Handbook of Forage and Rangeland Insects Available Through APS Press

The Entomological Society of America recently published the Handbook of Forage and Rangeland Insects, edited by William O. Lamp, Richard C. Berberet, Leon G. Higley, and Craig R. Baird. The handbook editors and authors are internationally recognized experts in management of forage and rangeland insects. The handbook has copious photographs, illustrations, and references to support each section. Both the major, widespread insect pests (e.g., aphids, alfalfa weevil, armyworms, potato leafhopper) and those less frequently talked about (e.g., alfalfa blotch leafminer, plant bugs, stink bugs) are discussed in detail—description, life cycle, ecology, injury, management, and selected references. Some of our favorite multiple-crop insect pests are addressed thoroughly—blister beetles, chinch bug, crane flies, grasshoppers, and white grubs (including Japanese beetle). Also included are sections about forage and rangeland production, integrated pest management, insect identification, and beneficial organisms (parasitoids, predators, entomopathogens, pollinators). A thorough and interesting discussion about biological control of weeds with insects concludes the text.

I recommend this handbook as a fundamental resource for anyone who grows, scouts, or services alfalfa and/or forage and rangeland grasses. It is available from APS Press (www.shopapspress.org/haoffoandrai.html). The 180-page soft-cover publication is currently on sale for $59. Other books about managing insect pests in field crops (e.g., corn, soybeans) and stored products are available from APS Press at www.shopapspress.org/titles-by-category-integrated-pest-management.html.

You might also want to check out the Plant Management Network (PMN; plantmanagementnetwork.org), whose tag line is “Fast, Easy, Applied Solutions in Agriculture.” Ready access to multiple, current resources is available from this site. Upgrade your reference library with the handbook for your bookshelf and PMN in your electronic files.—Kevin Steffey

Alfalfa Weevil Activity Is Conspicuous in Southern Illinois

Let me begin with an overview:

• Alfalfa weevils are causing significant damage to alfalfa fields in southern counties of Illinois. The injury and densities of weevils in some fields have justified insecticide applications.

• Use accumulated degree-days to predict when larvae hatch and begin causing injury.

• Scout now in alfalfa fields south of Route 50.

• Use economic thresholds (static or dynamic) to make control decisions.

As soon as we entomologists returned from our annual meeting of the North Central Branch of the Entomological Society of America in Winnipeg, Can-
ida (March 25–28), we began getting reports of significant alfalfa weevil activity in southern Illinois. Several reports received between March 30 and April 3 indicated noticeable injury in alfalfa fields as far north as northwestern Bond County. Some fields farther south have been damaged significantly. In the words of Kevin Black, insecticide/fungicide technical specialist with Growmark, ”Alfalfa weevils are tearing apart alfalfa fields in the south.” Many producers who are getting ready to plant corn have been surprised by the intensity of the injury this early in the season.

Ron Krausz, superintendent at the Southern Illinois University Belleville Center (St. Clair County), reported alfalfa weevil feeding as early as March 27. Ron Hines, now a seed agronomist with Growmark in southern Illinois, observed 25% to 30% of the tops of alfalfa plants injured by alfalfa weevil larvae in a field at the University of Illinois Dixon Springs Agricultural Center on March 30. He estimated about 20% leaf loss. Robert Bellm, crop systems educator at the University of Illinois Edwardsville Extension Center, visited an alfalfa field in Madison County on April 3 and found an average of 3 larvae per stem and heavy feeding injury. Jim Nusbaum, Rolling N Services, scouted alfalfa in northwestern Bond County on April 2 and found minor injury but weevils themselves.

In several of these instances, alfalfa weevil injury and densities were at or greater than the published static thresholds of 25% tip feeding and/or 3 larvae per stem, justifying an insecticide application. Dennis Epplin, crop systems educator at the University of Illinois Mt. Vernon Extension Center, sprayed an insecticide on an alfalfa plot in Franklin County on April 2 and suggested that the spray was probably three days late. Obviously, the relatively early warm-up in late March has “activated” alfalfa weevils in a relatively large area of Illinois.

As you know, we can predict biological events in some insects’ life cycles by keeping track of degree-days with specific baseline temperatures and start dates. For alfalfa weevils, we begin accumulating degree-days from January 1 with a baseline temperature of 48°F. Larvae begin to hatch from spring-deposited eggs after 300 degree-days have accumulated; larvae hatch from fall-deposited eggs (a biological event that occurs in southern and central but not northern Illinois) even earlier.

A glance at degree-day accumulations on April 3 revealed that larvae have been hatching from spring-deposited eggs anywhere south of a line from Alton (Madison County) to Robinson (Crawford County), roughly a little north of Route 50. A 1-week projection (using historic temperature data) suggests that alfalfa weevil larvae from spring-deposited eggs will begin hatching in fields south of Springfield. A 2-week projection shifts the ”larval hatching front” north to about Bloomington. A link to more information about alfalfa weevils indicates that major leaf feeding by third and fourth alfalfa weevil larvae occurs between 439 and 595 degree-days. You can keep track of degree-day accumulations for alfalfa weevils at www.sws.uiuc.edu/warm/pestdata/choosemap.asp?plc=#, a site co-developed by scientists at the Illinois State Water Survey and entomologists in the University of Illinois Department of Crop Sciences. The site is maintained at the Water and Atmospheric Resources Monitoring Web site (www.sws.uiuc.edu/warm).

