Information for pest management professionals and pesticide applicators

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Tree Squirrels: Identification and Management

Squirrels can be problem pests in many landscapes, gardens, and structures. California is home to several species of squirrels which can be divided into three groups: tree squirrels, ground squirrels, and flying squirrels. While ground squirrels and some species of tree squirrels can be pests, flying squirrels are very elusive and not considered pests.

There are four species of tree squirrels in California (Table 1); two species are native and two are introduced from the eastern part of the United States. Although it is easy to distinguish the different squirrel groups from each other, often it is difficult to tell the difference between the species within the groups; this is especially true for the tree squirrels. Regulations regarding management of tree squirrels are complicated, so it is extremely important to be able to identify squirrels to species level.

Tree Squirrel Species

Native western gray squirrels (*Sciurus griseus*) (Figure 1) are found throughout much of California, primarily in oak woodlands of the foothills and valleys and in pine/oak forests. The western gray squirrel is gray above with distinct white underparts and prominent ears. They are distinguished from the eastern gray and other squirrel species by their very long bushy tails that are primarily gray with white-frosted outer edges.

Eastern gray squirrels (*Sciurus carolinensis*) (Figure 2) were originally introduced from the eastern United States into Golden Gate Park in San Francisco, California. They are also established in areas of Calaveras and San Joaquin counties in California and may be expanding their range. They can be variable in color. As their name suggests, they have a mostly gray coat but some have a distinct reddish tint. Eastern gray squirrels are medium-sized, with relatively narrow tails and short ears as compared to western gray squirrels.

Eastern fox squirrels (*Sciurus niger*) (Figure 3) were also introduced from the eastern part of the United States and are well established in most major cities of California. Fox squirrels can be identified by their grizzled yellow-brown to orange coat, tan to reddish-brown underside, and bright orange-brown ears. The fox squirrel, often incorrectly referred to as the red squirrel by residents of California, is visually distinguishable from the native western gray squirrel; the

Figure 1. Western gray squirrel.
(Dr. Lloyd Glenn Ingles © California Academy of Sciences)

Figure 2. Eastern gray squirrel.
(J. P. Clark, UC)

Figure 3. Eastern fox squirrel.
(C. Christie, Baker City, OR)

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Tree Squirrels

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western gray squirrel is slightly larger, has silver-gray fur with creamy white underparts, and has a notably bushier tail.

Native Douglas squirrels (*Tamiasciurus douglasii*) (Figure 4), sometimes called chickarees, are found in mostly conifer-forested regions of the north coastal area and along the Sierra Nevada mountain region. These very vocal, native tree squirrels are not usually considered pests. However, they may become garden or home pests in some more remote rural areas.

Management and Regulations

First and foremost, it is illegal to use poison baits in the management of ANY species of tree squirrel in California. Of the four tree squirrels, the eastern fox squirrel is considered to be the most serious pest to homes and gardens in urban and suburban environments. Fox squirrels that are found to be injuring growing crops or other property may be taken at any time or in any manner in accordance with the California Fish and Wildlife Code and Regulations (henceforth called "the Code"). **Only eastern fox squirrels can be killed without a hunting license or permit**.

Several types of kill traps are useful for fox squirrel removal, but they must be set in a way that will not accidentally trap nontarget animals. Live-catch cage traps are also available, but once caught the squirrel must be disposed of, presenting a problem for some people. Because releasing an eastern fox tree squirrel is illegal, live-catch traps are not recommended. For more information on trapping tree squirrels check out the UC IPM *Pest Notes: Tree Squirrels*.

Western gray squirrels are not generally considered as pests of home, gardens, or agriculture but they may be occasional forestry pests. In many counties in California, they can be taken in the general hunting season by those in possession of a valid hunting license from the California Department of Fish and Wildlife (CDFW). The hunting season occurs in the fall but can vary between zones (§307).

There is a bag limit of four squirrels per day. Hunting western gray squirrels is not permitted in several counties and zones in California (§307). In many areas of California, where it is legal to take squirrels during the general season, it is illegal to take them by archery and falconry. The areas where it is legal to use these methods can also be found in section 307.

There are several methods authorized for the taking of western gray squirrels under the stipulations of the Code and county and city ordinances. Please consult section 311 of the Code for these legal methods which include a range of firearms and other options. Remember it is often illegal to discharge firearms in cities and even in unincorporated areas. Please contact your local sheriff for more information. Please see section 311 of the Code, "Methods Authorized for Taking Resident Small Game" for more information on the use of firearms and bow and arrow.

