



**Carbaryl: Use and Benefits in the Desert Southwest
and Response to EPA's Proposed Interim Decision**
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**Comments submitted by the Arizona Pest Management Center,
University of Arizona**

Date: February 14, 2023
Docket ID: EPA-HQ-OPP-2010-0230
Re: EPA's Proposed Interim Decision for Carbaryl

To Whom it may concern:

The EPA is seeking public comments in response its Proposed Interim Decision for the insecticide carbaryl. Carbaryl is registered for use on a wide variety of specialty crops, for use in outdoor residential pest control, ornamental plants, lawns and turf, rights of way, etc. Our goal at this time is to inform the EPA about a few remaining critical use patterns for carbaryl in Arizona and the Desert Southwest, and to respond to selected elements of the Proposed Interim Decision.

At an earlier stage of registration review, we contributed detailed comments on the uses and benefits of carbaryl to the USDA Office of Pest Management Policy (Fournier et al. 2016). Some of our input was included in the benefits analyses for carbaryl. We have included key points from these prior comments in this response to EPA. In developing the current comments, we have examined updated use data and solicited information from stakeholders to verify ongoing use patterns.

Summary

- The use of carbaryl has diminished greatly in recent years across a wide variety of crops in Arizona and other parts of the Southwest. There are still selected uses for which carbaryl is deemed important and for which few or no viable alternatives exist.
- Carbaryl is used, in rotation with pyrethroids, in the eradication program for the pecan weevil, an important invasive pest of pecans that has made recent incursions from West Texas into Eastern New Mexico. Loss of carbaryl would significantly impact the New Mexico Department of Agriculture's ability to prevent or slow the spread of pecan weevil throughout New Mexico, and incursion into Arizona, California, and northern Mexico. We are grateful that EPA's Proposed Interim Decision places no constraints on this use pattern.
- Carbaryl bait formulations are used in Arizona in the management of darkling beetles, crickets, grasshoppers, and various soil insects on desert melons. Darkling beetles in

particular can devastate a stand of watermelon transplants, causing significant economic losses. This is not a frequent problem. We estimate that in Arizona fewer than 7% of melon acres were treated with carbaryl in 2021. However, no effective alternative options are available for control, particularly for darkling beetle.

- Carbaryl is used in relatively rare situations to manage grasshoppers in turfgrass. Though not a frequent pest of desert turfgrass, grasshopper populations can migrate into residential turf from adjacent desert areas in large numbers, consuming seed from overseeding practices and damaging turf. Carbaryl bait is used as an effective means of control. If these baits are classified by EPA as granular pesticides, we recognize that EPA is proposing discontinuation of residential uses. We seek clarification on whether this mitigation would apply to Sevin 5 Bait applied by turf industry professionals working in residential settings.
- Based on input from US Forest Service professionals, we agree with discontinuation of backpack sprays and with all additional proposed PPE requirements. While we recognize the need for EPA to limit the amount of solution handled for tree boring beetle treatment applications by US Forest Service to 250 gallons of solution per worker per day, the mitigation would in some case severely limit the timely treatment of tress, which could slow protection of forests from attack by tree boring beetles. In addition, we acknowledge that this mitigation will have economic consequences on beetle control practices by the US Forest Service. Carbaryl remains the most effective and longest lasting preventative treatment to protect Western forests from potentially devastating tree boring beetle infestations.

Carbaryl Use on Arizona and New Mexico Crops & Turf

The use of carbaryl has diminished greatly in recent years across a wide variety of crops in the Southwest. Based on information from the Arizona Pest Management Center (APMC) Pesticide Use Database (Fournier et al. 2017) from 2015 to 2021, only a small number of uses on limited acres have been reported. Uses include cantaloupes and other melons, fallow land, and very limited reported use on citrus and in turfgrass. Based on comments the Arizona Pest Management Center previously submitted to USDA Office of Pest Management Policy on carbaryl (Fournier et al. 2016), the most significant use in 2016 was as part of the eradication program for the pecan weevil in New Mexico. Carbaryl bait formulations are also used occasionally in Arizona in the management of darkling beetles and other insects in both transplanted and seeded melons.

Carbaryl Use in Desert Melons

In 2021, Arizona growers harvested 9,300 acres of cantaloupe and 4,900 acres of watermelon for the fresh market valued at over \$124 million. (USDA 2022). In 2021, uses of carbaryl bait were reported on only 907 acres, about 6.4% of acres. Carbaryl is the Arizona Department of Environmental Management's Groundwater Protection List, and all agricultural uses require reporting to the state.