It’s important to point out that two distinct peaks of larval activity usually occur in southern Illinois, one from fall-deposited eggs and one from spring-deposited eggs. Hatching of overwintering eggs usually occurs when 200 degree-days (above a base temperature of 48°F) accumulate beyond January 1, and we suggest that scouting should begin when 250 to 300 degree-days accumulate. An early peak of third-stage larvae from overwintering eggs occurs after an accumulation of 325 degree-days; a second major peak of third-stage larvae from spring-deposited eggs occurs after an accumulation of 575 degree-days.

People throughout the southern half should be looking for alfalfa weevil activity; scouting now in southern counties is crucial. When you begin to scout alfalfa fields for alfalfa weevils, look first in areas of the field that might warm up early, such as south-facing slopes and areas of the field with lighter soils. The small, yellowish, early-instar larvae with black heads feed on these terminal leaves, causing injury resembling pinholes. Pinhole injury is not economic because the larvae are too small to cause significant defoliation. It is not until alfalfa weevils grow into third instars that they begin to cause more economic damage by skeletonizing the leaves. Third instars are bright green with a distinct white stripe along the center of the back, and the head capsule is distinctly black or dark brown.

If you prefer to use dynamic economic thresholds (which incorporate plant height and value of alfalfa hay) instead of static thresholds for alfalfa weevils, consult Table 1, developed by entomologists at Iowa State University (published in Integrated Crop Management, IC-494 [6], April 11, 2005, www.ipm.iastate.edu/ipm/icm/2005/4-11-2005/scoutweevil.html. Insecticides suggested for alfalfa weevil control in Illinois are presented in Table 2.—Kevin Steffey

**Arthropods in Wheat Deserve Your Attention**

Everyone scouting for insects and mites in wheat should be on the alert for a number of these potential pests. Kevin Black, insecticide/fungicide technical specialist with Growmark, provided the following commentary about a number of arthropods in southern Illinois during the last week of March: "Hessian fly numbers are very high in volunteer wheat, as are numbers of wheat curl mites. Wheat streak mosaic virus symptoms are obvious in mite-infested volunteer
Table 1. Economic thresholds based on alfalfa weevil larvae per stem, calculated from a 30-stem sample.

<table>
<thead>
<tr>
<th>Plant height (in.)</th>
<th>$40/ton</th>
<th>$70/ton</th>
<th>$100/ton</th>
<th>Management decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>1.8-2.8</td>
<td>0.8-1.3</td>
<td>0.6-0.8</td>
<td>Reevaluate in 4 days. If damage and larval numbers are increasing, a long-residual insecticide is recommended to prevent severe yield loss.</td>
</tr>
<tr>
<td>6</td>
<td>2.0-3.0</td>
<td>0.8-1.5</td>
<td>0.6-1.0</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>2.2-3.2</td>
<td>0.9-1.7</td>
<td>0.7-1.2</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>2.3-3.5</td>
<td>0.9-1.9</td>
<td>0.8-1.4</td>
<td>If alfalfa is in vegetative stages, a short-residual insecticide should be used.</td>
</tr>
<tr>
<td>12</td>
<td>2.4-3.8</td>
<td>1.0-2.2</td>
<td>0.9-1.6</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>2.5-4.2</td>
<td>1.2-2.5</td>
<td>1.0-1.8</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>2.6-4.6</td>
<td>1.5-2.8</td>
<td>1.1-2.0</td>
<td>If &gt;60 percent of alfalfa is in the bud stage, harvest is recommended. Evaluate stubble after harvest. If not scheduled to be cut within 7 to 10 days, a short-residual insecticide is recommended.</td>
</tr>
<tr>
<td>18</td>
<td>2.7-5.0</td>
<td>1.7-3.1</td>
<td>1.2-2.3</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>2.8-5.8</td>
<td>2.0-3.4</td>
<td>1.4-2.6</td>
<td></td>
</tr>
<tr>
<td>&gt;20</td>
<td>3.0-7.0</td>
<td>2.4-4.0</td>
<td>1.6-3.0</td>
<td></td>
</tr>
</tbody>
</table>

*Use the smaller threshold if alfalfa is drought-stressed or control costs are relatively low ($7–10 per acre). Use a larger threshold if rainfall is abundant, diseased larvae are present, or control costs are relatively high ($11–14 per acre).

Table 2. Insecticides suggested for control of alfalfa weevils in Illinois, 2007.