CDFW has prohibited the use of lead projectiles in some firearms in the California condor range. Generally, when people shoot nongame animals they leave them behind and this can be hazardous for scavengers like the California condor. Currently, the use of lead ammunition is permitted for the taking of small game animals such as tree squirrels. However, bill AB 711 would instead require, as soon as is practical but by no later than July 1, 2019 the use of nonlead ammunition for the taking of all wildlife, including game mammals, game birds, nongame birds, and nongame mammals, with **any** firearm. Given the associated risks to scavenging wildlife, tree squirrels should be shot with non-lead ammunition. Squirrels shot with lead ammunition should be removed and disposed of in a manner that will not leave them open to scavenging wildlife.

Figure 4. Native Douglas squirrel.
(C. Christie, Baker City, OR)

The above regulations also cover all the other species of tree squirrels in California. Eastern fox squirrels, also covered under this legislation, may be trapped by any legal means if they are shown to be causing damage to crops or property. If land or property is being damaged or destroyed, or is in danger of being damaged or destroyed by a western gray squirrel or an eastern gray squirrel, then the owner or tenant of that land or property may apply to the CDFW for a depredation permit which will allow for the killing of the squirrel. The CDFW will designate the type of trap to be used to insure the most humane method is used to trap gray squirrels. Under the terms of the depredation permit, it may be required to release trapped squirrels in parks or other nonagricultural areas. It is not permitted to use any type of poisons to take a western gray squirrel, even when in the possession of a depredation permit.

Remember, any trapper for hire must possess a valid trapping license from the CDFW when trapping any squirrel species for profitable gains. A valid hunting license is required for sport hunting of tree squirrels also. However, if a landowner legally shoots a depredating eastern fox squirrel outside of the hunting season, a hunting license would not be required.

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Tree Squirrels

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While uncommon occurrences, tree squirrels can be associated with pathogens that can potentially be harmful to humans. Under the Code, tree squirrels that are associated with dangerous disease outbreaks may be taken by appointed organizations. See section 4011 for a list of organizations to contact in such a case.

"Breaking" the Fish and Wildlife Code for Tree Squirrel Management

The CDFW's Fish and Game Code is certainly very difficult to navigate. Here are a few things to remember that will help you "break" through the code:

- Tree squirrels are considered resident small game. When the Code refers to "tree squirrels" it means eastern and western gray squirrels, eastern fox squirrels, and the Douglas squirrel. Details of the hunting areas and season for tree squirrels can be found in chapter 2, §307. Look out for differences in zones, as well as counties, and for differences between general hunting and taking using falconry and bow and arrow.

- The regulations that govern taking of tree squirrels can be found in section 311.

- In the Code, reference to "gray squirrels" means both eastern and western gray squirrels. It may seem unusual that the regulations for the management of a native and an invasive species are the same; but that is what the Code says, and it is important to follow it. Information on depredation permits for eastern and western gray squirrels can be found in section 4181.

For more information on tree squirrel management, consult the UC IPM *Pest Notes: Tree Squirrels* at http://www.ipm.ucanr.edu/PMG/PESTNOTES/pn74122.html and the California Department of Fish and Wildlife Code at http://www.fgc.ca.gov/regulations/current/mammalregs.aspx#307.

*- **Niamh M. Quinn, Vertebrate Pest Advisor, Los Angeles, Orange, and San Diego counties, nmquinn@ucanr.edu***

Table 1. Distinguishing Features and Management Restrictions for California Tree Squirrel Species.

Species	Native/Introduced	Distinguishing Feature	Measurements	Legislation
Western gray squirrel	Native	Large body, bushy tail	Length: 12 inches with tails of similar length Weight: 1.1 - 2.1 lbs (adults)	Can be shot with restrictions. Depredation permit available with proof of damage.
Eastern gray squirrel	Introduced	Narrow tail, short ears	Length: 16 to 20 inches from nose to tip of tail Weight: 1.25 - 1.75 lbs	Can be shot with restrictions. Depredation permit available with proof of damage.
Eastern fox squirrel	Introduced	Large body, distinct yellow-brown to orange coat	Length: 18 - 27 inches from nose to tip of tail Weight: 1.75 - 2.25 lbs	Can be taken using any legal means during any time of the year.
Douglas squirrel	Native	Often actively vocal	Length: 10-14 inches from nose to tip of tail Weight: 0.3 - 0.7 lbs	Can be shot with restrictions. No depredation permit available.

Check out our UC IPM Blog!

