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NPAG Report
***Agrilus coxalis* Waterhouse: Gold-spotted oak borer**
Coleoptera/ Buprestidae
NPAG Chair Approval Date: 1/22/09

Figure 1. Adult *Agrilus coxalis* (left) and oak mortality in the Descanso Ranger District, Cleveland National Forest, California (right). Photographs from Coleman, 2008b.

Initiating Event and Pest Identification: On September 5, 2008, Kristian C. Rondeau (PPQ-WR) notified the NPAG of the detection of *Agrilus coxalis* in California (Rondeau, 2008). Although *A. coxalis* is native to the United States (*i.e.* Arizona) (Schaeffer, 1905), Rondeau (2008) requested to further review this wood borer because it belongs to the same genus of the economically important emerald ash borer, *Agrilus planipennis,* and because it is causing extensive damage on oak populations in southern California where it was not known to be established (Coleman, 2008b; Rondeau, 2008). *Agrilus coxalis* was first recorded in southern California in 2004 (Coleman, 2008b). On May 28, 2008 Tom Coleman and others (USDA-FS, Forest Health Protection) surveyed the Descanso Ranger District, Cleveland National Forest, San Diego County, California to assess the ongoing oak decline and mortality prevalent in this region since 2002 (Coleman, 2008b). *Agrilus coxalis* larvae and pupae were hand collected from coast live oak and California black oak, and adults were reared from these collections (Coleman and Seybold, 2008c). In June 2008, over 180 adults were trapped with purple panel traps in one week (Coleman and Seybold, 2008c). The identification of adults was verified by Charles L Bellamy (California Department of Food and Agriculture), Henry A. Hespenheide (University of California, Los Angeles), and Rick L. Westcott (Oregon Department of Agriculture) (Coleman and Seybold, 2008c).

Data Sheet(s): None

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Current PPQ Policy: The Pest ID database lists the genus *Agrilus* as reportable/actionable, but it does not list *A. coxalis*. Pest ID lists eight other *Agrilus* species; *A. furcillatus, A. sulcicollis, A. planipennis,* and *A. subrobustus* as reportable/actionable, and *A. abstersus, A. bilineatus, A. cingulatus* and *A. palmacollis* as non-reportable/non-actionable (PestID, 2008; queried September 29, 2008). No *Agrilus* species are on the APHIS Regulated Plant Pest List (USDA-APHIS, 2000; queried September 29, 2008).

Pest Situation Overview:

Exotic status: *Agrilus coxalis* is native to the United States with limited distribution in the States of Arizona and California. (Coleman, 2008b; Coleman and Seybold, 2008c; OJSMNH, 2004). *Agrilus coxalis* records in Arizona date to 1905 (Schaeffer, 1905), and the species was first detected in southern California in 2004 during a survey for exotic woodborers by the California Department of Food and Agriculture (Coleman, 2008b; Coleman and Seybold, 2008b, 2008c; SBMNH, 2006). The well established populations of *A. coxalis* are limited to San Diego County, California (Coleman, 2008b).

Agrilus coxalis has two synonyms: *A. auroguttatus* and *A. socus* (Hespenheide, 1979). The synonym, *A. auroguttatus* is the type species for the locality of Palmerlee, Huachuca Mountains, Arizona (Schaeffer, 1905). Other records of *A. auroguttatus* in Arizona are mentioned in Baptista (2008), CAS (2007), Fisher (1928), and Hespenheide (1979).

Biology: *Agrilus* is one of the largest genera in the world with almost 3,000 described species, and a very diverse genus with 171 known species in North America (USDA-APHIS, 2008).

Larvae of *A. coxalis* feed and construct galleries primarily on the sapwood, from the base of the tree up to larger branches. Larval galleries are approximately 3 mm wide, black in color with a meandering appearance, and packed with frass. Extensive larval feeding can kill areas of the tree's cambium, which then turn black. *Agrilus coxalis* appears to pupate on the outer bark. Adults are bullet-shaped and dull metallic green in color, with three predominant golden yellow spots on each elytron (see right figure above). Adults are an average of 9.5 mm in length and 1.5 mm wide. Adults may mate and feed on the foliage. Eggs of *A. coxalis* have not been observed (Coleman, 2008b; Coleman and Seybold, 2008b).