According to Dr. John Palumbo, Professor, Extension IPM Specialist, and Endowed Chair in Integrated Pest Management at University of Arizona, the main (occasional) use of carbaryl on

desert melons is the use of carbaryl bait targeting darkling beetles and other soil insects. Carbaryl bait is also sometimes used to control crickets and grasshoppers.

Experience has shown that foliar sprays are ineffective for preventing darkling beetles from feeding on netted melons. Sprays cannot penetrate the foliage to get to the ground or undersides of melons where the beetles are active. The best chance of control is with the use of Sevin bait. There are no effective alternatives to carbaryl bait for this use. Gowan previously formulated a pyrethroid bait that was very effective, but it is no longer available on the market.

Most applications of bait in the desert for darkling beetle control are applied pre-harvest. There are blooms in the field, but commercial pollinators have been removed by the time of application. The baits are spread on top of beds and must remain dry to be attractive to beetles. In the event that the bait got wet (e.g., rainfall), it is highly unlikely that the a.i. would move deep enough for soil uptake by the plant. Melon roots are deep in the soil profile by the time carbaryl would be applied. According to Dr. Palumbo, potential foliar alternatives for control of the darkling beetles prior to bloom include pyrethroids, neonicotinoids and methomyl.

Some bait usage may occur pre-bloom, during stand establishment, to control soil insects. The use of sprinkler irrigation during stand establishment often precludes bait usage at this stage, but this practice can work well for drip-irrigated melons. In these cases, carbaryl is generally applied prior to transplanting, or at emergence for direct seeded melons. The most common alternative to carbaryl for this use is multiple applications of pyrethroids, whereas a single application of carbaryl bait provides effective control and lasts until the bait gets wet.

One central Arizona grower I spoke with confirmed the importance of Sevin bait for control of darkling beetles in watermelon transplants. “Darkling beetles can and will devastate an expensive stand of watermelon transplants. It is not widely used, but for this pest, it is important. We do not use much active ingredient, but when we do it is vital!” (Fournier 2016).

Carbaryl is Critical for Control of Invasive Pecan Weevil

In 2021, pecans were the highest grossing crop in New Mexico, with 46,000 harvested acres valued at nearly \$189 million (USDA 2021b). In 2015, over 2,000 New Mexico farms were involved in commercial pecan production, accounting for almost one third of pecans produced in the U.S. (Sutherland et al. 2017) In Arizona, 22,000 acres of pecans harvested in 2021 were valued at over \$93 million (USDA 2021).

As documented in detail in our 2016 comments to USDA Office of Pest Management Policy, carbaryl is critical to the eradication program for the pecan weevil, a destructive invasive pest. According to Sutherland et al., 2017: “Pecan weevil infestations can reduce nut yields significantly at two points in each growing season. In summer, adult weevils puncture and feed on immature nuts, causing these nuts to fall. Later in the growing season, females lay their eggs (up to six per nut) into larger, more mature nuts. Infested nuts cannot be salvaged. The adult stage is the only stage that is susceptible to insecticides. Eggs and larvae develop inside the maturing nuts where insecticides are not effective. Mature larvae emerge from nuts and burrow into the soil, as deep as 2–3 feet. No soil treatments are currently labeled for pecan weevil

larvae.” Due to the prolonged emergence period, multiple insecticide applications are required to control adult weevils.

The pecan weevil is still intensively managed and is under quarantine in New Mexico (Garcia 2023). According to Brad Lewis, Agricultural and Environmental Services Director at the New Mexico Department of Agriculture, New Mexico is considered the front-line battleground against this invasive pest. The department has successfully contained the pest within certain areas of the state and helped to prevent its spread farther west. Loss of carbaryl would significantly impact the department’s ability to slow the spread of pecan weevil throughout New Mexico, Arizona, California, and northern Mexico. The eradication program targets both commercial growers and residential plantings of pecans in monitoring for and treating pecan weevil (Garcia 2023).

The repeated applications required for eradication of pecan weevil necessitate a rotational program. Carbaryl is the department’s primary rotational product when paired with a pyrethroid. Liquid formulations of carbaryl (e.g., Sevin 4F) are used in rotation with pyrethroids to control adult weevils after emergence. Lewis reported that typically, two applications of carbaryl are used in rotation with three applications of pyrethroids. Sevin 4f use rates were reported at 3 to 4 quarts/acre (Fournier et al. 2016).