Our blog provides a one-stop site for UC IPM news related to pests of homes, gardens, landscapes, and structures. We will be posting articles from our newsletters as well as announcing new and revised Pest Notes and other new educational materials or activities of interest to urban and residential audiences.

View or subscribe to the blog at: ucanr.edu/blogs/ucipmurbanpests/.

Spring Monitoring for Turf Insects

Turf areas—such as residential lawns, commercial landscape features, municipal rights-of-way, sports fields, and golf courses—can be challenging to manage since they often require substantial inputs and may be expected to always look clean, green, and uniform by clients. Insect pests, though actually quite rare in well-managed turf, can sometimes jeopardize a flawless appearance (Figure 1), leading to further inputs in the form of pesticide applications. With proper monitoring, however, pest infestations can be detected when pest populations are still small and can be dealt with using cultural tactics and other nonchemical methods. Initially, some important preventive measures can be taken to ensure that the turf areas you manage never become infested in the first place.

Pest management for turf areas begins during the design and installation of the site, with species selection, grading and drainage, irrigation systems, and the maintenance plan. Choosing the appropriate turf species for the site by considering regional climate and water availability is the single best way to reduce overall stress and to ensure longevity and resiliency of the grasses planted. The University of California's Division of Agriculture and Natural Resources (UC ANR) has published some excellent online resources to help choose appropriate turf species based on tolerance to key stressors such as temperature, salinity, drought, and foot traffic: http://www.ipm.ucdavis.edu/TOOLS/TURF/TURFSPECIES/index.html and http://anrcatalog.ucdavis.edu/pdf/8035.pdf.

Once established, turf needs to be properly managed for health, considering aspects such as mowing height, appropriate watering and drainage, and periodic thatch removal. Thatch removal can be especially important since many pests take shelter in thatch and because monitoring is more difficult when thatch has built up.

Next, realize that an integrated approach to pest management will require regular monitoring and some knowledge of the key turf pests in the region. In most of California, the major insect pests of turf fall into one of several categories: beetle larvae (grubs) feeding on roots, caterpillars feeding on grass leaf blades, true bugs with piercing-sucking mouthparts feeding on leaf blades, and nuisance pests disturbing the soil. Blade-feeding pests may be active at odd hours and are usually hidden within the thatch layer, so it is necessary to bring them to the surface to confirm their presence and to monitor population changes. One way to do this is by using the "drench test," where a soap and water solution is applied to saturate the thatch and soil in an area suspected to be infested (Figure 2). This test works well for caterpillars such as cutworms, armyworms, webworms, and the larvae of fiery skippers and lawn moths. It also will work for highly mobile piercing-sucking pests such as leafhoppers and chinch bugs. Unfortunately, this simple monitoring procedure will not work with pests that live deeper in the soil profile feeding on roots. For these pests, including the potentially damaging white grubs (C-shaped larvae of scarab beetles), billbug larvae, and crane fly larvae, it will be necessary to undercut a section of turf in order to inspect the root zone (Figure 3). Utilizing these monitoring practices in problem areas or in high value landscapes **before** damage occurs can help reduce management costs later in the season. The spring months, when grass is growing rapidly and when moisture is more available, are ideal for weekly or bi-weekly monitoring (Table 1).

Figure 1. Patch of turfgrass killed by billbugs. (J. K. Clark, UC IPM)

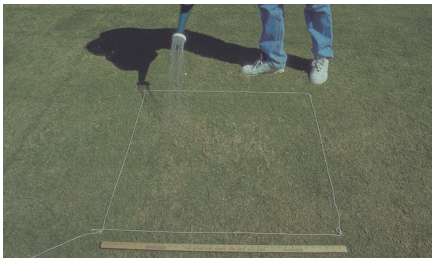

Figure 2. Performing a drench test. (J. K. Clark, UC IPM)

Figure 3. Pull back turf to inspect root zone. (J. K. Clark, UC IPM)

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Table 1. Approximate Monitoring and Treatment Times for Some Lawn Insects.

