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# Agronomy News

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## In this issue



# Kudzu Bug, a Potential Soybean Pest, Survives the Harsh Winter

*Jessica Grant, Alan Leslie, and Dr. Bill Lamp, Department of Entomology*

The kudzu bug (*Megacopta cribraria)* is a soybean pest that was introduced to the U.S. from Asia in 2009, and has rapidly spread across southeastern states. The bug was first found in Maryland in 2013. The harsh winter in 2014 largely stopped the spread of the bug everywhere, but future spread of the insect is uncertain. In the summer of 2013, kudzu bugs were detected in eight counties in Southern Maryland and the Eastern Shore, as well as the District of Columbia (Figure 1). These populations have largely persisted into this summer, although the population sizes this year are relatively small. Soybean producers should still be concerned that this invasive species could become an economic pest, and thus we will continue to monitor the future growth and spread of the kudzu bug in Maryland.

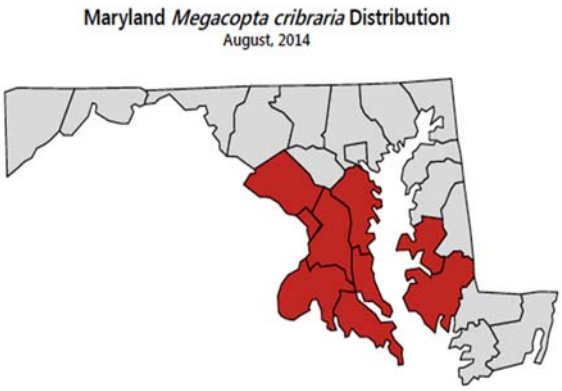


Figure 1.
Distribution of kudzu bugs (*Megacopta cribraria)* in Maryland, August 2014.

The Asian kudzu bug is named after the Asian kudzu vine (*Pueraria montana),* but the bug feeds on a variety of plants, especially soybeans. Kudzu bugs feed as both nymphs and adults by piercing and sucking on stem and leaf tissue of plants with their pointed mouthparts. This differs from the more familiar soybean pest, the brown marmorated stink bug (*Halyomorpha halys),* which feeds on developing soybean pods. Feeding injury from kudzu bugs causes reduced photosynthesis and stunted growth. Kudzu bugs have become a major soybean pest in the southern U.S., and it has the potential to become a major pest in Maryland as well.

***Identification***

Kudzu bug adults are brown to greenish brown, measure between 1/8$^{th}$ and 1/4$^{th}$ inch in length, and are rounded making them easily mistaken for beetles (Figure 2). The adults are further characterized by a hard plate that completely covers the wings on the abdomen and is squared off at the end. Eggs are laid in two parallel rows usually on the underside of a leaf (Figure 3). Nymphs hatch from eggs and develop through five stages before becoming adults. Young nymphs often resemble the kudzu stem with a green and fuzzy appearance (Figure 4). Similar to stink bugs such

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Figure 2.
Adult kudzu bug distinguished by the rounded shape, squared off end, and brownish green coloration. Photo courtesy of Alan Leslie.

as the brown marmorated stink bug, kudzu bugs release a chemical that is very pungent when disturbed.

***Current Research***

Given that the kudzu bug is a significant agricultural pest in the southeastern U.S., much of what we know about the insect is based on research from those states (i.e., Georgia and South Carolina). Maryland's agriculture and climate needs to be assessed to better understand how the kudzu bug responds at the northern edge of its distribution. Therefore, with funding from the Maryland Soybean Board, we sampled throughout the summer to determine how many generations the kudzu bug has in Maryland and when adults, nymphs, and eggs are present. We expected to find that adults emerge from overwintering sites in late May to early June. This overwintering generation invades kudzu vines where they lay eggs for a first generation. The adults emerge in late July to August. These adults will most likely produce offspring that overwinter as adults. Both generations of adults may disperse to soybeans. The timing of kudzu bug movement into soybeans contrasts with that of the brown marmorated stink bug, which invades crops in the late summer to feed on seedpods. Through our sampling this year, we found that kudzu bug populations are reduced from those of the previous year. Such low numbers at our sample sites have made it difficult to assess life history characteristics in Maryland. We will continue to monitor at our sites through the fall until the kudzu vines senesce and die back. In addition, given the low numbers found this summer, we have not yet seen the bug produce high enough numbers to become a pest to Maryland soybeans. Future studies will include work on the impact of kudzu bug injury on soybean crops.

