followed by pavement replacement has become a necessary evil for most cities. Unfortunately, it is a short-term solution which can shorten the useful life span of the tree and increase risk potential. At best, this approach is temporary, as roots grow back causing renewed damage. Over time the intervals between needed repairs decreases and damage often worsens. Eventually, otherwise healthy and valuable trees are routinely removed when the repair costs become excessive.

The major concerns of root pruning and trenching for barrier installation include:

- What type of root system is being treated?
- Where and how roots are cut, e.g., roughly or cleanly, close to trunk, within the buttress zone or beyond.
- Will the sinker roots be affected?
- Is the timing favorable, i.e. done when environmental stress is low and root regeneration is greatest (early spring, late summer/fall)?
- Follow up treatment is also important. Irrigation is helpful, but fertilization and pruning to compen sate for root loss may delay root regeneration.
- The type of barrier used, e.g., deflector, engagement or chemical inhibition, how it's installed, and soil conditions are all important considerations.

Other issues that must be addressed include:

- increased failure potential, drought stress leading to dieback and decline, increased pest problems, impermanence of treatment, cost effectiveness, and obtaining easements to divert sidewalks.

Preventing damage

Design

Obviously, the most effective means to prevent root/pavement conflicts is to increase the distance between trees and infrastructure. The greater the distance, the lower the potential for damage. Simply by increasing the dimensions of pavement cutouts from the standard 4 ft. x 4 ft. to 6 x 6 ft. or greater would help to minimize pavement damage or at least delay its onset. A 6 ft. x 6 ft. cutout is just barely adequate for medium sized tree—those attaining 25 to 35 ft at maturity. For large-growing trees, the

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cutout should be no less than 8 ft. x 8 ft. Certain trees like *Ficus*, camphor, ash, red maple, *Liquidambar*, *Chorisia*, etc., typically require twice that to avoid damaging pavement. Another approach is to design and build favorable habitats for urban trees. Instead of planting in straight, evenly spaced rows, plant trees in 'groves' along streets.

Other methods include excavating large cutouts and filling with engineered soil mixtures, which can be compacted and paved conventionally. Large planting pits, e.g., 10' x 10' x 4,' filled with a non-compacted soil mix, can be covered by cantilevered, reinforced concrete panels. Auguring vertical holes in the corners and filling with gravel can often provide adequate drainage in these large holes. Another possibility is to use pre-stressed concrete panels, supported by piers, to span over large planting pits to create 'air gaps.' A less expensive method involves creating root 'channels' in compacted soil by digging narrow trenches radiating outward from the edge of the pit, and then backfilling with a favorable soil mix before replacing the pavement.

Contiguous curb and sidewalks

In some parts of the country, tree lawns–wide planting strips (greater than 10 feet across) between the sidewalk and street are still common. They were typically planted years ago with large growing trees that have since attained great size without causing much pavement damage. Unfortunately tree lawns with their towering and shady canopies are a thing of the past. Space, particularly for trees, comes at a premium. Most cities, pressured by developers to increase building density, have eliminated the planting strip altogether by placing the sidewalk directly against the curb. So, in many new residential developments there is no space for street trees. 'Contiguous' curbs and sidewalks can provide more adequate space for tree growth, but does not provide a buffer between pedestrians and vehicles. Because residential lots have gotten smaller, space for large-growing trees is often lacking. And unless developers plant trees as a requirement of building, trees may never be planted.

