2025
Cornell Guide for Integrated Field Crop Management

Cornell Cooperative Extension

These guidelines are not a substitute for pesticide labeling. Always read and understand the product label before using any pesticide.

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Abbreviations and Symbols Used in This Publication

A	acre	EC	emulsifiable concentrate	SP	soluble powder
AI	active ingredient	F	flowable	ULV	ultra-low volume
D	dust	G	granular	W	wettable
DF	dry flowable	L	liquid	WDG	water-dispersible granules
DG	dispersible granule	P	pellets	WP	wettable powder
E	emulsion, emulsifiable	S	soluble		

* .... Restricted-use pesticide; may be purchased and used only by certified applicators
† .... Not for use in Nassau and Suffolk Counties

Every effort has been made to provide correct, complete, and up-to-date pest management information for New York State at the time this publication was released for printing (April 2025). Changes in pesticide registrations, regulations, and guidelines occurring after publication are available in county Cornell Cooperative Extension offices or from the NYSIPM Pesticide Safety Education Program (psep.cce.cornell.edu).

Trade names used in this publication are for convenience only. No endorsement of products is intended, nor is criticism of unnamed products implied.

These guidelines are not a substitute for pesticide labeling. Always read and understand the product label before using any pesticide.

The guidelines in this bulletin reflect the current (and past) authors' best effort to interpret a complex body of scientific research, and to translate this into practical management options. Following the guidance provided in this bulletin does not assure compliance with any applicable law, rule, regulation or standard, or the achievement of particular discharge levels from agricultural land.

Cover photo by: *Anja Timm, Cornell University Agricultural Experiment Station (Cornell AES)*

2 GENERAL INFORMATION FOR CROP PRODUCTION *(continued)*

3 CORN GUIDELINES *(continued)*

4 FORAGE CROPS GUIDELINES *(continued)*

1 Pesticide Information

1.1 Pesticide Classification and Certification

Pesticides can be classified as general use or restricted use. **General use pesticides** may be purchased and used by anyone. **Restricted use pesticides** can only be purchased and used by a certified applicator or used by someone under a certified applicator's supervision. In some cases, the pesticide label may limit use of a restricted use pesticide to only a certified applicator.

Private applicators use or supervise the use of pesticides to produce agricultural commodities or forest crops on land owned or rented by the private applicator or their employer. If a private applicator wants to use or supervise the use of restricted use pesticides, they need to be a **certified private applicator**. Certified private applicators are also allowed to purchase restricted use pesticides. Certification is not needed if a private applicator uses general use pesticides.

In New York State, a **certified commercial applicator**, **certified commercial technician**, or **commercial apprentice** working under the supervision of a certified commercial applicator is allowed to apply any type of pesticide on property that is not a private application (described above) or is a residential application. (A residential application is the use of general use pesticides on property owned or rented by the applicator, excluding establishments selling or processing food and residential structures other than where the applicator lives.) Certified commercial applicators are allowed to purchase restricted use pesticides.

Information on pesticide certification and classification is available from your Cornell Cooperative Extension office (cce.cornell.edu/localoffices), regional NYSDEC pesticide specialist (dec.ny.gov/about/contact-us/statewide-office-information), the Pesticide Applicator Training Manuals (www.cornellstore.com/books/cornell-cooperative-ext-pmep-manuals), or the Cornell Pesticide Safety Education Program (psep.cce.cornell.edu).

1.2 Use Pesticides Properly

Using pesticides requires the user to protect their health, the health of others, and the environment. Keep in mind "pesticide use" is more than just the application. It includes mixing, loading, transporting, storing, or handling pesticides after the manufacturer's seal is broken; cleaning pesticide application equipment; and preparing a container for disposal. These activities require thoughtful planning and preparation. They also require you to comply with state and federal laws and regulations intended to protect human health and the environment from the adverse effects pesticides may cause.

1.2.1 Plan Ahead

Many safety precautions should be taken *before* you begin using pesticides. Most pesticide accidents can be prevented with informed and careful practices. **Always read the label on the pesticide container before using the pesticide.** Make sure you understand and can follow all label directions and precautions. Be prepared to handle an emergency exposure or spill. Know the first aid procedures for the pesticides you use.