Agrilus species are known to be good fliers. For instance, tethered flights in laboratory conditions suggest that mated females of the emerald ash borer, *Agrilus planipennis* may fly more than 20 km per day (Taylor *et al.*, 2007). *Agrilus coxalis* may complete one generation per year with adults emerging in late spring and early summer (Coleman, 2008b). Initial observations by Coleman (2008b) suggest that *A. coxalis* may favor oaks $\geq$ 25 cm DBH[1], while oaks less than 25 cm DBH are either not favored or are unsuitable for development.

External evidence of *A. coxalis* is visible on the trunk and larger branches as extensive bark staining, appearing as black regions or red blistering with sap oozing from under the bark. The adults make a D-shaped exit, about 3 mm in width. On *Quercus agrifolia,* the bark is frequently removed by woodpeckers as they forage for larva and pupae. Attacks of *A. coxalis* can also lead to crown thinning, which begins with premature leaf drop and progresses to twig and branch die back. Crown thinning may only be evident after two to three years of attack. *Quercus kelloggii* loses foliage more quickly than *Q. agrifolii* (Coleman and Seybold, 2008b).

Buprestids are considered mostly secondary species that may attack trees of all ages, but more commonly at older stages. Their type of impact may vary from wounding trees and causing death of shoots and branches to directly killing the trees (Evans *et al.*, 2004). *Agrilus coxalis* is not known to vector pathogens, and although it is not evident that economically important *Agrilus* are vectors of

[1] DBH = Diameter at Breast Height, which is the diameter of a tree at 1.37 m above ground.

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plant pathogens that aid in tree death, there are complex associations of wood borers with other organisms that may aid in the death of oaks (*e.g. A. bilineatus* (wood borer) + Gypsy moth + *Armillaria mellee* (fungi) = oak death) (Evans *et al.*, 2004; Solomon, 1995). Trees weakened by drought, disease, lightning strikes, defoliation, phloem and xylem girdling can be attacked and killed by phloem-feeding borers, like buprestids (Dunn *et al.*, 1990 and references therein). The past six years of drought in southern California may have caused stress to oak trees, therefore making oak trees more susceptible to attack by *A. coxalis* (Coleman, 2008b; Dunn *et al.*, 1987). Dun *et al*. (1987) showed that the condition of the oak tree (*i.e.* stressed tree) appears to regulate both beetle attraction and successful colonization of *A. bilineatus*.

The presence of the larvae and their galleries, the emergence holes, and the associated woodpecker damage all distinguish *A. coxalis* infestation from infection by the sudden oak death pathogen, *Phytophthora ramorum*. This pathogen has not been detected in the area of California infested with *A. coxalis* (Coleman and Seybold, 2008b).

Prevalence and global distribution: Mexico, Guatemala, and United States (Arizona and California) (CAS, 2007; Coleman and Seybold, 2008b; Hespenheide, 1979; Obenberger, 1935; OJSMNH, 2004; Waterhouse *et al.*, 1882-1897).

Host range: Fagaceae – *Quercus agrifolia* (coast live oak), *Q. chrysolepis* (canyon live oak), *Q. engelmannii* (Engelmann oak), *Q. kelloggii* (California black oak), *Q. hypoleucoides* (silverleaf oak) (Coleman and Seybold, 2008b, 2008c).

The host range of this insect is not well known (Coleman, 2008b), and may include additional species of *Quercus* (*e.g.* Schaeffer (1905) reports "black oak", which may possibly be *Q. devia* according to Coleman and Seybold, 2008c). *Agrilus coxalis* has been reared from *Quercus agrifolia, Q. kelloggii, Q. chrysolepis* (Coleman, 2008a).

Potential pathways and spread: The presence of *A. coxalis* in California may be either a range expansion or an introduction (Coleman, 2008b).

A range expansion may be plausible because native populations exist to the east and south of the current infestation in southern California. To the east, there are many records of *A. coxalis* in Arizona (Baptista, 2008; CAS, 2007; Fisher, 1928; Hespenheide, 1979; Schaeffer, 1905). To the south, *A. coxalis* has been recorded in the northwestern Mexican State of Baja California Sur and the southeastern States of Chiapas, Oaxaca, and Veracruz (Coleman, 2008a; Coleman and Seybold, 2008a, 2008b; Waterhouse *et al.*, 1882-1897; Westcott *et al.*, 1989). In addition, other *Agrilus* species are known to be good fliers. For instance, tethered flights under laboratory conditions suggest that mated females of the emerald ash borer, *Agrilus planipennis* may fly more than 20 km per day (Taylor *et al.*, 2007).