Response to Selected Proposed Mitigations for Carbaryl

Citrus

There have been very few reported uses of carbaryl in lemons over the past ten years, reportedly to control red scale. However, several knowledgeable licensed Pest Control Advisors (PCAs) who work with Arizona citrus growers say they either have never used carbaryl or have not used it over a decade in citrus. We do not expect the proposed rate reduction or additional personal protective equipment to negatively impact growers in Arizona.

Turf

According to Kai Umeda, Area Extension Agent in Turfgrass Science for University of Arizona (recently retired), carbaryl is used in relatively rare situations to manage grasshoppers in turfgrass. Though not a frequent pest of desert turfgrass, grasshopper populations sometimes build up in the desert after summer rains. As desert vegetation dries up, they can move into turf in residential areas adjacent to the desert large numbers, where they consume turf seed (from overseeding activities) and otherwise may feed on turf. On such occasions, pest control professionals providing contracted services may apply carbaryl (e.g., Sevin 5 Bait). It is one of few registered products and provides highly effective control. One to two applications may be needed to control grasshoppers. Multiple applications of registered pyrethroids could provide an alternative means of control.

With respect to EPA’s proposed mitigation, “prohibit use on residential turf of granular formulations,” it is unclear to us whether EPA considers Sevin 5 bait (and generics) to be granular formulations. Based on current pesticide label information obtained through agrian.com, the Sevin 5 Bait label refers to the formulation as “bait,” whereas on a generic product label for

Drexel Carbaryl 5% Bait, the formulation is listed as “granules.” **We request that EPA clarify whether the prohibition of granular formulations to residential turf includes applications of bait made by licensed professionals.**

We agree with EPA’s proposed maximum annual application rate of 16 lbs ai/A on turf. This would not be problematic, as one or two applications are sufficient to manage grasshoppers.

We agree with EPA’s proposed prohibition on residential dust formulations of carbaryl.

Forest Service Uses

“The US Forest Service (USFS) reported treating <1% (approximately 800 acres) of all USFS land in the US with carbaryl annually from 2014-2018, to control wood-boring bark beetles on high-value or very vulnerable trees in forest lands managed by the USFS. All USFS treatments occurred west of the Mississippi River, primarily in the intermountain West and west of the Rockies.” (Mallampalli et al. 2022). Carbaryl has been described as “one of the most effective and environmentally safe insecticides used to prevent bark beetle attacks” (Hasting et al. 2001).

According to Chris Fettig, Research Entomologist with the US Forest Service, Pacific Southwest Research Station, carbaryl remains a critical tool for the management of various tree boring beetles in Western forests. Fettig is a leading researcher on wood-boring bark beetle control in forests and has authored or co-authored numerous papers on this topic. In addition, we reached out contacts specifically familiar with current practices in Arizona forestry, including Alyssa McAlexander, Forest Health Specialist with the Arizona Department of Forestry and Fire Management and Joel McMillan with the USDA Forest Service Forest Health Protection Team based in Flagstaff, Arizona.

In reviewing the EPA’s proposed mitigations on the use of carbaryl by USFS employees, these expert contacts offered the following insights.

1. Prohibit backpack applications for tree boring beetle treatment applications by U.S. Forest Service (USFS).

Experts we spoke with agreed with EPA’s proposed mitigation to discontinue use of backpack applications for tree boring beetle treatment by the U.S. Forest Service. Backpack applications are no longer typically used by the US Forest Service for treatment of tree boring beetles. The current emphasis is on preventative applications used in advance of beetle infestations to protect the trees. In such cases, larger equipment is used (Fettig et al. 2013). A common method of protecting trees from bark beetle attack is to saturate the tree bole with carbaryl using a hydraulic sprayer (Fettig et al. 2008). McMillan confirmed that loss of access to backpack sprays of carbaryl would not be problematic in Arizona for the same reason.

In addition, both McMillan and McAlexander acknowledge that carbaryl use in Arizona is minimal compared to other Western states. Carbaryl has not been used to a large extent for wood boring beetle control in Arizona since the last severe infestation occurred around 2005. Beetle attacks are tied to severe drought events or other disturbances cause by weather conditions that can lead to large-scale tree loss if beetles are not properly

managed. While some level of drought has certainly persisted, we have not seen the large-scale and concerning level of damage and tree loss that drove the last wave of carbaryl applications. Currently, tree removal and other management techniques prevail to limit the spread of infestations. In addition, shortages of staff for large scale control efforts and the availability of alternative insecticides for management of tree boring beetles on a smaller scale were cited as other reasons why carbaryl use had declined. Permethrin or emamectin benzoate are the main insecticides used by homeowners or contractors in forested regions. Injections are preferred to spraying because effectiveness of injection is dependent on water flow, which can be controlled through irrigation. While research shows that carbaryl is more efficacious and lasts longer than alternatives, its use here has continued to decline for these reasons.