1.2.2 Move Pesticides Safely

Transporting pesticides carelessly can result in broken containers, spills, and contamination of people and the environment. Accidents can occur even when transporting pesticides a short distance. You are responsible for a pesticide accident so take every effort to transport pesticides safely. Be prepared for an emergency.

1.2.3 Personal Protective Equipment and Engineering Controls

Personal protective equipment (PPE) needs depend on the pesticide being handled. **Required PPE are listed on pesticide labels.** Any required PPE is based on the pesticide's toxicity, route(s) of exposure, and formulation. Label-listed PPE are the minimum that must be worn when using a pesticide. You can always use more than what's listed!

The type of PPE used depends on the type and duration of the activity, where pesticides are being used, and the user's exposure. For example, mixing/loading procedures often require more PPE than when applying a pesticide. Studies show you are at a greater risk of accidental poisoning when handling pesticide concentrates. Pouring pesticide concentrates is the most hazardous activity.

Engineering controls are devices that help reduce a pesticide user's exposure. An example is a closed transfer system that reduces the exposure risk when dispensing pesticide concentrates. Consult the product label for more information on using engineering controls in place of PPE.

1.2.4 Avoid Drift, Runoff, and Spills

Pesticides that move out of the target area can injure people, damage non-target areas, and harm the environment. Choose weather conditions, pesticides, application equipment, pressure, droplet size, formulations, and adjuvants to minimize drift and runoff potential. Product labels may have specific application and/or equipment requirements to reduce issues with drift and runoff.

2 General Information for Crop Production

2.1 Introduction

This publication includes the most up-to-date information on growing field crops in New York, drawn from Cornell research, extension demonstrations, and on-farm experience. It has been designed as a practical guide for farmers, for merchants who provide sales and services to producers, and for others who advise them. Our aim is to supply the best information available to help those who make management decisions. We do not consider this a cookbook but rather a source of practical information to use in the development of sound planning and good management.

In any statewide publication, we must deal with a spectrum of crop environments; information and guidelines must cover general farm situations. Though we have tried to make these as specific as possible for various conditions in New York, each farmer must determine how these varieties and practices will work on his or her farm. The information in this publication should be considered general rules. Additional information is available in the publication **Cornell Field Crops and Soils Handbook**, revised in 1987 and available through Cornell Cooperative Extension offices or directly from the Section of Soil and Crop Sciences at Cornell. For further information on any topic in this booklet, you may contact your local Cornell Cooperative Extension office.

2.2 New York State Climate

2.2.1 Growing Degree Days for Corn and Soybeans

Crop plants require heat from their atmospheric environment to develop, grow, and mature. The effect of this heat is cumulative as the growing plant progresses through its life cycle.

Temperature is an indirect measure of the heat available in the atmosphere. Heat sufficient to cause growth and development in a plant is indicated when the daily mean temperature warms to a certain level, called the base or threshold temperature. Below (cooler than) this level there is essentially no growth. Different species of crop plants have different base temperatures. Corn and soybeans have a base temperature of 50°F.

The growing degree day—sometimes called a heat unit—has become a useful indirect measure of the heat available for growth and development of corn and soybeans. In the 86/50 method it is assumed that for corn and soybeans, growth increases linearly from 50°F to 86°F, at which peak growth occurs, and growth remains at peak for temperatures above 86°F. The maximum temperature for the day is set at an upper limit of 86°F, and the minimum temperature is set at the lower limit of 50º F. On each day of the growing season the crop receives a number of growing degree days equal to the number of degrees that the daily adjusted mean temperature is higher (warmer) than the 50°F base temperature. Growing degree days are then accumulated each day as the crop progresses toward maturity.

To calculate the daily growing degree days for your farm, first, determine the adjusted mean air temperature for each 24-hour day during the growing season. For a day with a high temperature of 60ºF and a low of 40ºF, for example, the low temperature would be set at the lower limit of 50ºF. The adjusted mean temperature for the day would be 55ºF. Subtracting 50ºF, the base temperature for corn and soybeans, from the mean temperature gives 5 growing degree days for that day. If, on the other hand, the high temperature for a given day is 90ºF and the low is 66ºF, the high temperature would be set at the upper limit of 86ºF. The adjusted mean temperature for the day would be 76ºF. Subtracting 50ºF, the base temperature for corn and soybeans, from the mean temperature gives 26 growing degree days for that day. On any day that the adjusted mean temperature is 50ºF or colder, the number of growing degree days is recorded as zero.