<table>
<thead>
<tr>
<th>Product</th>
<th>Amount of product per acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>*Ambush 25W</td>
<td>12.8 oz</td>
</tr>
<tr>
<td>*Baythroid 2</td>
<td>1.6 to 2.8 oz</td>
</tr>
<tr>
<td>Imidan 70W</td>
<td>1 to 1½ lb</td>
</tr>
<tr>
<td>*Lorsban-4E</td>
<td>1 to 2 pt</td>
</tr>
<tr>
<td>*Mustang Max</td>
<td>2.24 to 4 oz</td>
</tr>
<tr>
<td>*Pounce 3.2EC</td>
<td>4 to 8 oz</td>
</tr>
<tr>
<td>*Proaxis</td>
<td>2.56 to 3.84 oz</td>
</tr>
<tr>
<td>*Warrior</td>
<td>2.56 to 3.84 oz</td>
</tr>
</tbody>
</table>

*Use restricted to certified applicators.

wheat. Adult Hessian flies are emerging right now. Bird-cherry oat aphid numbers are variable, sometimes above the 10-per-foot-of-row threshold for limiting barley yellow dwarf virus infection.

Hopefully the article “Hessian Flies Should Be on Our Radar Screens” published in issue No. 1 (March 23, 2007) of the Bulletin provided enough information for you to be on the alert for this pest. However, Kevin Black’s additional observations about Hessian flies and about the wheat cur mite and aphids are worthy of note. It’s also not too early to mention armyworms once again. Captures of armyworm moths, although not heavy in most Illinois traps, continue, and the relatively recent memory of the impact of armyworms in 2000 should still be a motivator to scout diligently. As we receive more reports from people scouting wheat fields, we’ll keep you apprised of developments. Obviously the forecasts for colder temperatures should slow insect and mite activity, but the presence of these potential pests should be noted early and regularly.—Kevin Steffey

**PLANT DISEASES**

**Corn on Corn: What Are the Disease Risks?**

With the anticipated increase of corn to be planted in Illinois this season, a lot of acres will have to go back on last year’s corn ground. One of the key tactics to help manage plant diseases is crop rotation. Although high yields can be achieved with corn following corn, there are disease risks associated with this practice.

All plant diseases rely on the disease triangle (Figure 1) for disease development to occur. The disease triangle is composed of three elements: the pathogen, the susceptible host, and a conducive environment. Producers have full control over one of these components, the susceptible host, since they choose what they want to grow in a particular field. Producers also have some control over the pathogen. Some plant pathogens (especially leaf and ear pathogens) can survive in the previous year’s crop debris, and when the same crop is planted right back into last year’s debris, the pathogen and the susceptible host may be in the same place together.

Producers have no control over the third component, environment, except under irrigated conditions (and even then, control is limited). All of these components must be in place for a disease to occur. For instance, corn could be planted into corn debris that is infested with the gray leaf spot fungus, which would meet two thirds of the criteria needed for disease; however, disease will occur only if the environment is conducive for the fungus to produce spores and infect leaves.

With corn on corn, the option of managing diseases with crop rotation is gone, so other management tactics are relied upon. The first and one of the most important is hybrid selection. Choosing a hybrid with a high level of resistance to diseases is always a good idea, and the benefits of a hybrid with a good disease resistance package are likely to be even greater when planting back into corn.

Fungicides are another way to manage foliar fungal diseases of corn. Fungicides are likely to benefit susceptible hybrids more than hybrids that have high levels of resistance to foliar diseases, and even more so when the

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**Figure 1. Disease triangle.**
previous year’s corn debris is left on the soil surface. However, a fungicide may not be able to overcome all of the detrimental characteristics of a susceptible hybrid—i.e., if the best fungicide was sprayed on the worst hybrid, there would likely still be yield losses under high disease pressure. Therefore, it is important to plant the best resistance available, scout fields for disease as they near tassel emergence, and apply a fungicide if necessary. Also, only foliar diseases can be controlled with currently available foliar fungicides for corn, according to the fungicide labels.

There is potential for different types of disease to increase in a corn-on-corn situation. Foliar fungal diseases are generally the first diseases that come to mind, but an increase of other pathogens may also occur. In Illinois, these foliar fungal diseases are primarily gray leaf spot, northern corn leaf blight, and northern corn leaf spot, which harbor in infected corn debris. The risk of ear and stalk rot diseases, such as Diplodia ear rot and anthracnose stalk rot, may also increase in corn-on-corn.

Below the soil, diseases caused by root rot pathogens and nematodes can also be on the increase in a corn-on-corn situation. Most of the nematodes that can damage corn are specific to corn and are usually managed fairly well with rotation to soybean or another nonhost. With corn-on-corn, however, there is no “check” on the buildup of these nematodes, and populations can get high enough in the first year to cause significant yield loss in the second year. This problem is compounded because most of us no longer use insecticidal chemicals, some of which had the added side benefit of suppressing corn nematode populations. Nematode damage to corn roots is often associated with root rotting due to infection by opportunistic soil fungi, and root rots are often a tip-off that nematode problems may be present. Diagnosing corn nematode problems is difficult because the symptoms can look like so many other problems, so soil sampling is an absolute requirement. See the Plant Clinic web site (plantclinic.cropsci.uiuc.edu/submit.html) for information on how to take and submit soil samples.

