Orchardgrass Die-off

After the morning coffee break, Session 2, **Orchardgrass Die-off Update on Findings From Virginia**, was moderated by James Cropper. He introduced Gordon Jones, doctoral candidate from Virginia Tech University. Gordon spoke at our conference in 2015 and was invited back to share what he learned from his research work in 2015 that occurred after our winter conference.

The title of Mr. Jones' presentation was *An update on orchardgrass persistence research in Virginia*. Gordon started his presentation with the background of orchardgrass reduced persistence and why it impacts the hay industry in Virginia and other Mid-Atlantic States. It has been grown in the Mid-Atlantic states since 1750. There are an estimated 1.1 million acres of orchardgrass grown in the Mid-Atlantic. Producers have experienced reduced yield and stand longevity. Cost to the Mid-Atlantic hay producers could be $90 million annually.

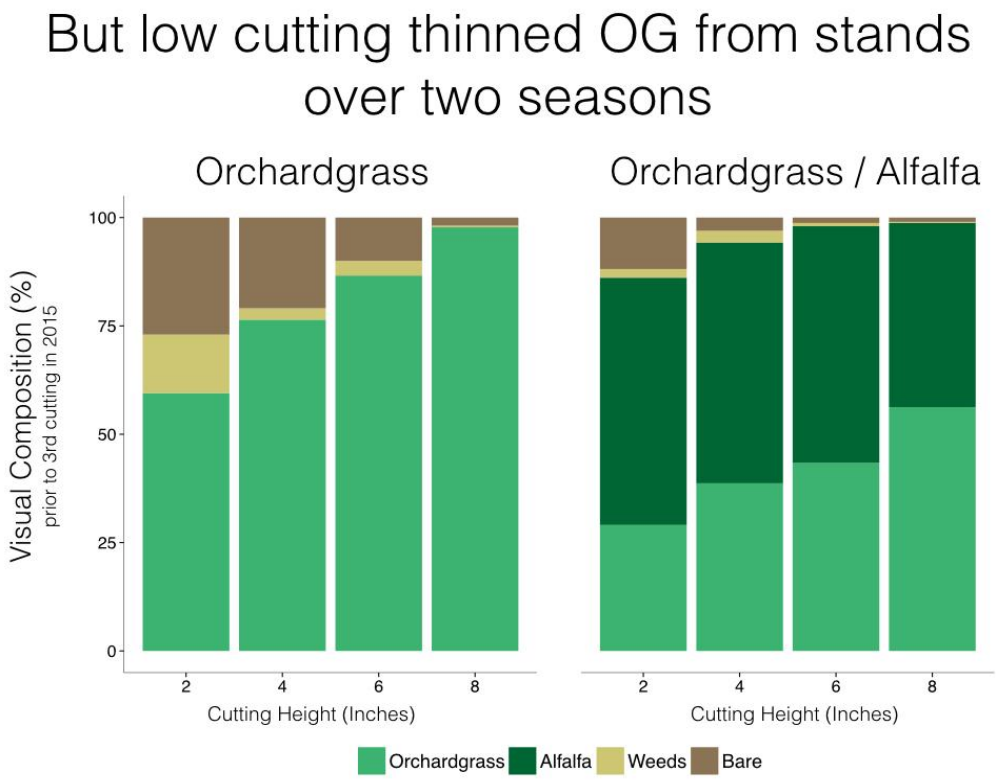
Hypothesized causes of reduced orchardgrass persistence are:

- Soil fertility
- Pest and Diseases
- Harvest Management

His overall objective is to attempt to determine the cause/s of reduced persistence in orchardgrass hay stands. In his previous work, he had looked at soil fertility and pest/disease issues, but most of the hay stands were not affected very much by those potential causes. Only in isolated incidences were these affecting orchardgrass hay fields adversely. This past year he focused more on harvest management issues, especially with changing climate of increased night time temperatures. A change in hay cutting technology could also be the culprit. Many hay producers have switched to discbines from sickle bar-type mower-conditioners. Discbines are often set at lower cutting heights than the sickle bar mowers were. Cutting at 2 inches tends to remove some or all stored carbohydrates in the stem bases and scalps random high spots in the field reducing stands significantly.