Records are kept for each day of the growing season, from the first frost-free day in the spring through the last frost-free day in the fall. By adding together the growing degree days supplied each day, the accumulated total for the frost-free growing season is determined.

The distribution of average accumulative growing degree days in New York State is presented in Figure 2.2.1. These data, applying to the freeze-free season, were determined from temperature records kept by numerous weather stations around the state during a 30-year period ending in 1980.

2.2.1.1 How to Use Growing Degree Days

Early corn hybrids and short-season soybean varieties need fewer growing degree days than late corn hybrids and long-season soybean varieties to grow and mature.

Use the map (Figure 2.2.l) to determine the growing degree days available for corn and soybean growth in your locality. You can then choose corn hybrids and soybean varieties suited to your vicinity from the groups listed in sections 3.2: Corn-Hybrid Selection and 6.1: Soybean Varieties. You may need to make adjustments to fit local differences in elevation or frost susceptibility.

For example, if your locality averages 2200 growing degree days (as read from the map) but your field is in a pocket or is observed to be subject to early fall frosts, then choose a slightly earlier hybrid or variety, perhaps one that can mature with 2000 degree days.

The organic matter content is generally high, but the release of nitrogen is slow, especially in the spring. The nitrogen-supplying power of these soils usually exceeds 80 pounds of nitrogen per acre per year. The efficiency of applied nitrogen fertilizer is often low, especially if applied as a preplant application. These heavy-textured soils are often waterlogged, especially when not artificially drained, resulting in nitrogen loss by denitrification. Sidedressing nitrogen fertilizer can increase its uptake efficiency.

Phosphorus (P) availability is usually low, and it is critical to place phosphorus fertilizer in the band near the seed at planting time in low or medium P soils. The heavy texture slows root growth into a large soil volume; therefore, broadcasting of phosphorus fertilizer is not very effective. In addition, the soils are commonly wet and cold in the spring; slow root growth and low phosphorus uptake result.

Examples of group IA clayey soils are the moderately well-drained Vergennes, the somewhat poorly drained Kingsbury, and the very poorly drained Livingston soils. Large acreages of this group occur in northern New York, with limited acres (not shown in Figure 2.4.1) in eastern New York and the Hudson Valley.

2.4.1.2 Subgroup IB. Medium- to Fine-textured Soils Developed from Lake Sediments

These soils are formed from glacial lake or marine deposits and have a permeable, very fine sandy loam, silt loam, or silty clay loam surface over a more slowly permeable, heavy silty clay loam to clay subsurface. They differ from subgroup IA because they have a more sandy surface and usually a more permeable subsoil. They generally occur on nearly level to gently sloping or rolling landscapes of the lower elevations near the lakes and along the Hudson River. The more rolling landscape makes surface water control and drainage easier than on nearly level areas, but it increases the erosion hazard. Water control is important in managing these soils for crop production.

The pH of these soils ranges from 5.2 to 7.4, but most often is 5.8 or above. Most subgroup IB soils need some lime for alfalfa production. The magnesium supply is usually adequate.

The organic matter content is generally medium, and the nitrogen release is good on the well-drained to moderately well-drained soils. The nitrogen-supplying power generally exceeds 80 pounds per acre per year, but nitrogen loss can be a problem as with the subgroup IA soils.

Original phosphorus levels are low, but the addition of manure and fertilizer phosphorus to cultivated areas has increased phosphorus contents on many production fields to high or very high levels. Band placement of phosphorus is important for establishment of all crops grown on fields with low or medium P availability.

The potash-supplying power of these soils is high, but continuous cropping without replenishment of potassium through manure or adequate fertilizer potash can reduce potassium levels substantially.

The Hudson, Odessa, and Schoharie series are examples of the well-drained and moderately well-drained soils of the group. Other examples are the somewhat poorly and poorly-drained Caneadea, Canadice, and Rhinebeck soils and the very poorly drained Lakemont soils.

2.4.2 Soil Management Group II

The soils of group II are medium-textured to moderately fine-textured soils developed from calcareous glacial till, calcareous glacial till mixed with shale, or recent alluvium. There are three subgroups within this group. They are separated depending on the parent material.