Insect	Apr	May	June	July	Aug	Sept	Oct
armyworm, cutworm	■	■	■	■	■	■	■
billbug	■	■	■	■	■	■	
black turfgrass ataenius	■	■	■	■	■	■	■
chinch bug	■	■	■	■	■	■	
fiery skipper		■	■	■	■	■	■
sod webworm, lawn moth			■	■	■	■	■
white grub			■	■	■	■	■

Turf Insects

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Often times, damage due to insect pests in turf only becomes apparent during late summer and fall, when low soil moisture and heat stress take a visible toll on areas with damaged roots or tattered blades. Unfortunately, it is difficult or even impossible to mitigate the damage at this point since pests may already be gone or dormant and because grasses are no longer vigorously growing. For example, the larvae of masked chafers (the most common and most damaging of the 'white grub' species, having only one generation per year in California) (Figure 4) have largely stopped eating roots and stopped growing in size in autumn

Figure 4. Masked chafer larvae (white grubs). (J. K. Clark, UC IPM)

(the season when they and the damage they cause are most observable). The most effective treatments for this pest should be made in June or July, when grubs are small and damage has not yet appeared. Without a spring monitoring program, landscape managers in areas where masked chafers are common can easily find themselves in an autumn situation where turf has been irreparably damaged and where few management options remain.

Learn more about prevention, monitoring, and treatment of turf pests by accessing the newly revised UC IPM *Pest Notes: Lawn Insects* at http://www.ipm.ucdavis.edu/PMG/PESTNOTES/pn7476.html.

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New UC IPM Online Course Helps Schools and Child Care Centers Follow the Healthy Schools Act

California requires that pest control companies providing services in schools and licensed child care centers comply with a series of laws called the Healthy Schools Act (HSA). The HSA promotes IPM and seeks to minimize pesticide exposure to children in all public K–12 schools and licensed private child care centers.

Providing Integrated Pest Management Services in Schools and Child Care Settings (Figure 1) is the new free online training module available from UC IPM that explains the history of the Healthy Schools Act and details what schools, child care centers, and pest control companies are required to do to follow the law.

IPM Advisor Andrew Sutherland; Center for Environmental Research and Children's Health (CERCH) Associate Director Asa Bradman; UC San Francisco Staff Specialist Vickie Leonard; and Luis Agurto Jr. from Pestec IPM Providers developed the training module with the input of dozens of California's pest management professionals and child care providers, using surveys, focus groups, and pilot courses. The Center for Environmental Research and Children's Health is also developing a database of individuals who complete the course so that schools and child care centers can connect with pest control providers familiar with IPM and the Healthy Schools Act.

The online course is divided into three narrated presentations. The first presentation is about the Healthy Schools Act. The second is a section on IPM and how it can be applied to control common pests in schools and child care environments, such as ants, rodents, spiders, and roaches. The third presentation discusses how pest control companies can prosper by incorporating IPM principles and practices within their business model. IPM effectively and efficiently manages pests, builds professionalism within providers, and captures value for the customer while minimizing unnecessary pesticide applications, pesticide exposures, and associated negative impacts on children's health, the environment, and the larger community.

The course includes the latest Healthy Schools Act requirements that went into effect on January 1, 2015. If child care and public K-12 school staff plan to apply any non-exempt pesticides, they are now required to do the following:

1) Develop an IPM plan for the school site or school district and post it either on the school's or district's website or send it out to all parents and staff with the annual pesticide notice.

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School and Child Care Course

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2) Send pesticide reports at least once a year to the Department of Pesticide Regulation for all non-exempt pesticides applied by school employees. The first reports are due January 30, 2016 and cover the period from January 1, 2015 to December 31, 2015.

Beginning July 1, 2016 any professional applicator, school IPM coordinator, and school or child care employee, or other unlicensed person applying pesticides must complete annually a Department of Pesticide Regulation-approved training on school IPM and safe use of pesticides.

Licensed pest management professionals can receive two continuing education units by completing the online course: one "Rules and Regulations" and one "IPM" from the Structural Pest Control Board; and one "Laws and Regulations" and one "Other" from the Department of Pesticide Regulation.

To take the course, see the UC IPM website. For more information on the Healthy Schools Act requirements or forms, visit the Department of Pesticide Regulation's School IPM website.

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Figure 1. Child care online course.
(K. Windbiel-Rojas, UC IPM)

See UC IPM's other free online training courses at www.ipm.ucdavis.edu/training.

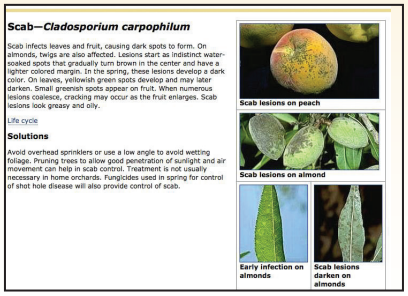
New and Updated Resources

Biological Control Pest Note Updated

Learn more about how natural enemies are an important component of any IPM program and how you can identify, encourage, and protect beneficials in the garden and landscape in the recently revised Pest Note *Biological Control and Natural Enemies of Invertebrates* at http://www.ipm.ucdavis.edu/PMG/PESTNOTES/pn74140.html.