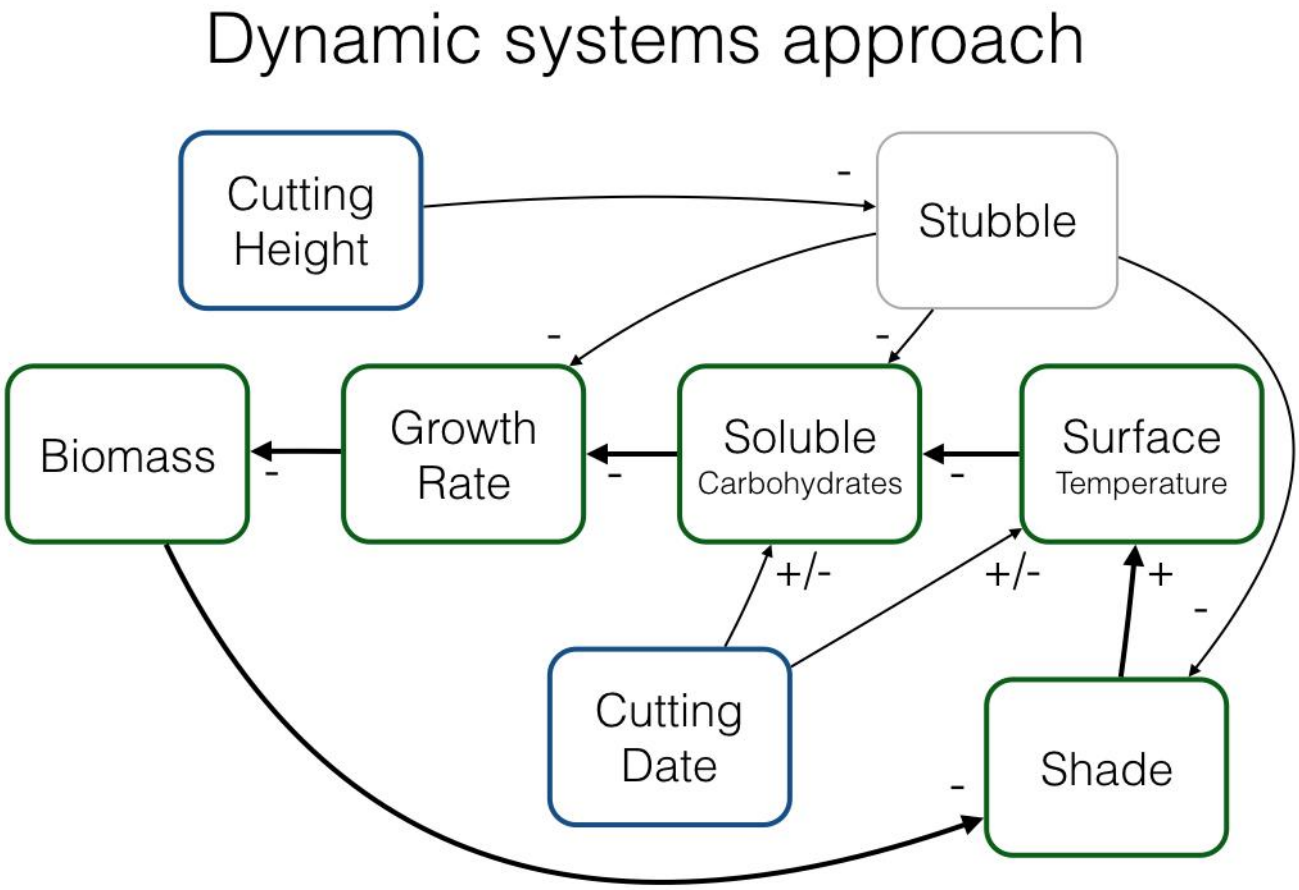
In his literature review, he found inconsistent results. Several studies indicate that lower cutting heights *decrease* yields and persistence. However, several studies indicate that lower cutting heights *increase* yields. One study found both can occur. In a multi-state experiment, the low cutting height treatment improved stand persistence in two states, reduced persistence in one state, and had no effect in another. Interestingly, these studies were over a long range of time - many prior to the invention of the discbine and its wide-spread usage in the Mid-Atlantic.

In his research, he found 2-inch cutting height resulted in the highest yields over two seasons, 2014 and 2015, in pure orchardgrass and orchardgrass-alfalfa hay trials. However, low cutting heights thinned orchardgrass from hay stands over the two seasons. See the effect in the above chart. Its loss was even more dramatic when grown with alfalfa. Even with very high cutting heights of 6 and 8 inches, there was much loss of orchardgrass from the alfalfa-orchardgrass stands. (Editor's note: This loss of



orchardgrass may be due to harvesting the alfalfa at its correct stage of maturity without regard to the orchardgrass cultivar's best stage of maturity.)

Orchardgrass growth declines significantly above 80° Fahrenheit (F). Air temperatures have warmed in Blacksburg, Virginia since 1970. Changing climate may be impacting the adaptation range for orchardgrass. Virginia is at the southern edge of its adaptation range. Lower cutting heights causes warmer soil temperatures. In July, with the air temperature at 85° F, soil temperature at 1 inch below the surface was 88° F when orchardgrass cutting height was 2 inches, 85° F at a 4-inch cutting height, 82° F at 6-inch cutting height, 79° F at 8-inch cutting height, and 76° F in uncut orchardgrass.



Gordon proposed a dynamic systems approach to orchardgrass cutting management. The full diagram is shown above.

A cutting height experiment was conducted at three sites in Virginia: Orange, Steeles Tavern, and Blacksburg. Cutting heights were 2 and 4 inches for first cut conducted at two different times, May 10 and June 10. Regrowth after 28 days was much better at the 4-inch cutting height at May 10 than it was for June 10. Regrowth after 28 days for the 2-inch cutting height was consistently lower than the 4-inch cutting height for the May 10 date and site locations. The June 10 cutting date had very low 28-day regrowth at either cutting height showing that waiting to cut that late really hurt regrowth potential.