Root rotting, caused by opportunistic pathogens, increases when nematode populations are high, even if the nematodes themselves are not pathogenic. If you observe rotting roots, be sure to send in a soil sample for nematode analysis.

In summary, the risk of disease does increase when going to corn-on-corn. However, all three pieces of the disease triangle must be in place for disease to occur. To reduce disease risk in corn-on-corn: 1) plant the best disease-resistant hybrids available; 2) scout fields for disease; and 3) if needed, apply a fungicide to control leaf diseases. We emphasize that there is no way to determine if a foliar fungicide will be warranted in a particular field before the crop is even planted.—Carl A. Bradley and Terry Niblack

WEEDS

Additions to the Corn Herbicide Arena

In the first issue of the 2007 Bulletin, we presented an update on several herbicide changes that weed control practitioners may encounter in 2007. Three more products to add are Breakfree, Breakfree ATZ, and Breakfree ATZ Lite. These products, marketed by DuPont, contain the active ingredients acetochlor (Breakfree) or acetochlor plus atrazine (Breakfree ATZ and Breakfree ATZ Lite). Formulations and labels of Breakfree, Breakfree ATZ, and Breakfree ATZ Lite are very similar to Surpass, Keystone, and Keystone LA, respectively.—Aaron Hager

Injunction Prevents Planting Glyphosate-Resistant Alfalfa Seed

A lawsuit pending in the U.S. District Court for the Northern District of California has implications for farmers who may have wanted to plant a glyphosate-resistant alfalfa variety this spring. A preliminary injunction issued by the judge in the case has halted the planting of glyphosate-resistant alfalfa seed past March 30, 2007. Any glyphosate-resistant alfalfa planted prior to this deadline can continue to be harvested and used. This preliminary injunction will likely remain in effect until a final verdict is reached. You can read the Memorandum and Order for the case at the Web site for the Northern District of California (www.cand.uscourts.gov); click the “Opinions” link, then case number CV C-06-01075 (Geertson Seed Farms v Mike Johanns).—Aaron Hager

Weed Management Considerations in Continuous Corn

Numerous indications point to an increase in the acres of corn planted in Illinois during the 2007 cropping season. Some have asked if weed management practices will need to be altered for continuous (second-year) corn as compared with a corn-soybean cropping rotation. Only minor adjustments are likely to be needed; here are a few points to consider:

- Control all existing weed vegetation before planting. Preplant tillage (in some form) is practiced on the majority of Illinois corn acres, but reduced tillage or no-till practices have gained popularity in recent years. Whether you plan to use tillage or herbicides before corn planting, be sure to plant corn into weed-free conditions. A practice that has become common in soybean production is no-till planting into existing weed vegetation that is not sprayed until some time following soybean emergence. Glyphosate is then applied to control existing winter annual weeds and early-emerging summer annual weed species. This practice is very unadvisable in corn for several reasons, perhaps the foremost being that corn is not as competitive with early-season weed interference as is soybean. In other words, early-
season weed interference can reduce yield potential sooner in corn than soybean. Also, fields with weedy vegetation may be more attractive oviposition sites for insects (such as black cutworm) compared with fields devoid of weeds.

- **Be cautious about adopting total postemergence weed control programs.** It is altogether possible that glyphosate-resistant corn hybrids will be planted on the majority of Illinois corn acres in 2007. However, while some weed control tools can be used only in conjunction with glyphosate-resistant corn hybrids, the principles of weed interference and management are identical in conventional and herbicide-resistant hybrids. In other words, weed interference will reduce corn yield potential whether the hybrid is herbicide-resistant or not. The key to preserving the inherent crop yield potential is to not allow weeds and crop to compete too long. This can be accomplished with timely postemergence herbicide applications, but the specific date after which crop yield is reduced due to weed interference cannot be predicted with great precision. Thus, including multiple weed management tactics (including soil-residual herbicides, cultivation, etc.) introduces a higher probability of preserving crop yield potential than does relying exclusively on any single weed management tactic.

- **Existing crop residue and soil-residual herbicides.** When including soil-residual herbicides in continuous corn systems, keep in mind that existing surface crop residue may (at least initially) reduce the amount of herbicide available for weed control. This residue may physically prevent some of the applied herbicide from reaching the soil surface, potentially allowing weeds to emerge before the herbicide is moved off the corn residue. Precipitation and mechanical incorporation are two methods that can move the applied herbicide into the soil solution; precipitation can occur either before or after planting, whereas mechanical incorporation is usually best accomplished before planting. Aggressive row cleaning attachments may displace enough herbicide-treated crop residue or soil to allow weeds to emerge within the crop row. A potential solution would be to apply the soil-residual herbicide after planting instead of before.