2.4.2.1 Subgroup IIA. Medium- to Fine -textured Soils Developed from Calcareous Glacial Till

These soils are found in areas of undulating to gently rolling topography in the central plains of New York. They are formed from strongly calcareous glacial till. The soil profile is slightly acidic to slightly alkaline in the surface and slightly alkaline to strongly alkaline in the subsoil.

The surface texture may be a very fine sandy loam, loam, or silt loam with silt loam to silty clay loam subsoils. The water-holding capacity of these soils is high. Lime is usually not required. The nitrogen and potassium supplies are generally high, but the native phosphorus supply is low. Additions of manure and fertilizer phosphorus have increased the phosphorus content to high or very high levels in some soils.

Soil water management is a problem on most of these soils. Erosion control, adequate soil drainage, and compaction are critical problems. Subsurface drainage is effective in removing excess soil water. Once the soil and water management problems have been solved, these are among the most productive soils of the state.

Some examples are the well-drained to moderately well-drained Cazenovia, Hilton, Honeoye, Lima, and Ontario series; the somewhat poorly drained Appleton, Kendaia, and Ovid series; and the poorly drained Lyons and Romulus series.

2.4.2.2 Subgroup IIB. Medium-textured to Moderately Fine-textured Soils Developed from Slightly Calcareous Glacial Till Mixed with Shale

These soils generally have a very fine sandy loam or silt loam surface over a heavy silt loam or silty clay loam

Table 2.8.1. General adaptability ratings for tillage systems for row crop production by soil management group based on long-term yield potential and cost of production.

Soil Management Group		Moldboard Plow		Chisel Tillage			Ridge Tillage	Zone/Strip Tillage	No-Tillage
		fall	*spring*	*fall*	*frost*	*spring*			
Group IA,B	clays and silty clay loams	2	2-3	2-3	2-3	2-3	1	2	4
Group IIIB	heavy silts with fragipan	4	2	2	2	3	2	3	4
Group IIA,B	silt loams	3	3	3	2	2	2	2	4
Group IIC	silt loams	5	2	4	3	2	3	1–2	2
Group IIIA	coarse sands and gravels	5	2	4	2-3	2	3	1	2
Group IV	sands and coarse loams								
Group V	sands and gravels								

Notes:
- 1 = highly adapted, 5 = poorly adapted
- Ratings do not include environmental concerns. These should be evaluated separately based on site-specific information.
- Relative rankings apply only within a row.
- Adaptability of reduced-tillage systems may be lower when soils are severely compacted or poorly drained.
- No-, strip, zone, and ridge tillage generally perform better in strict corn-soybean rotations.

2.8.6.2 Maximum Surface Cover

Relative soil loss decreases rapidly with increasing surface residue levels (Figure 2.6.2) and protects the soil from heat and temperature extremes. The amount of residue left on the soil surface after tillage is affected by the amount of residue produced (crop type, yield, harvesting method), overwintering, and the type and number of tillage passes. Table 2.8.2 may be applied to estimate residue levels from various field operations and weathering by multiplying the remaining percentages of residue for each tillage pass, starting with the initial residue levels. For example, assuming 80 percent residue cover after corn harvest for grain, a typical residue level after planting may be:

> 80% (initial) x 90% (overwintering) x
> 70% (spring chisel with straight points) x
> 60% (finishing disk, light setting) x
> 85% (planter with fluted coulters) =
> 25.7% final residue cover

Residue cover may be field estimated by using the Natural Resources Conservation Service (NRCS) "line-transect method." It involves a measuring tape that is laid out over the soil surface in representative areas. Residue cover is assessed by counting the relative number of tape 1-foot marks that lie directly over a piece of residue. For more information on this method, contact your local NRCS office.

Table 2.8.2. Estimated percent residue cover remaining on the soil surface after specific implements and field operations.