Creating Space

Although offending trees can be replaced with smaller growing species, a better, but certainly more expensive solution is to increase available space by redesigning the infrastructure. For example, cutouts can be enlarged when there is sufficient sidewalk space, planting strips widened, pavement curved around trees and curbs eliminated or 'popped' out. Planting trees in specially designed vaults where broad expanses of pavement are needed for pedestrian traffic is a proven method to ensure reasonable growth without causing pavement damage. Space to accommodate large growing trees can be reclaimed by narrowing roadways or eliminating parking along one side of a street–not a very popular idea, but possible. This area can then be used to increase space for trees along one or both sides of the street. In parking lots, adequate space can be obtained by devoting an entire parking space or two (end to end) for large stature trees. One option that I heard to reduce the cost of pavement repairs is to install expansion joints around the perimeter of a standard cutout about a foot from the inside edge. A concrete-saw could be used to precut a 'break' zone around a cutout. In this manner, roots will displace or break only the small outer ring of pavement instead of the whole panel. The displaced or damage portion can be broken up for removal and the space filled with porous but compactable material.

Root barriers

Although root barriers are commonly thought to minimize or delay tree caused pavement damage, there is some concern about their long-term effect on tree health. They work by deflecting root growth and they trend to work best in deep and uncompacted soil. Tree roots forced downward by root barriers often return to the surface in compact-

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ed soil. Unfortunately, root barriers don't solve the underlying problem of an unfavorable root environment.

Engineering

Eliminating or altering the sand or gravel base under pavement has been discussed by a number of researchers, but doesn't appear to be very promising. The use of rigid foam has also been discussed but research data is lacking. Pervious pavement is another possible option, but there are questions about how it will hold up and if it will remain pervious over time.

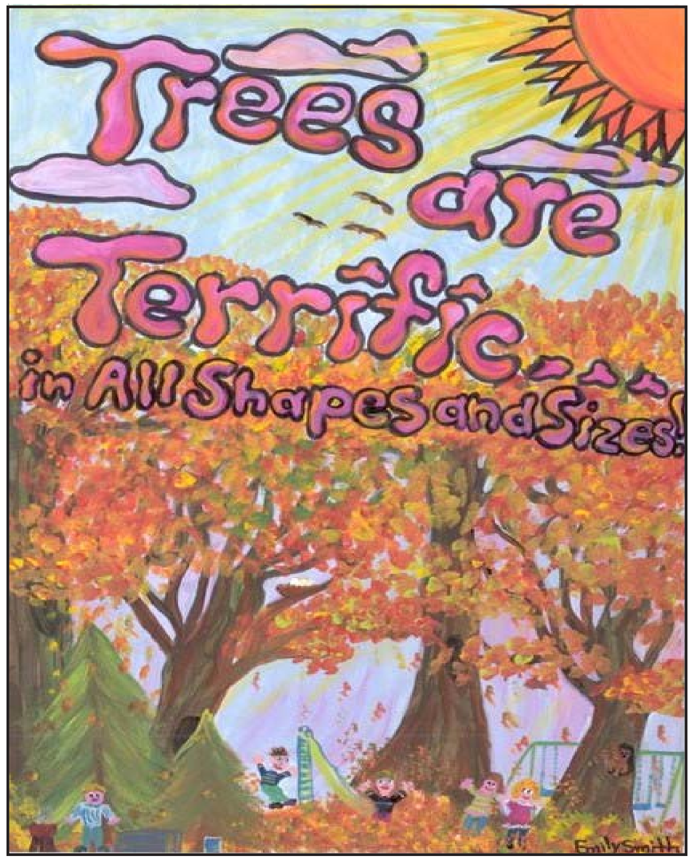
Species selection

Careful assessment of each planting site and careful selection of a species appropriate to the specific site conditions can minimize future problems. When large trees are desired, adequate space must be provided to avoid pavement damage and associated costs. Costly repairs, personal injuries, tree damage and loss will continue unless city/county planners are willing to redesign the infrastructure to provide more favorable conditions and rooting space. Size of roots, depth of rooting and rate of root growth vary greatly by species. Thus, certain species are associated with more sidewalk damage than others. Municipalities would do well to determine which tree species are adaptable to the given site conditions and space constraints.