- **Control of volunteer corn in field corn.** It’s unlikely that the weed spectrum will dramatically change or shift during only the second year of corn production on a given parcel of land. However, one unique “weed” that may be present in second-year (or continuous) corn is volunteer corn. In conventional corn, no selective corn herbicide will selectively control volunteer corn. If second-year corn is planted, control of volunteer corn in the 2007 corn crop can be enhanced with the use of herbicide-resistant/tolerant hybrids that allow the application of herbicides that normally control corn. Table 3 lists some options for volunteer corn control in the 2007 corn crop. —Aaron Hager

### Controlling Existing Vegetation Prior to Planting

The recent stint of warm weather has spurred the growth of many winter annual (and even some summer annual) weed species. Henbit and purple dead nettle are in flower across many regions, and several mustard species will soon add splashes of white and yellow to the landscape. Chickweed growth in no-till, wheat, and seedling alfalfa fields has accelerated during the past two weeks. Existing weed vegetation present in no-till fields is frequently denser today compared with 10 years ago, which could be attributable to one or more factors. Whatever your plans for cropping practices in 2007, it is best to control existing weed vegetation before planting corn or soybean. A few thoughts related to preplant weed control tactics follow:

- **As previously mentioned, some winter annual weed species are already in flower.** These weeds should be controlled soon to prevent seed production and addition to the soil seed bank. Successful seed production as a result of delayed burndown applications or tillage operations is one factor that has contributed to the increased prevalence of certain winter annual weed species.

### Table 3. Postemergence herbicide options for volunteer corn control in the 2007 corn crop.

<table>
<thead>
<tr>
<th>If the 2006 corn hybrid was:</th>
<th>Planting one of these corn hybrids in 2007:</th>
<th>Would allow the use of these herbicide options for control or suppression of volunteer corn:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conventional</td>
<td>Clearfield</td>
<td>Lighting</td>
</tr>
<tr>
<td>Liberty Link</td>
<td>Clearfield</td>
<td>Glyphosate products labeled for use in glyphosate-resistant hybrids</td>
</tr>
<tr>
<td>Roundup Ready</td>
<td>Clearfield</td>
<td>Glyphosate products labeled for use in glyphosate-resistant hybrids</td>
</tr>
<tr>
<td>Liberty Link</td>
<td>Roundup Ready</td>
<td>Glyphosate products labeled for use in glyphosate-resistant hybrids</td>
</tr>
<tr>
<td>Roundup Ready</td>
<td>Roundup Ready</td>
<td>Glyphosate products labeled for use in glyphosate-resistant hybrids</td>
</tr>
<tr>
<td>Clearfield</td>
<td>Roundup Ready</td>
<td>Glyphosate products labeled for use in glyphosate-resistant hybrids</td>
</tr>
<tr>
<td>Liberty Link/Clearfield</td>
<td>Roundup Ready</td>
<td>Glyphosate products labeled for use in glyphosate-resistant hybrids</td>
</tr>
<tr>
<td>stacked traits</td>
<td>Clearfield</td>
<td>Lightning</td>
</tr>
</tbody>
</table>
• Growth regulator herbicides are frequently included in burndown applications. 2,4-D is the most common growth regulator used, but some use of dicamba also occurs. Both product labels specify an interval that must elapse between application and planting. The Clarity label specifies that 14 days must elapse and a minimum of 1 inch precipitation be received between application (up to 8 fluid ounces per acre) and soybean planting. The labels of many 2,4-D ester formulations (3.8 lb acid equivalent per gallon) allow application of up to 1 pint per acre at least 7 days prior to soybean planting; increasing the rate over 1 pint increases the interval to 30 days. Pay careful attention to label statements, as some 2,4-D labels also specify a waiting interval between application and corn planting.

• Many Illinois farmers are aware that populations of horseweed (Conyza canadensis, also referred to as marestail) in several states have been confirmed resistant to glyphosate. We previously reported that populations from several areas of Illinois have been identified that are not effectively controlled by glyphosate under field or greenhouse research conditions. Resistant plants are frequently stunted and display some yellowing in the meristem area following treatment. In many instances, the top of the plant may die back, but this is usually followed by profuse branching along the lower stem of the resistant plant. Because glyphosate use is pervasive both prior to planting (i.e., burndown) and following crop emergence (i.e., postemergence in glyphosate-resistant varieties/hybrids), identification of horseweed populations from Illinois that are not adequately controlled by glyphosate necessitates that farmers consider what options (i.e., other than sole reliance on glyphosate) are available to control these populations. Ideally, all horseweed should be controlled prior to planting, especially prior to soybean planting. However, because horseweed may emerge in the spring as well as during the fall it is likely that some horseweed will emerge following crop planting. Thus, farmers will need to consider how to manage glyphosate-resistant horseweed both before planting and after crop emergence. Tankmix partners are needed to provide adequate burndown control of glyphosate-resistant horseweed. Suggested tankmix partners include 2,4-D ester, FirstRate, Gangster, Valor XLT, Canopy, and Canopy EX. Control of horseweed with Gramoxone is often improved when tankmixed with Sencor and/or 2,4-D. Valor and Python alone are not very effective at controlling emerged horseweed, but they can provide soil residual control. Other herbicides that provide soil residual control include Sencor, Classic, Authority First or Sonic, and FirstRate. Utilizing tankmixtures and soil-residual products can be considered as a proactive approach to slowing the spread of resistant populations. Preplant tillage and interrow cultivation are additional options for horseweed control.