On the other hand, although wood borers, including species in the genus *Agrilus,* are known to be dispersed though the movement of firewood, logs, timber, and other wood materials (USDA-APHIS, 2008), there are no recorded interceptions of *A. coxalis* from Mexico. From 1984 to 2007 United States intercepted at ports of entry 48 specimens of *Agrilus* worldwide. Only one specimen (*i.e. Agrilus* sp.) was intercepted from Mexico, at the International Airport in Houston, Texas, in baggage (PestID, 2008; queried September 29, 2008). However, moving potentially infested firewood, logs, and timber with *A. coxalis*, from the current infestation in southern California, may be a source for new infestations in other areas within the state or other states.

Control: *Agrillus coxalis* is not a pest in Arizona, Mexico and Guatemala, therefore does not have specific management options.

Management options exist for other economically important species of *Agrilus* that have similar biology and impacts on hardwood, such as the emerald ash borer, *A. planipennis* (USDA-APHIS, 2008); bronze birch borer, *A. anxius* (Karren and Roe, 2000); twolined chestnut borer, *A. bilineatus* (Haack and Acciavatti, 1992); and other *Agrilus* spp. (Solomon, 1995). These control options would have to be tested on *A. coxilus* to assure effectiveness.

Management options suggested for *A. coxalis* include the use of systemic insecticides (*e.g.* imidacloprid), and topical spraying of foliage, large branches, and main stems for high-value trees (*e.g.* using carbaryl or pyrethroids) (Coleman and Seybold, 2008b). Avoid removal of logs and firewood from *A. coxalis* infested areas. Tarping oak wood with thick clear plastic or exposing cut wood to direct sunlight may kill *A. coxalis* larvae and pupae. Also, chipping wood into 2.5 cm pieces may reduce survival of *Agrilus* spp. in cut logs (Coleman and Seybold, 2008b).

Although many biological control agents are known from various species of *Agrilus,* none are known to attack *A. coxalis* (Kenis and Hilszczanski, 2004; Solomon, 1995).

Potential economic impacts: With the exception of California, *Agrilus coxalis* has not been known to cause extreme damage to oaks in Arizona, Mexico, and Guatemala (Cibrián-Tovar *et al.*, 1995; Rivas, 1992; Solomon, 1995). The past six years of drought in southern California may have caused stress to oak trees, resulting in oak trees that are more susceptible to attack by *A. coxalis* (Coleman, 2008b; Dunn *et al.*, 1987).

In 2002, the western United States contributed 3.4% of the total U. S. oak timber volume (*i.e.* 13 billion board feet). However, the Pacific Southwest accounted for 94% of oak timber for the entire western United States (USDA-NASS, 2008). The impact that *A. coxalis* may have on the timber industry is unknown. Currently *A. coxalis* is impacting populations of *Q. agrifolia, Q. kelloggii,* and *Q. chrysolepis* (Coleman and Seybold, 2008b). *Quercus agrifolia* wood is primarily used for fuel and some commercial charcoal, but is unsuitable for lumber (Steinberg, 2002). *Quercus kelloggii* wood is used for fuel and has limited use for lumber and other wood products (Plumb and Gomez, 1983). *Quercus chrysolepis* has been considered a non-manageable hardwood; however, its high caloric value and rapid sprout growth make it an excellent source of fuel wood (Thornburgh, 1990). The three oak species have aesthetic value, are important for wildlife, and have a role in watershed protection (McCreary and Tecklin, 2005; Steinberg, 2002; Thornburgh, 1990; Plumb and Gomez, 1983).

Businesses that may depend from *Q. agrifolia, Q. kelloggii,* or *Q. chrysolepis* for firewood may be affected, because firewood is a potential pathway for dispersal. The U.S. Forest Service has restricted movement of oak firewood from two of the Cleveland Forest's Ranger Districts (Descanso and Palomar) until more research about potential movement of *A. coxalis* in firewood is available (Coleman, 2008a).