***Management and Resources***

Kudzu bug populations can be difficult to suppress because of their highly mobile nature, even though most insecticides are effective. Finding an effective pest management system for Maryland soybeans still needs further research. Many educational resources are available to the agricultural community and general public for kudzu bugs. For general information and distribution across the southeast United States visit "The Megacopta Working Group" at www.kudzubug.org. For the status of the kudzu bug in Maryland, we post updates of our findings at http://mdkudzubug.org. A Maryland fact sheet on the bug is available from our website, and we provide an opportunity for residents to report their discovery of kudzu bugs. Reporting possible locations of kudzu bugs will help inform us of the potential spread of the bugs.

***Future of Kudzu Bug in Maryland***

Although the kudzu bug numbers were low this summer, the bugs were able to survive the harsh winter. Given their persistence, we cannot rule out kudzu bugs as a potential threat to soybean producers in Maryland. The exact seasonal timing and generations of the bugs is still unknown for Maryland; however, we do still expect that they first emerge in late May to early June with two generations during the summer. From their first emergence through the fall they have potential to stunt soybean growth by feeding on the stem and leaf tissue with their piercing/sucking mouthparts. Based on current evidence, the potential of the invasive kudzu bug as a soybean pest in Maryland remains unclear.

Figure 3
Kudzu bug egg mass laid in two parallel rows on the underside of a soybean leaf. Photo courtesy of Alan Leslie.

Figure 4.
Kudzu bug adult and nymphs are noted by a green to brown color, and nymphs appear fuzzy similar to the soybean plant. Size and color varies depending on the stage of nymph. Photo courtesy of Alan Leslie.

# How Management Practices Affect Herbicide Resistant Weed Populations

*Peter A. Steimer, Herbicide Discovery Scientist, DuPont Crop Protection*

Herbicide resistance has been a rapidly growing issue in agroecosystems worldwide. Herbicide resistance is when a weed develops resistance to a particular group of herbicides and a resistant weed biotype will not be controlled by the application of that group of herbicides when the sensitive weed biotype of that species would. Resistance issues can develop fairly quickly in weeds after a repeated use of the same herbicide or a similar herbicide with the same target site in the plant. The first case of herbicide resistance was in 1968 with triazine resistant weeds. By 1991 there were 120 weed biotypes resistant to triazine herbicides and resistance issues were found with 15 other herbicide families as well (Gunsolus, 2013). With such rapid resistance development, growers need to pay close attention to the how frequently the same herbicide is being used. With the stacked trait technology being used in crops, growers are becoming more dependent on just a few herbicides but need to consider the resistance issue prior to getting comfortable with the same application year after year. There are many management practices that growers today can implement in order to combat the fast growing resistance issue appearing in fields worldwide.

The best option for combating resistant weeds is to use herbicides that target a different site of action within the weed. A site of action is where the herbicide binds within the plant to disrupt physiological processes within the weeds. If you use herbicides that bind to the same site of action, resistance issues could develop. According to Dr. Jeffry Gunsolus from University of Minnesota, “A change in a site of action that results in resistance to a particular herbicide may or may not result in resistance to other herbicides that are active at the same site of action. The reason for this is there can be many different binding sites at a particular site of action and those binding sites can be very herbicide specific”. Weeds will develop resistance to some herbicide groups much faster than others.

ALS inhibitors and triazines (photosystem II disruptors) are among the faster modes of action that weeds will develop resistance to. As stated above, with new herbicide resistant crops, growers will need to pay careful attention to their rotation of herbicides in order to continually combat resistant weed populations. With crops being tolerant of compounds like glyphosate that provide non-selective weed control it becomes easy to fall into the habit of using glyphosate year after year. Glyphosate resistant weeds are now found worldwide and I think the rapid increase can be attributed to the use of herbicide resistant crops that are being marketed. Now, with stacked trait crops you can have crops that are resistant to multiple herbicides. This should help farmers with herbicide rotations and allow them to not depend so heavily on glyphosate usage.