• Soil-residual herbicides can be tankmixed with most burndown herbicides, and many soil-residual herbicides themselves possess activity against emerged weeds, especially when applied with spray additives such as crop oil concentrate or UAN solution. Utilizing soil-residual herbicides in corn and soybean production provides many advantages, including reducing the potential for early-season weed interference that can lead to loss of crop yield potential, a reduced density of weeds and a more uniform weed size range when post-emergence herbicides are applied, and reducing the intensity of selection for herbicide-resistant weeds by exposing the weed spectrum to multiple sites of herbicide action.

• Cool temperatures can slow the activity of many burndown herbicides, and translocated herbicides are sometimes slower acting than contact herbicides under these conditions. For example, glyphosate is very effective for control of common chickweed, but symptoms of activity may take several days to develop during periods of cool air temperatures. Contact herbicides may not be as slow to act as translocated herbicides under cool conditions. When the forecast calls for several days or nights of cool air temperatures, symptoms of activity on existing vegetation may develop sooner with a contact herbicide than with a translocated herbicide.—Aaron Hager

Publications on Using Site of Action to Prevent Resistance to Fungicides, Herbicides, and Insecticides

Three University of Illinois Extension bulletins—Utilizing Herbicide Site of Action to Combat Weed Resistance to Herbicides, Utilizing Insecticide Mode of Action to Combat Insect Resistance to Insecticides, and Utilizing Fungicide Site of Action to Combat Resistance—are now available for purchase. These publications establish a color-coded site-of-action classification system based on the various sites of action.

The bulletins are intended to enhance growers’ ability to rotate pesticides based on site of action to slow development of resistant biotypes. The front cover explains the importance of using a site-of-action classification scheme for resistance management. The inner table separates pesticides by site of action into “primary” colors. For example, herbicide chemical families sharing a particular site of action are coded in shades of the respective site-of-action family “primary” color. Each bulletin also includes common and trade names of pesticides used in agronomic production systems in the Midwest. Information on the back page varies among bulletins. The herbicide publication presents corn and soybean herbicide premixes, with individual premix components coded with the appropriate color based on their respective site of action. The insecticide and fungicide publications go into detail on how the different sites/modes of action work.
The publications can be purchased for $2 each, or you can order one of each (insecticide, herbicide, and fungicide) for $5. For orders of 25 or more, the publications are $1 each plus the cost of shipping. Please contact Kris Ritter at karitter@uiuc.edu or call 217-333-4424 to place an order.—Dawn Nordby

**Glyphosate, Weeds, and Crops—Who Needs Anything Else?**

To fill the need for information on hard-to-control weeds and to address issues arising from extensive use of glyphosate, Extension weed specialists throughout the Midwest have joined forces to develop a series of publications and a Web site titled “Glyphosate, Weeds, and Crops” (www.glyphosateweedscrops.org).

The widespread adoption of Roundup Ready soybean and corn has led growers to become heavily—or solely—reliant on glyphosate for weed control. Since the introduction of Roundup Ready soybean in 1996, seven species of weeds have developed resistance to glyphosate. Five of these can be found in the Midwest: common ragweed, giant ragweed, waterhemp, Palmer amaranth, and horseweed (marestail). Along with resistance issues, there are weed shifts associated with the use of glyphosate. Weeds such as wild buckwheat and morningglory, which are not effectively controlled with glyphosate, have become quite common in some areas. Publications in the “Glyphosate, Weeds, and Crops” series tackle the biology of these weeds, explain what has led them to become prevalent in our current cropping systems, and offer suggestions for their management.

Even with the development of glyphosate-resistant weeds, we understand there will be continued use of glyphosate for weed control. To support sensible usage decisions, we have developed several publications: Facts about Glyphosate Resistant Weeds, Understanding Glyphosate, Understanding Glyphosate to Increase Performance, Using Glyphosate Wisely, and Economic Implications of Glyphosate Stewardship.

The Web site provides up-to-date information on glyphosate resistance and implications on weed management as well as useful tools such as a glyphosate rate calculator, yield loss calculator, and tank mix calculator. The publications are also available on the site.

The publications in this series are free. If you would like a copy of any, please contact Kris Ritter (karitter@uiuc.edu) or me (dnordby@uiuc.edu) or call 217-333-4424.