2. Reduce amount of solution handled per worker per day for tree boring beetle treatment applications by USFS to 250 gallons of solution per worker per day.

Fettig conveyed that the amount of carbaryl solution applied to a tree can vary a great deal, depending on a number of factors. “The amount of material (product + water) applied varies with bark and tree architecture, tree size, equipment and applicator, among other factors, but ranges from ~15 to 30 L per tree (roughly 4 to 8 gal.) under most circumstances. Application efficiency, the percentage of material applied that is retained on trees, ranges from ~80 to 90%.” (Fettig et al. 2013). Fettig expressed concerns that at the higher end of what may be needed for effective management, EPA’s proposed mitigation would severely limit the number of trees that could be treated per worker per day, which could slow protection of forests from attack by tree boring beetles.

Joel McMillan was a participant in conversations with Cameron Douglass and others from USDA Office of Pest Management Policy in 2021 ahead of EPA finalizing this Proposed Interim Decision. He recalls that the 250 gallons of solution per worker per day was the consensus compromise among participants in those discussions. It was noted that this limitation would likely increase control costs, particularly for applications that are contracted out, since carbaryl sprays in some cases would have to be extended over multiple days to keep workers under the daily exposure limit. However, everyone acknowledges the importance of minimizing worker risk.

3. Require double layer, gloves, PF10 respirator, chemical-resistant hat, and chemical-resistant apron for beetle treatment applications.

McMillan commented that it is likely in Arizona that USDA would contract out any future carbaryl applications and would develop contract specifications to ensure use of all required PPE by contractors.

Restricted Entry Intervals

We do not expect any of EPA’s proposed Restricted Entry Intervals (REIs) to impact Arizona growers, as there are no reported uses of carbaryl in any of the crops with new REIs proposed.

Who We Are

The Arizona Pest Management Center is host to the University of Arizona's expert IPM scientists including Ph.D. entomologists, weed scientists and plant pathologists with expertise in the strategic tactical use of pesticides within IPM programs that protect economic, environmental and human health interests of stakeholders and the society at large.

Dr. Al Fournier is Associate Director of the APMC / Associate Specialist in Entomology, holds a Ph.D. in Entomology, and has expertise in evaluating adoption and impact of integrated pest management and associated technologies. He serves as an Integrated Pest Management Network Coordinator through the Western IPM Center Signature Program, representing stakeholders in the desert Southwest states in EPA registration reviews. Dr. John Palumbo is a Research Scientist and Extension Specialist with the University of Arizona who works with the Arizona vegetable industry, based at the Yuma Agricultural Center. He serves as Endowed Chair in Integrated Pest Management in the Department of Entomology at the University of Arizona. Mr. Kai Umeda is a recently retired Area Extension Agent in Turfgrass Science for University of Arizona, previously stationed at Maricopa County Cooperative Extension. He has worked extensively in golf and recreational turf management, with particular expertise in weed management. Mr. Wayne Dixon holds a B.S. in Computer Information Systems and develops tools and data used in IPM research, education and evaluation, including management of the APMC Pesticide Use Database.

These comments are the independent assessment of the authors and the Arizona Pest Management Center as part of our role to contribute federal comments on issues of pest management importance and do not imply endorsement by the University of Arizona or USDA of any products, services, or organizations mentioned, shown, or indirectly implied in this document.

Our Data and Expert Information

Through cooperative agreements with Arizona Department of Agriculture, the Arizona Pest Management Center obtains use of, improves upon, and conducts studies with ADA's Form 1080 data. Growers, pest control advisors and applicators complete and submit these forms to the state when required by statute as a record of pesticide use. These data contain information on 100% of custom-applied (i.e., for hire) pesticides in the state of Arizona. Grower self-applied pesticide applications may be under-represented in these data. In addition, we actively solicit input from stakeholders in Arizona and other Southwest states (Nevada, Colorado, New Mexico and Southeastern California), including those in the regulated user community, particularly to better understand use patterns, use benefits, and availability and efficacy of alternatives. The comments within are based on the extensive data contained in the Arizona Pest Management Center Pesticide Use Database, collected summary input from stakeholders and the expertise of APMC member faculty.

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