Plant Disease Index

We've made it easier to find solutions to plant diseases in our new Plant Disease Index page. Users can access close to 300 diseases on flowers, fruits, trees and shrubs, lawns, and vegetables. Information can be searched by host, disease common name, scientific name, and disease type. See the index at http://www.ipm.ucdavis.edu/PMG/menu.disease.html.



WHAT IS IPM? Integrated Pest Management (IPM) programs focus on long-term prevention of pests or their damage through a combination of techniques including resistant plant varieties, biological control, physical or mechanical control, and modification of gardening and home maintenance practices to reduce conditions favorable for pests. Pesticides are part of IPM programs but are used only when needed. Products are selected and applied in a manner that minimizes risks to human health, beneficial and nontarget organisms, and the environment.

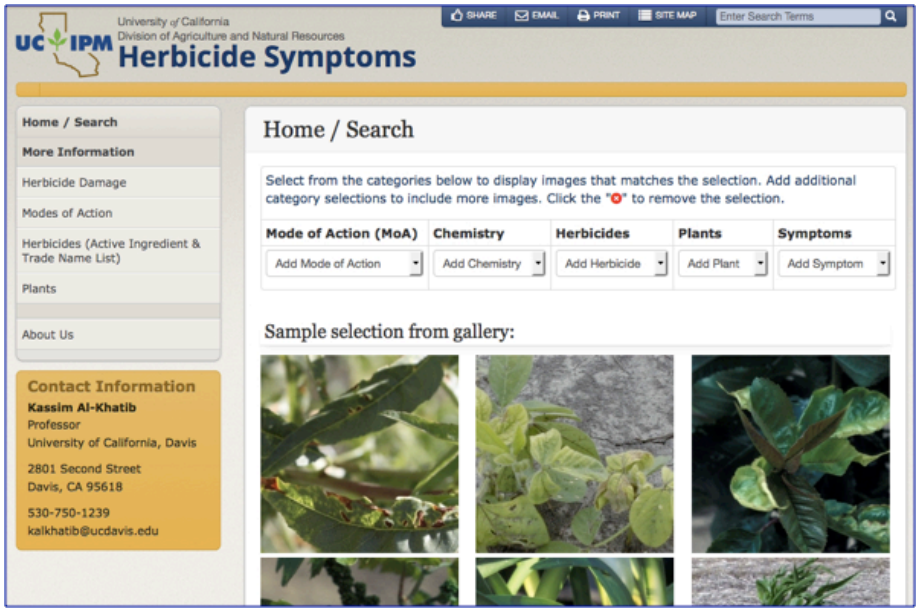
New UC IPM Photo Repository Shows Plant Damage from Herbicides

Identifying nontarget crop and ornamental plant damage from herbicides has become much easier, with the launch of a new online photo repository by the Statewide IPM Program, University of California Division of Agriculture and Natural Resources.

Dr. Kassim Al-Khatib, weed science professor at UC Davis and Director of the UC Statewide Integrated Pest Management Program (UC IPM), has gathered nearly 1,000 photos of herbicide-damaged plants, drawn from his own and others' research.

The images are cataloged to show damage that can occur from 81 herbicides in more than 14 specific herbicide modes of action, applied in field to demonstrate the symptoms or when known herbicide spray has drifted onto the plant.

Each image is characterized with the name of the plant, mode of action of the herbicide, and notes the specific symptoms of damage. Together these photos provide a comprehensive archive of damage to over 120 different crops and ornamental plants by known herbicides, which users can easily compare with what they see in the field.



This user-friendly database contains additional information briefly describing modes of action of various herbicides, herbicide damage, ornamental and crop plants included in the database, and an index of example herbicide trade names and active ingredients. The repository can be found at http://herbicidesymptoms.ipm.ucanr.edu/.

Ask the Expert!

Q **Are the regulations for managing tree squirrels the same in every county in California? Where do I go to find out what the regulations are?**

A No, they are not the same. Regulations for season and methods of take can vary by county. Some counties, like Kern County, even have different regulations depending on if you are east or west of I-5.

To keep up with the regulations in your area, check out the California Fish and Wildlife Code. Alternatively, you can contact your regional Fish and Wildlife office and local Wardens will be able to provide you with the details.

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For more information about managing pests, contact your University of California Cooperative Extension office listed under the county government pages of your phone book, or visit the UC IPM Web site at www.ipm.ucanr.edu.