Rather than looking for alternatives, many cities are gradually replacing their larger, more expensive trees, with smaller, less damaging species. This approach, while initially reducing costs, is shortsighted because larger trees provide greater environmental, economic and social benefits. If this trend continues, the character of our community forests and the quality of life in urban areas will change. Large trees in urban areas are desirable and should be retained whenever possible, and emphasized in the general plan. When space is limited and large trees are required, specialized engineering and designing techniques are needed.

The above discussion is by no means complete; there are certainly other options and new strategies are being developed. For a more complete discussion see *Reducing Infrastructure Damage by Tree Roots:* A compendium of Strategies, L.R. Costello, and K.J. Jones, A Western Chapter of ISA Publication, 714-639-3610.

California's 2006 Arbor Day Poster Contest Winner



"Trees are Terrific...in All Shapes and Sizes!" is the theme for the 2006 Arbor Day Poster Contest, sponsored by the National Arbor Day Foundation. Here in California, the contest was co-sponsored by the California Community Forests Foundation.

Emily Smith from the Ekstrand Elementary School in San Dimas crafted California's winning poster. Forty-nine 5th grade classes from around the state competed for the top prize of a $100 dollar check from the California Community Forests Foundation and the opportunity to compete at the national level with winning posters from other states. The national winner will receive a $1,000 savings bond and an expense-paid trip to the Lied Lodge & Conference Center, home of the Arbor Day Farm.

California's winning poster will be displayed at various locations throughout the year including State Scientist's Day on May 24, 2006 in Sacramento and at the California State Fair's Forestry Center from August 11 through September 4, 2006. After May, 2006 check www.caltrees.org for information about the poster display locations.

1,000th Tree Planted

By ALDRICH TAN,Daily Democrat

A soft wind howls near Highway 113 on a freezing Saturday morning. Local resident David Wilkinson and other volunteers place young oak saplings into the compacted soil next to the highway. “It’s cold when you start working,” he said, “but it doesn’t take long to warm up once you start digging and planting. Trees will add so much beauty to these transportation routes. “

Wilkinson is president of Woodland Tree Foundation, a nonprofit organization that is helping maintain Woodland’s namesake as the “City of Trees” by supporting urban forestry in the city. The organization has planted more than 1,000 trees in and around Woodland, since the Tree Foundation’s first tree planting five years ago.

“Woodland has had a civic tree planting tradition for at least a century,” he said. “It feels good to be a part of that history. “

The Woodland Tree Foundation planted its first tree during the city’s Arbor Day celebration in 2001, Wilkinson said. Foundation members planted trees on Bush Street between First Street and College streets.

“The asphalt and sidewalk generate a lot of heat in the summertime so downtown shade trees have a big impact,” he said. “We thought the event would be a visible way of bringing the community together and call attention to Woodland’s long tree tradition. “

Following its formation, the Foundation received its first state grant from the state department of forestry, funded by Proposition 12, to plant trees in the downtown area and low-income neighborhoods, Wilkinson said. The City Council adopted a resolution to provide matching in-kind funds.

Throughout the years, the foundation’s funding comes from other grants by the Department of Forestry, Pacific Gas & Electric’s Safe Tree Program, donations from local businesses and support from the community, Wilkinson said.

The Foundation does not have any paid staff and relies on volunteers to raise funds and plant trees.

“We find our volunteers through word of mouth and community service announcements,” Wilkinson said. “I’m proud of the volunteers that come out to help us because they care about the community and the future environment.”

Foundation volunteers include members of the local Boy and Girl Scout troops, churches, college fraternities, volunteer clubs, and AmeriCorps.

The foundation organizes community tree planting events on Saturday mornings with local volunteers, Wilkinson said. Plantings can take up to six weeks to prepare for. City staff needs to determine if certain underground electrical utilities will complicate plantings in the area.

The foundation’s volunteers also take extra time to contact neighbors and landlords to approve the plantings in front of their properties.

Regularly scheduled tree plantings will resume in late February with an Arbor Day celebration planned for March 11 at the Gibson House, Wilkinson said.