Even with the heavy dependence on glyphosate, an addition of a short residual herbicide will help to control potential glyphosate resistant weed seeds that have contaminated the field over the years. Having a short residual herbicide applied to a field will provide weed control during the critical weed emergence period before planting occurs. “Using herbicides that do not persist in the soil for long periods and are not applied repeatedly within a growing season reduces the selection of herbicide-resistant weeds. However, repeated applications within a growing season of a herbicide with no soil activity (e.g., Gramoxone) has resulted in weeds resistant to the herbicide” (Mallory-Smith, 2014).

While paying attention to what the mode of action of the herbicide is, you must also be sure to follow the recommendations on the label for use rates. Often the use rate will depend on the soil type or the organic matter content of the soil. Using rates well over the recommended rate is not only illegal but also can speed up herbicide resistance in weeds as the strongly resistant biotypes will not be controlled and add the highly resistant seed to the fields seedbank. On the other end, if growers begin to use a herbicide at less than the recommended use rates, metabolic herbicide resistance can develop within the weeds over time. As you apply rates that may not control the weeds, the plants can build up a tolerance or learn to metabolize the low amount of the compound. Over time this metabolic resistance can become stronger and stronger until even a higher dose of the compound will not control the biotype. All growers must adhere to labels for legal reasons as well as minimizing the chance of herbicide resistance developing in their fields.

While rotating herbicides is the most common recommendation for combating herbicide resistant weeds there are several other practices that can be used to help slow the ever-growing problem. Simply rotating crops can also help to combat herbicide resistance issues since different crops will have different herbicides labeled for weed control in those systems. UC Davis Extension states, “Crop rotation is one of the best tools for preventing resistance” (DiTomaso et. al., 2000).

Growers must be careful that when rotating crops they are still rotating the mode of

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action used for weed control. For example, you do not want to use an ALS inhibitor in a corn field and then use another ALS inhibitor targeting the same site of action in the winter wheat following the corn. Another benefit of rotating crops is that different weeds prefer and grow in different situations. During a winter wheat season, you will see far different weeds emerging than in a field of a summer annual like corn. Therefore, crop rotations will help to reduce the weed seed bank in a particular field since you will be killing both winter and summer weeds.

Picture 1.
Herbicide resistant palmer amaranth in a soybean filed. Photo courtesy: Sudeep Mathew

Another essential practice in maintaining control of herbicide resistant weeds is to scout newly sprayed fields to ensure the expected weed control is achieved. Sometimes there can be issues with the actual application but if no distinct pattern is easily visible then chances are there is a resistance issue. If a patch of weeds that should be controlled by the herbicide application is found then the grower may need to turn to mechanical control instead of relying on chemical control. Many growers do not want to start hand weeding fields but the benefits to hand weeding are far greater than letting a herbicide resistant weed go to seed. Weed seeds can persist in a field's seed bank for decades so the extra effort to hand weed is well worth it. UC Davis Extension found, "A 90 percent or greater rate of weed removal reduces the chances that a resistant plant will produce seed" (DiTomaso et. al, 2000).

There are many non-chemical methods that can be used for management of herbicide resistant weeds. The use of tillage is a common and effective method to fight these detrimental pests. Performing a conventional till on a field will help to bury any newly emerged weeds while also disrupting the current seeds in the seed bank. Seeds deeper in the soil will be brought to the surface and will bake in the sun until the seed is no longer viable.

On the other hand, having a residue or mulch can also help reduce weed emergence and lower the number of resistant plants that can make it through the mulch. Many growers are using plastic and synthetic mulches but organic mulches and crop residues also help with effective weed control.

In some parts of the country, soil solarization can be used to raise the soil temperatures to levels so high that the seeds of certain species of weeds cannot survive. This generally can only be done on small scale farms as it takes lots of time and resources to lay clear plastic over an entire field. Most fields will require the use of both chemical and non-chemical practices in order to successfully control resistant weed populations.