Looking at the surface air temperatures 1 inch above the ground for 7 days after May 10 first cutting, they were 89.7° F at Blacksburg, 81.5° F at Steeles Tavern, and 94.7° F at Orange. At the June 10 first cutting, the surface air temperatures were 101.3° F at Blacksburg and 97.3° F at Steeles Tavern. Orange was not first cut on June 10. The results seen in Gordon's experiments is borne out by work done by Colby et al. 1962 where high nitrogen (N) fertilization rates and low cutting heights can cause poor regrowth of orchardgrass especially when temperatures are high. Stringer et al. hypothesized that high N rates, low cutting heights, and late cutting dates could cause reduced persistence of tall fescue

(1980). In creeping bentgrass turf, increased cutting height increased photosynthetic rate and improved turf quality (Liu & Huang, 2005).

Gordon's final hypothesis is: (1) Low cutting heights, later cutting dates, and warmer spring temperatures may be slowing growth rates, causing heat stress, and reducing persistence, and (2) This stressed condition is likely compounded by soil fertility imbalances, insect pests, diseases, and drought.

Mr. Cropper thanked Mr. Jones for providing the Consortium membership his invaluable insight on why orchardgrass persistence has declined so quickly over the past 10 years. Mr. Cropper then gave the last presentation for this session. The title of his presentation was *Attack of the Billbug*. He had spent some time in search of a speaker on this topic of billbug damage to orchardgrass stands, but the entomologist at Virginia Tech that studied these insects had retired recently. No one with his expertise was available to speak about billbug infestations in orchardgrass stands. Since Mr. Cropper had collected some very good pictures from various sources and two VA Tech publications (*Bluegrass Billbug Pest Management in Orchardgrass* and *Hunting Billbug Pest Management in Orchardgrass*) and one Penn State publication article (*Billbugs Feeding in Orchardgrass*) on the subject, he decided to give a brief description of how billbugs damage and, in severe cases, kill orchardgrass plants.

He displayed close-ups of the two billbug species that attack orchardgrass in Virginia and elsewhere in the Mid-Atlantic states, bluegrass billbug and hunting billbug. As the name suggests the bug has a large proboscis or snout projecting from its head. The two billbug species are similar in appearance, but the bluegrass billbug is slightly smaller, 5/16 inch in length at maturity than the hunting billbug, 7/16 inch in length at maturity. Bluegrass billbug also has a dark ridge running lengthways across the middle top of its thorax amid equally spaced pits. Its wing covers have a pattern that resembles chains running down their lengths. The hunting billbug is most easily distinguished from the the bluegrass billbug by having the top of its thorax displaying pits and black smoothed areas that form a characteristic “V” or “Y” shape that is framed by parenthesis-like markings. As these billbugs mature, they become darker making these distinguishing markers less noticeable.

The tip-off that these bugs are present in orchardgrass is the several paired feeding holes left in the folded leaves of orchardgrass. This is easily seen when inspecting orchardgrass for insect damage. The adults lay eggs in the stem bases and plant crowns shortly after emerging in the Spring. They emerge beginning 280 degree-days from March 1, usually appearing in late April and early May. Egg laying may continue through June. The larvae feed on the carbohydrates stored in the stem bases. This weakens the stem in time so that it easily breaks off if pulled. Frass (fine, sawdust-colored excrement) falls out of the pulled off stem, or can be seen if a pocket knife is used to open up a stem base to see signs of feeding. The larvae are about a half inch long, off-white, have no legs, and a tan to red-brown head. They hollow-out the stem base; essentially eating all the stored carbohydrates of the plant. If the infestation is severe enough that most or all stems are destroyed on a plant, the plant dies.

illbug damage to orchardgrass - paired holes in leaves, hollowed out dead stem base (by feeding larvae), and dead patches in orchardgrass hayfields

If this was not complete enough, the larvae move out of the stem bases into the crown of the plant and continue feeding until they pupate. This can complete finishing off an orchardgrass plant. Mr. Cropper showed two slides showing emerging larvae coming out of the stem base into the roots and an exit hole left by a larva.

To complete the life cycle the larvae pupate in the soil in July and emerge as adult bugs in July/August. They then feed on orchardgrass until they hibernate overwinter.

Billbug damage occurs in scattered spots around orchardgrass fields, but is most common along field edges. Orchardgrass loss by billbug feeding seems to be influenced by other stressors including soil compaction and droughty soils on knolls. The billbugs may simply be the last straw that broke the camel's back, resulting in orchardgrass mortality in less than ideal soil conditions.

In the last slide, an adult billbug and two larvae are shown on a penny indicating their small size. Mr. Cropper thanked Tim Mize and Bobby Clark, Virginia Tech Extension agents, and Marvin Hall, Forage Agronomist, Penn State for the great pictures of billbugs and their larvae and the damage they cause.