Currently available:

- Facts about Glyphosate Resistant Weeds
- Understanding Glyphosate to Increase Performance
- Biology and Management of Horseweed (Marestail)
- Biology and Management of Wild Buckwheat

Coming soon:

- Using Glyphosate Wisely
- Economic Implications of Glyphosate Stewardship
- Biology and Management of Common Lambsquarters (April)
- Biology and Management of Giant Ragweed (April)
- Biology and Management of Common Ragweed
- Biology and Management of Common Waterhemp (July)

—Dawn Nordby

**CROP DEVELOPMENT**

**Cold Temperatures and Wheat**

The warm temperatures of recent weeks have helped the wheat crop to green up and grow nicely in many areas, especially southern Illinois. The crop continues to lag in parts of northern Illinois due to late planting last fall and wet soils in recent weeks. Overall, the state’s wheat crop is rated as rather average at this time, but its condition ranges widely across Illinois.

There is a lot of concern about how the wheat crop will be affected by the cold temperatures that moved into Illinois on April 3 and 4. Nighttime lows are expected to be in the mid-20s in the central part of southern Illinois (Mt. Vernon) over the next few days and in the upper teens in the northwestern part of the state.

While it’s optimistic to expect there to be no damage from low temperatures when the crop is in its present stage, history provides some reason to hope. Nighttime temperatures in the 20s have occurred at least once during April at Mt. Vernon in five of the last 10 years, including lows of 20 and 23 degrees on April 9 and 10, 1997. Low temps were 24 and 26 on April 4 and 5, respectively, in 2002. While it is possible that some badly damaged wheat might have been planted to a different crop in such cases, statewide yields did not suffer, and the damage was not reported to be widespread.

How well the wheat crop can tolerate temperatures dropping from highs in the 70s to lows in the 20s depends on crop stage and on how fast the temperature drops. Young, growing leaf tissue is vulnerable to freeze damage or death, but if the temperatures drop over two days or so, the leaf tissue can physiologically adjust to some extent, perhaps enough to escape serious injury. Wheat does not do this as well as bluegrass in a lawn, but it has much more ability to tolerate low temperatures than does a crop like corn.

One factor in the crop’s favor is that the “growing point”—the small, developing head—is still down in the canopy, surrounded by a lot of leaf tissue. Leaf orientation also tends to be vertical as the stem grows upright, and this helps protect it from heat loss by radiation to the sky at night. Temperatures down in the canopy of a cold, still night, aided by heat radiating from the warmer soil, will...
be several degrees higher than the air temperature above the canopy. This is one reason that freeze injury to the head normally happens only after the head is “in boot,” a week or so before head emergence. Exposed near the top of the plant, heads don’t benefit much from warm soil or from surrounding plant tissue.

So what can we expect the wheat crop to look like after this cold period? The crop in southern Illinois has “jointed” by now, and most is about 12 to 18 inches tall, with the head located roughly a third of the way up the plant. I would expect temperatures in the mid-20s to cause some loss of leaf area, with damage increasing as plant height increases. Wheat planted early last fall and that with “extra” N applied early this spring thus will be more prone to injury. Such plants may not die, but they might lose so much leaf area that they can no longer produce full yields. Wet soils might provide a little more temperature protection to plants, but if wet soils cause stress, leaves may not be able to protect themselves as well physiologically.

In fields planted at the normal time or a little late, with leaves still upright and plants about a foot tall, there should be less loss of leaf area and yield potential. Leaf tips and margins might freeze, after which they will dry out and give the crop a “frosted” appearance. Once temperatures warm and new leaf growth emerges, the appearance will improve quickly. More winter-hardy varieties, which usually green up and start growing later in the spring, might show less freeze damage.

While temperatures in northern Illinois are predicted to be even lower than those in the south, the crop is considerably behind in its development there, and so should generally be safer from injury. Exceptions might be fields that were planted well before the optimal time, where plants are already growing upright. But most of the wheat there is not yet jointed and should not suffer much damage. Of course, highs in the 30s don’t do much to encourage growth, so there will be some “lost” days there until temperatures return to normal.

Predicting damage from an upcoming weather event is often not very accurate. In the case of freeze injury in wheat, there can be large differences in damage based on things like cloud cover, how fast temperatures drop, how long they stay low, and even how much the sun shines on the days following cold nights. Coupled with differences in plant stage and activity, this makes such predictions more guesswork than we’d like.

If the temperatures get lower than predicted or if previous experience proves not to be a very good guide in this case, damage to larger plants or to plants in lower-lying parts of fields could be much more severe than I have outlined. Such damage will start to show up within a day of the low temperature; it will include limp plants with discolored leaves and death of the upper part of the stem, including the head. There is no chance that such wheat will revive. It might be possible to salvage such a crop (after it dries some) as forage. If not removed, heavy residue might make planting difficult, and such fields will dry slowly.—Emerson Nafziger

Last Call for On-Farm N Rate Trial Cooperators

I know that weather delays are going to start to produce anxiety soon and that many producers don’t want any distractions once planting starts. But we are still looking for more cooperators to take part in the on-farm nitrogen rate trials I have described here several times before. I used the trial results to talk about N rates in the previous issue of the Bulletin (issue 1, March 23, 2007).