One of the last, but often overlooked, practices that is essential to preventing the spread of herbicide resistant weed populations is sanitation. "Equipment clean out is essential to reduce the spread of resistant weed seed" (*Herbicide Tolerant Crops & Weed* Management, DuPont Biotechnology 2013). Thoroughly cleaning all equipment prior to switching between fields is essential to not spreading resistant seed. Sometimes it becomes easy to finish one field and continue to the next, but this can contaminate multiple fields with the same resistant weed if all equipment is not cleaned prior to moving to a new field. Packed soil in tires is a common way that weed seeds can be missed when cleaning off equipment. If a grower cleans all equipment when moving between fields then the spread of resistant weed seed can be minimized.

Herbicide resistance is an ongoing issue in the world. Most companies are racing to discover the next new herbicide that can control resistant weeds but the fact is, if growers follow the management recommendations available then we can begin to combat resistant weeds immediately. Simple practices like being aware of labels and becoming familiar with the various modes of action can help growers make sound decisions while helping to suppress the rapidly growing herbicide resistance problem. In addition, practices such as tillage, timely scouting, use of mulches, and sanitation can help to greatly reduce resistant weed populations showing up in fields worldwide. The more growers become educated about this issue and the management practices they can implement to help stop the spread of these resistant weeds, the easier it should become to suppress these growing resistant populations.

## Crop Reports

**Western**
Most of Washington County will enjoy an excellent crop year. Corn and soybeans are looking good and choppers have begun to harvest corn silage. Alfalfa hay crops have been good while grass hay yields have been running a little behind for the year. There was a good peach crop and apple harvest is in full swing with the Galas ready for you to enjoy.

**Central**
Light to heavy rains fell across the region during the reporting period. Cooler than normal temperatures started this reporting period, but normal to slightly above normal temperatures ended it. Corn silage harvest started about 2 weeks behind schedule but is now in full swing with excellent yields being reported in most areas. Soybeans have gotten needed degree days to help push pod development. August hay was short in height, but with warmer temperatures predicted, there is hope that additional growth will reward those who held off on harvest. Well-managed pastures are in excellent condition. Small grains planted for cover crops following corn silage is emerging well.

**North East**
Summer and fall are colliding and it is affecting crops. Even though there have been showers and thunderstorms around the area, most soil moisture levels are considered low to droughty in the region. Corn is maturing rapidly with much of the crop past black layer. Some full season soybeans are showing some yellowing and late planted double crop beans are just starting to flower. Most of the second cutting of grass hay has been completed.

**Upper Eastern Shore**
The region has turned dry which is good for corn harvest, but bad for soybean seed fill. Initial corn harvest is validating the expectation of record yields. There are non -irrigated fields that were planted at 24,000 seeds/A, and received 160 lbs/A of nitrogen yielding over 200 bushel/A of dry corn! Why do I keep planting 30,000 seeds and use 200 lbs of nitrogen under irrigation? Early group 3 soybeans are maturing and starting to drop leaves. Our recent droughty conditions are affecting pod fill and will impact seed size on late maturity group 3 and maturity group 4beans unless we get rain soon. Soybean aphid populations have dropped off in some fields but increased in others and pod worm pressure is still low in most areas. Hay yields continue to be good with adequate harvest windows to make good quality hay.

**Lower Eastern Shore**
Corn harvest has begun with yields reported in the high 200 bu/A range across the early harvested fields. The majority of the remaining corn is in the dent stage, depending on how early it was planted. Soybeans are in various stages of seed fill. There have been reports of damage to soybeans caused by deer. There have also been reports of aphids and Japanese beetles seen in soybean fields. With the end of summer, rains have become sparse, but enough showers have occurred to keep soil moisture adequate. Chipping potato harvest is nearing completion with average yield over 400 CWT/A. Watermelon harvest is continuing.

Crop Report Regions: Western (Garrett, Allegany and Washington), Central (Carroll, Frederick, Howard, Montgomery), Northeast (Cecil, Harford, Baltimore), Southern (Anne Arundel, Prince George's, Calvert, Charles, St. Mary's), Upper Eastern Shore (Kent, Queen Anne's, Talbot, Caroline), Lower Eastern Shore (Dorchester, Wicomico, Worcester, Somerset)

## Agriculture Weather Report

*Scott A. Minnick, Meteorologist - National Weather Service*

Generally near-normal temperatures and above-normal rainfall characterized August across Maryland. Precipitation is expected to remain near to above normal, but variable across the state. An occasional cold front, the first during the first weekend of the month, will bring additional chances for rainfall and cooler temperatures.