In the last U.S. census of horticultural specialties, *Quercus* contributed $6.6 million to nursery crop sales in the State of California (USDA-NASS, 1998). The impact that *A. coxalis* may have on the nursery industry is unknown. Recent observations on the attacks of *A. coxalis* on oak trees indicate that beetle attacks have not been observed in small diameter oaks (less than 12 cm DBH) (Coleman and Seybold, 2008b). In addition, six years of drought in the affected region may have stressed the oak trees and provided conditions for successful and extensive attacks of *A. coxalis* on wild oak trees (Coleman, 2008b; Dunn *et al.*, 1987). Ideal nursery conditions may provide non-stressed trees. Therefore, oak trees with a small diameter trunk grown in ideal conditions may be less susceptible to attacks by *A. coxalis.* In contrast, there is a market in the western U.S. coast for very costly large oak trees over 12 cm DBH (*i.e.* $5 to $7 thousand or more each tree), if trees are not in ideal conditions, attacks by *A. coxalis* on these type of oak trees, may put this market at risk (Randall-Schadel, 2008)

Currently *A. coxalis* is not know to attack any oak species that are important as lumber in the eastern United States ("red oak" as many as 17 species, and "white oak" as may as 8 species) (Cassens, 2007a, 2007b). The eastern United States accounted for 96.6% of the total U. S. oak timber volume in 2002 (*i.e.* 372 billion board feet) (USDA-NASS, 2008), and *Quercus* trees contributed $79.8 million to nursery crop sales for the entire United States in 1998 (USDA-NASS, 1998). It is worth noting that since the 103 years that *A. coxalis* was discovered in the State of Arizona (Schaeffer, 1905), there is no record to date that this beetle has been able to expand its range to the eastern United States. However, because the host range is not well known, and the potential pathway for dispersal not well understood (*e.g.* firewood), this beetle may pose a risk to the lumber and nursery industry in the eastern United States.

Dead oaks can create potential hazards, especially near dwellings, along roadways, and in recreational areas. Oak mortality also represents a significant increase in fuel loads across the landscape, which can increase the probability and severity of wildfires (Coleman and Seybold, 2008b). In addition, potential removal of dead oak trees will have a monetary cost (Randall-Schadel, 2008).

Potential environmental impacts: *Agrilus coxalis* has not been known to cause extreme damage to oaks in Arizona, Mexico, and Guatemala (Cibrián-Tovar *et al.*, 1995; Rivas, 1992; Solomon, 1995). Oak mortality has occurred in southern California, on the Descanso Ranger District, San Diego County since 2002. Over six years, an estimated 15,790 oaks have died across 16,118 acres on the district (Coleman, 2008b). *Quercus agrifolia*, *Q. kelloggii*, and *Q. chrysolepis* are the primary species affected. Initially, oak death had been attributed to the past six years of drought in the area. *Agrilus coxalis* was first detected in 2004, and during surveys done in 2008, *A. coxalis* was causing significant injury to healthy and declining oaks in a 50 x 40 km area east of San Diego, CA (Coleman, 2008b; Coleman and Seybold, 2008b).

In California, the predominant oak species are found in 11.1 million acres of oak woodlands and oak forests habitats, which 1.0 million acres of *Quercus agrifolia*, 1.8 million acres of *Q. kelloggii*, and 0.9 million acres of *Q. chrysolepis* may be at risk. Furthermore, because the host range of *A. coxalis* is not well known, other predominant species of oak found in oak woodlands and oak forests in California may also be at risk (*e.g.* blue oak, *Q. douglasii*; interior oak, *Q. wislizeni*; white oak, *Q. garryana*; valley oak, *Q. lobata*; and Engelmann oak, *Q. engelmannii*), putting the remainder 7.4 million acres of oak at risk from *A. coxalis* (Gaman and Firman, 2006).

Oak woodlands provide a wide range of critical values and services including forage for livestock, important wildlife habitat, recreation, beautiful scenery, and watershed protection (McCreary and Tecklin, 2005). California oak woodlands sustain high levels of biodiversity, and provide food and shelter to more than 250 species of vertebrates (COF, (no date); McCreary and Tecklin, 2005; Steinberg, 2002; Plumb and Gomez, 1983). Therefore, if *A. coxalis* continues to kill large numbers of oak trees, it may put entire communities at risk, through loss of food source and habitat (Coleman and Seybold, 2008b).