One of the foundation’s goals is to re-introduce native tree species to Woodland, Wilkinson said.

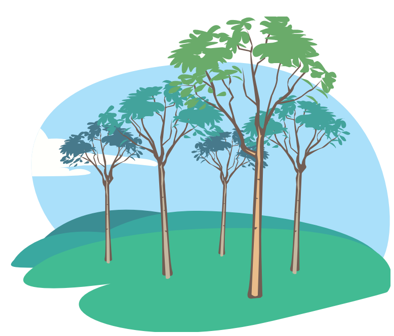
For its freeway plantings, the foundation plants mostly native valley oak, black walnut and redbud trees since they are adaptable to the climate.

“We’ve lost a lot of native oaks due to urbanization,” he said. “It’s nice to re-introduce them back to the community.”

Last March, the foundation organized a large planting of native trees around Plainfield Elementary School, located on local roads 97 and 25A. Each classroom planted a tree seed and the older children and parents planted real trees all around the perimeter of the school.

Within ten years, motorists driving along Highway 113 will also notice the Foundation’s work, Wilkinson said. The oak saplings will grow into tall and sturdy trees. These trees can grow two to three feet taller every year and may live more than 400 years.

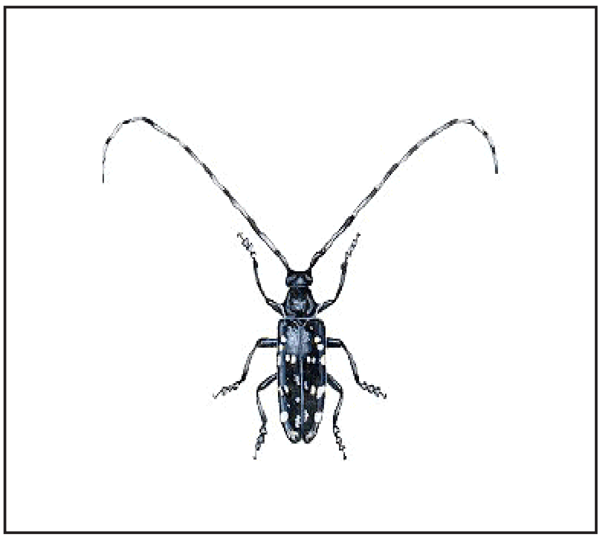
This article was originally published in the Daily Democrat Newspaper, located in Woodland, California. References to the ‘state department of forestry’ refer to the California Department of Forestry & Fire Protection.



What's Buggin' You?

The Asian longhorned beetle, a voracious pest of hardwood trees, was discovered on the grounds of a warehouse on McClellan Air Force Base in Sacramento on June 16, 2005 in wooden crates containing tiles imported from China. After extensive surveys, no additional evidence of the beetle was found outside of the initial discovery, however officials are concerned that this destructive invader which has forced the removal of thousands of trees in the eastern United States will become established in California. Susceptible hardwoods include maple, box elder, horsechestnut, willow, elm, buckeye, sycamore, hackberry, birch, poplar, alder, ash, mimosa and European mountain ash. Adult beetles can be seen from late spring to fall or later if the climate is warm.

Please report any evidence you may find of the Asian longhorned bettle to the California Department of Food and Agriculture at 800-491-1899 or www.cdfa.ca.gov.



Adult beetles. Individuals are ¾ to 1¼ inches long, with jet black body and mottled white spots on the back. The long antennae are 1½ to 2½ times the body length with distinctive black and white bands on each segment. The feet have a bluish tinge.

Round holes, 3/8 inch in diameter or larger, on the trunk and on branches larger than 1½ inches in diameter. These exit holes are made by adult beetles as they emerge from the tree.

Accumulation of coarse sawdust around the base of infested trees, where branches meet the main stem, and where branches meet other branches. This sawdust is created by the beetle larvae as they bore into the main tree stem and branches.

**Text and photos taken from the USDA Forest Service website www.na.fs.fed.us

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