Thereafter, confidence decreases, but indications are that above normal temperatures will prevail. The mean high temperature during September drops around 10 degrees across the state. September 30 average high temperatures are in generally in the lower 70s with average low temperatures in the lower 50s.

Average rainfall across the state is generally around 4 inches for the month. Rainfall during September is occasionally enhanced by tropical systems, but below normal tropical activity to date translates to a low chance of a tropical cyclone. That means the state is depicted as having equal chances for above, near, or below

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normal precipitation by the Climate Prediction Center.

Looking farther out in time for the upcoming harvest, the above normal temperature trend is expected to persist through October and November. The chance for El Nino to develop this fall and early winter has decreased, leaving us again with no strong climate indicator for precipitation. As a result, the Climate Prediction Center continues with equal chances for below, near, or above normal precipitation. If El Nino does develop, the latter half of fall could trend wetter than normal.

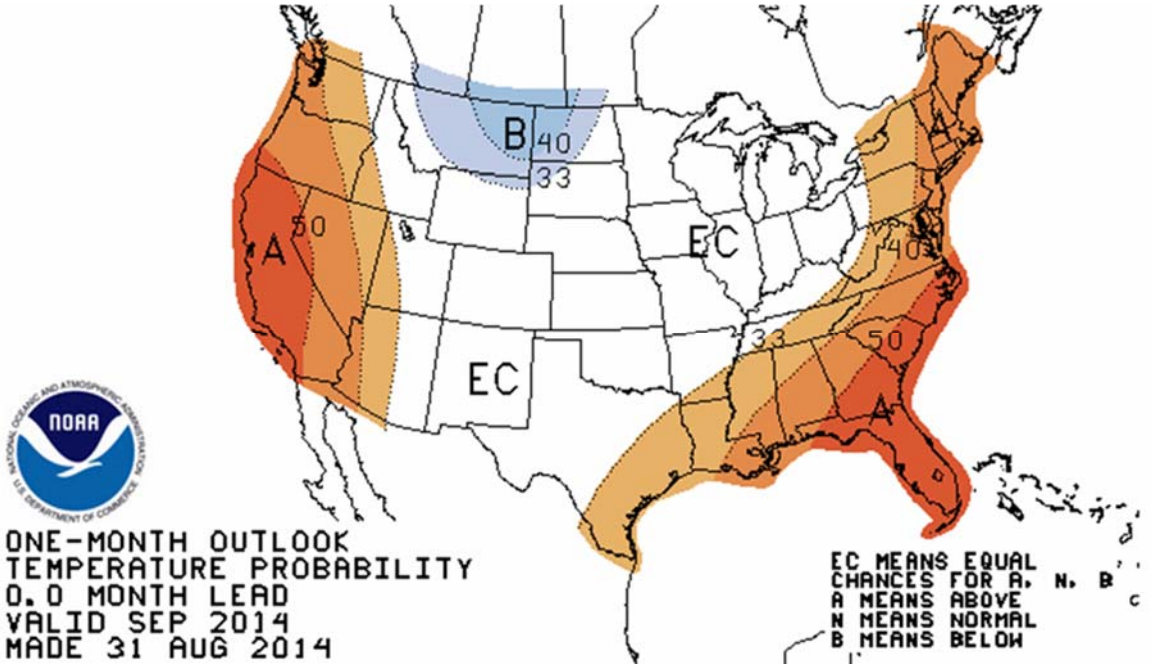


**Figure 1 CPC September 2014 Temperature Outlook**

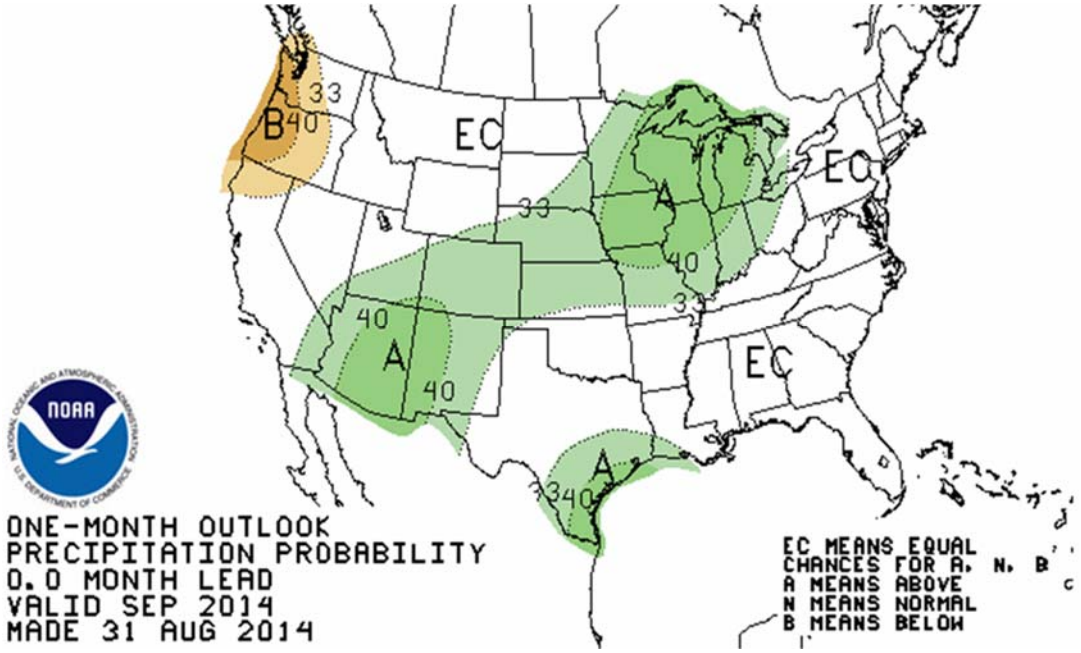


**Figure 2 CPC September 2014 Precipitation Outlook**

## Upcoming Events

### Registration for the 20th Mid-Atlantic Crop Management School is now open

The annual Mid-Atlantic Crop Management School will be held November 18-20 at the Princess Royale Hotel in Ocean City, MD. This highly acclaimed event has for many years been the "one-stop" location for Certified Crop Advisors to obtain Continuing Education Units (CEUs) in the categories of Crop Management, Pest Management, Nutrient Management, and Soil and Water Management. This year, a remodeled conference center at the Princess Royale will provide larger rooms for the concurrent educational sessions offered at this school. The expanded facility allows the planning committee to accept a higher number of students than could be supported in previous years.