Dead oaks can create potential hazards, especially near dwellings, along roadways, and in recreational areas. Oak mortality also represents a significant increase in fuel loads across the landscape, which can increase the probability and severity of wildfires (Coleman and Seybold, 2008b).

Trade implications: Because *A. coxalis* has limited distribution in the United States (Coleman and Seybold, 2008b), and attacks species of oaks that may be used primarily as firewood or charcoal (Plumb and Gomez, 1983; Steinberg, 2002; Thornburgh, 1990), the presence of this pest may result in restrictions on the domestic movement of potentially infested wood.

Agrilus coxalis is unlikely to result in significant losses of foreign markets from California forestry products. In 2002, California exported 2.9% of U.S. forestry products (USDC, 2008). The majority

may have been softwood timber, because in 2002, of the total timber production for the Pacific Southwest (*i.e.* California), 9% of the production was hardwood timber (USDA-NASS, 2008). However, loss of foreign markets could occur if *A. coxalis* was to establish on the eastern United States, because the eastern United States accounted for 96.6% of the total U. S. oak timber volume in 2002 (USDA-NASS, 2008), and because the United States exported 1.5 million m^3 of oak logs and lumber in 2007 (USDA-FAS, 2008). Although some *Agrilus* species are of quarantine concern for some foreign countries, currently *Agrilus coxalis* is not specifically listed as a quarantine pest by any country (CERIS-PRF, 2008).

NPAG teleconferences: None held

Current response and activities: The State of California is not currently taking any regulatory action in response to the detection of *A. coxalis* (Wright, 2008). Since *A. coxalis* is native to Arizona, the State of Arizona has no interest in conducting any CAPS surveys, nor in taking any further action with this insect (Wright, 2008).

Actions by U.S. Forest Service (USFS) – The USFS has restricted movement of oak firewood from two Cleveland Forest Ranger Districts (Descanso and Palomar) until more research about potential movement of *A.coxalis* in firewood is available. Tom W. Coleman (USFS) and Steven J. Seybold (USFS) will continue their work on *A. coxalis* on 2009. T. W. Coleman and S. J. Seybold have started a firewood emergence study and will be conducting some insecticide trials for high-value trees in 2009 with Sheri Smith (USFS-Forest Health Protection, R5-Regional Entomologist) and Brian Strom (USFS-Southern Research Station). T. W. Coleman has been discussing plans for firewood management (tarping, solarization, etc.) with the University of California IPM Program, hoping to start in 2009 (Coleman, 2008a).

Outreach – The USFS has initiated public awareness of *A. coxalis* by sending press releases, developing outreach material (*e.g.* Pest Alert document, firewood awareness poster), holding town meetings in communities around affected areas, and talking with Fire Council groups and state and county foresters/firefighters in southern California (Coleman, 2008a; Coleman and Seybold, 2008b; Cornejo, 2008; Harris, 2008).

Interagency activities – Currently, USFS is working with the California Department of Forestry and Fire Protection to see if there are any pathogens contributing to the oak mortality. Tests for pathogens are being conducted on roots from trees with *A. coxalis* injury, and there are plans to look for associated fungi on the beetle. There has been communication between USFS and San Diego County (Agriculture), Natural Resources Conservation Service (NRCS) in San Diego County, and Riverside County conservation groups. According to T. W. Coleman, groups are eager to assist with future trapping. In 2009, USFS plans to expand monitoring not only on national forest land but also on state, private, and county land to get a better idea of the beetle's distribution in southern California (Coleman, 2008a).

Need for new technology or knowledge:

- Determine the host range of *A. coxalis* because other oak species may be at risk.
- Confirm if logs and firewood from trees killed by *A. coxalis* may be a source of further infestations, and a pathway for the pest's dispersion.
- Determine if *A. coxalis* is the sole agent responsible for the death of oak trees or if it is a combination of biotic (associated pathogen) and abiotic factors that have made *A. coxalis* a pest.

- Determine if *A. coxalis* has the potential to disperse to the eastern United States and establish.

National Plant Board consultation: None.

NPAG Recommended PPQ Policy: The NPAG recommends a change in PPQ policy regarding *Agrilus coxalis* to non-reportable/non-actionable policy.