We just received word that there will be funding for this project in 2007 from the Fertilizer Research and Education Council (FREC), which administers fertilizer checkoff funds under the Illinois Department of Agriculture. The funds will be used to provide a modest payment to cooperators to help make up for yield lost with low N rates. The average N rate we use in these trials is only 100 lb N per acre, so there is some savings in N. While use of the results will certainly make money for all, those wanting to make a quick profit might not find this to be the best program to sign up for.

Most of these trials will be done using side-dressed N this spring, so nothing need be done before planting except leaving N off the area. Trials, done using regular farm equipment, consist of 15 strips: 5 N rates and 3 reps. Strips are typically 12 to 16 rows wide and 300 to 1,000 ft long (we suggest shorter strips to minimize the amount of N-deficient corn), so the whole trial will take up as little as 3 to 5 acres. Yields will be taken with yield monitors or weigh wagons. The part of the field where the trial is done should be fairly uniform, and we need locations both where corn follows corn and corn follows soybean.

We will soon contact directly those who conducted trials in 2006 and have indicated they are willing to participate again. If you or someone you work with would like to conduct a trial in 2007, please contact me by e-mail (edna@uiuc.edu) or call 217-333-9658. Thanks to those who have done these trials, we are quickly gaining confidence in the soundness of our N rate guidelines in Illinois. The guidelines are based directly on N rate trials such as these, and no other state has a database as large or as good as the one we’ve assembled in Illinois. Thanks to all who have helped make this happen.—Emerson Nafziger

Regional Reports

Extension center educators, unit educators, and unit assistants in northern, west-central, east-central, and southern Illinois prepare regional reports to provide more localized insight into pest situations and crop conditions in Illinois. The reports will keep you up to date on situations in field and forage crops as they develop throughout the
season. The regions have been defined broadly to include the agricultural statistics districts as designated by the Illinois Agricultural Statistics Service, with slight modifications:

- North (Northwest and Northeast districts, plus Stark and Marshall counties)
- West-central (West and West South-west districts, and Peoria, Woodford, Tazewell, Mason, Menard, and Logan counties from the Central district)
- East-central (East and East South-east districts [except Marion, Clay, Richland, and Lawrence counties], McLean, DeWitt, and Macon counties from the Central district)
- South (Southwest and Southeast districts, and Marion, Clay, Richland, and Lawrence counties from the East Southeast district)

We hope these reports will provide additional benefits for staying current as the season progresses.

Northern

Winter wheat throughout the region appears to have come through the winter in good shape. There was some earlier concern about wheat health as a result of the ice-covered fields during February and early March. The wet soil conditions this spring have delayed nearly all spring oat and alfalfa seeding to date. Also, tillage operations have been very sparse because of the wet conditions. Extension educators will be monitoring black cutworm moth traps throughout the northern region and will be reporting moth captures (or absence of captures) in future weekly reports.

Southern

The weather is impacting crop agriculture in southern Illinois. Wheat growers are concerned that low temperature forecasts in the low to mid-20s could result in significant crop damage. Most wheat is Feekes 6 to 7 growth stage and is at risk for injury.

Frequent rains have kept many farmers out of the fields. Some fertilizer and herbicide applications have been accomplished, but limited tillage and very little corn planting.

Alfalfa weevils have come on like gangbusters. Winter annual weeds have responded to the warm temperatures and moist soils with rapid growth. Things can change quickly, but we need a change for the better.

West-Central

The west central district has a lot of variability in rainfall and soil conditions. We have had anywhere from .2 to over 3 inches of rain in the last week.

Wheat looks good in most areas except where stand establishment was questionable due to planting and other problems. Tillering is progressing well. Most fields have had nitrogen applied at this point.

Alfalfa looks a little thin in some areas—people probably pushed a late cut a little too late, and the winter was thus rough on those fields. However, alfalfa growth seems to be ahead of schedule, and some first cuttings may be earlier than normal this year.

Fields are rapidly turning green with winter annuals. Some EPP herbicide applications have been made in the very western areas, but not many.

As everywhere, seed supplies are deemed tight in this area. Producers have to get it right the first time around or they might not like their seed choices a second time.

Corn is being planted in the southern Pike County bottoms.

Contributing Authors

Carl Bradley (carlbrad@uiuc.edu), Extension Plant Pathology, 217-244-7415
Aaron Hager (hager@uiuc.edu), Extension Weed Science, 217-333-4424
Emerson Nafziger (ednaf@uiuc.edu), Crop Sciences, 217-333-4424
Terry Niblack (tniblack@uiuc.edu), Crop Sciences, 217-244-5940
Dawn Nordby (dnordby@uiuc.edu), Extension Weed Science, 217-333-4424
Kevin Steffey (ksteffey@uiuc.edu), Extension Entomology, 217-333-6652