Over the three days of the school, there will be 45 different topics presented in the four subject areas previously mentioned in addition to an open fifth category. We encourage **farmers and farm managers**, agronomists, crop consultants, farm service providers, soil conservationists, state department of agriculture personnel, and extension educators located in the Mid-Atlantic to register and attend this school. Please visit the below web link for registration and program details http://psla.umd.edu/extension/md-crops.

### How to write a Nutrient Management Plan Trainings

University of Maryland Extension in collaboration with Maryland Department of Agriculture will conduct two training classes for nutrient management plan writing in September. Participants will learn how to write a nutrient management plan from beginning to end and how to use the nutrient management planning software, NuMan Pro. Participants will not come out of this training with a finished nutrient management plan; rather, they'll have a better understanding of the plan development process and inputs needed to create a plan. This program will award 6 Maryland Nutrient Management continuing education credits. This training is intended for newly certified nutrient management consultants.

Thursday, Sep. 25, 2014 - 9:30am to 3:00pm at University of Maryland Wye Research & Education Center, 124 Wye Narrows Dr., Queenstown, MD 21658.

Tuesday, Sep. 30, 2014 - 9:30am to 3:00pm at University of Maryland Extension Montgomery County office, 18410 Muncaster Rd., Derwood, MD 20855

For registration, contact 410-841-5959.

### How to access Agronomy News on the web

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Click the Extension dropdown menu
Click mdcrops
Click Agronomy News menu on your left hand side

Option 2.
Visit www.extension.umd.edu
Click the News & Events dropdown menu
Click newsletters
Click Agronomy news

## Did You Know

In ancient times, corn cobs were only about the size of your thumb. Through selective breeding, scientists expanded their size to what is considered normal today.

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