Recommendations:
The NPAG recommends that PPQ establish a non-reportable/non-actionable policy regarding *Agrilus coxalis* for the United States because *Agrilus coxalis* is native to Arizona and it is established in southern California. **Action Leader: Joe Cavey, PPQ-NIS**

Direct referral to Joe Cavey, PPQ-NIS

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Author: Ignacio Baez

Chair's Approval: */s/* David R. Prokrym, Jan 22, 2009

Amended NPAG Report
***Agrilus coxalis auroguttatus* Schaeffer: Gold-spotted oak borer**
Coleoptera/ Buprestidae
NPAG Chair Approval Date:

AMENDMENT:

Background: *Agrilus coxalis* was reported in California for the first time in 2004 (Coleman, 2008b). Since then, *A. coxalis* has established and caused extensive mortality to coastal live oak and California black oak in San Diego County, California (Coleman and Seybold, 2008a). The native distribution of *Agrilus coxalis* includes the U.S. state of Arizona, and some localities of Mexico and Guatemala (Coleman and Seybold, 2008a). On January 22, 2009, the NPAG recommended that PPQ establish a non-reportable/non-actionable policy regarding *Agrilus coxalis* for the United States because *Agrilus coxalis* is native to Arizona and it is established in southern California.

New events: In July, 2009, several stakeholders requested the NPAG to re-open *A. coxalis* report to re-evaluate and consult with U. S. Forest Service about this pest. On August 5, 2009, NPAG contacted Bob Rabaglia (USDA-FS-Forest Health Protection) to gather concerns from the Forest Service regarding *A. coxalis*, and any additional information that may be pertinent to update the report (Rabaglia, 2009).

Information provided by Forest Service: On August 24, 2009, Bob Rabaglia provided concerns by Forest Service and a draft of the 'Golden-Spotted Oak Borer Strategic Plan', result of a multi-agency meeting (FHP, 2009).

Forest Service in California "is concerned about the impacts of *A. coxalis* not only in San Diego County but also its potential spread to other areas" (Rabaglia, 2009). The apparent lack of unique insect- plant-host relationship, the lack of geographical / environmental factors, and the lack of natural enemies, that may regulate this pest, has allowed *A. coxalis* to establish in California and aggressively attack oaks outside of its native range (Rabaglia, 2009).

This strategic plan "contains information to guide a management program for the goldspotted oak borer (GSOB)…, and a restoration program for affected oak ecosystem. It is intended to assist in a multi-agency effort to manage current known infestations and reduce the likelihood of spreading GSOB to other locations. It also addresses hazard tree mitigation and restoration of areas affected by GSOB and subsequent loss of oak habitat. It lays the foundation for prioritizing on-the-ground work, research, and funding needs. Implementation of specific activities within the strategy is flexible and will be based on the best information available at the time" (FHP, 2009).

Additional events:
New taxonomic status on AZ and CA populations of *A. coxalis* - Since the original January 2009 NPAG report, the *A. coxalis* populations of Arizona and California are now considered a distinct subspecies of the population of *A. coxalis* from Mexico and Guatemala, recognizing *A. coxalis auroguttatus* unique to

Arizona and California (Hespenheide and Bellamy, 2009).This new taxonomic status further reinforces that the population of *A. coxalis auroguttatus* are native to the United States.

***Agrilus coxalis auroguttatus* included in the FY 2010 EWB/BB National Survey Manual** - By recommendations from Bob Rabaglia and others, CAPS-AHP Team decided to add the native *A. coxalis auroguttatus* to the Exotic Wood Borer/ Bark Beetle National Survey Manual (EWB/BB) as "an additional pest of concern" because of the mortality that it is causing to oaks in California.

Current Regulatory Response:

- CDFA has been clear about not wanting to take any action on this pest, because it is native to Arizona, and it is established in California. "Any regulatory action would be extremely difficult and could be resource intensive" (Scott, 2009; Wright, 2008).
- Since *A. coxalis* is native to Arizona, the State of Arizona has no interest in conducting any CAPS surveys, nor in taking any further action with this insect (Wright, 2008).
- PPQ-NIS supports NPAG's current recommendation of keeping *A. coxalis* non-reportable/non-actionable because is native to the United States (i.e. Arizona) (Cavey, 2009)

Recommendations:

The NPAG recommends that *Agrilus coxalis auroguttatus* be referred to PPQ, Emergency and Domestic Programs. **Action Leader: Scott E. Pfister, PPQ-EDP-Forest Pest Programs**

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