Implement	Nonfragile residue remaining
Plows:	
Moldboard plow	0–10
Disk plow	30–40
Machines that fracture soil:	
Paratill/paraplow	70–90
V ripper/subsoiler:	
12–14 in. deep, 20-in. spacing	60–80
Combination tools:	
Subsoil-chisel	50–70
Disk-subsoiler	30–50
Chisel plows with:	
Sweeps	70–85
Straight chisel spike points	60–80
Twisted points or shovels	40–70
Combination chisel plows:	
Coulter chisel plows with:	
Sweeps	60–80
Straight chisel spike points	50–70
Twisted points or shovels	30–60
Disk chisel plows with:	
Sweeps	60–70
Straight chisel spike points	40–60
Twisted points or shovels	20–50
Undercutters:	
Stubble-mulch sweep or blade plows with:	
Sweep/V-blade 30 in. wide	75–95
Sweeps 20–30 in. wide	70–90

Table 2.12.2. Lime guidelines for soil with a pH less than the minimum pH for the rotation.

Modified Mehlich Buffer pH	Desired rotation pH (minimum pH)			
	7.0 (6.7)	6.8 (6.6)	6.5 (6.4)	6.2 (6.0)
	tons/acre (100% ENV)			
5.0	11.0	10.0	8.5	6.5
5.1	10.0	9.0	7.5	6.0
5.2	9.0	8.0	7.0	5.5
5.3	8.0	7.5	6.0	5.0
5.4	7.5	6.5	5.5	4.0
5.5	6.5	6.0	4.5	3.5
5.6	5.5	5.0	4.0	3.0
5.7	4.5	4.0	3.0	2.5
5.8	4.0	3.5	2.5	1.5
5.9	3.0	2.5	2.0	1.0
6.0	2.0	1.5	1.0	0.5
6.1	1.0	1.0	0.5	0.5
6.2	1.0	0.5	0.5	0.5
6.3	1.0	0.5	0.5	0.5
6.4	1.0	0.5	0.5	0.5
6.5	1.0	0.5	0.5	0.5
6.6	1.0	0.5	0.5	0.5

2.12.2 Lime Applications

If the soil pH is below 6.0, lime should be applied long enough before a legume seeding to react with the entire plow layer. If there is insufficient time for an adequate reaction with the entire plow layer (at least two plowings), at least one-half of the recommended lime rate should be added to the surface and disked in before the seeding to provide a favorable pH in the soil zone near the seed to encourage good establishment.

Split the lime application on soils that require more than 4 tons per acre by plowing one-half down and disking the remainder into the surface. Smaller lime applications necessary to maintain the pH above 6.5 can be made at any time before seeding and can be either applied to the surface or plowed down.

If the pH is 5.5 or below, lime should be applied at least a year before a pH-sensitive crop such as alfalfa or barley is planted. It is usually recommended that a split application of lime be applied and a less sensitive crop such as corn or clover be planted for a year before planting alfalfa. The last summer or fall that a field is in sod is a good time to apply smaller maintenance additions of lime. At that time the soil is firm and lime can be applied with less likelihood of machinery getting stuck and rutting and compacting soil.

Producers can download a lime rate calculator at: nmsp.cals.cornell.edu/software/calculators.html and find other supporting documents at: nmsp.cals.cornell.edu/projects/curriculum.html. The lime guidelines for field crops were updated in 2023 and can be found here: http://nmsp.cals.cornell.edu/publications/extension/LimeDoc2023.pdf.

2.12.3 Liming for No-Tillage Production

Because the soil is not mixed periodically in a no-tillage crop production system, additional attention must be given to the soil pH and liming program. Often under no-tillage the soil surface (0- to l-inch depth) becomes acidic more rapidly than the 0- to 6-inch surface zone.

When the soil surface becomes acidic under corn production, the effectiveness of triazine herbicides is reduced and weed control is reduced. For legumes, the pH of the seeding zone is reduced, and establishment problems are increased.

In the no-tillage liming program, the pH of two soil zones (0 to 1 inch and 0 to 6 inches) must be considered. Generally, there are three situations that can result in different lime guidelines for no-tillage versus conventionally tilled crops:

1. Surface (0- to 1-inch depth) pH is low, but the pH of the 0- to 6-inch zone is adequate. Guideline: add 1 to 1 1/2 tons of lime per acre to raise the pH of the soil surface.
2. Strongly acidic throughout both the 0- to 1- and 0- to 6-inch soil zones. Guideline: do not use no-tillage methods for establishment of legumes until lime has time to react (6-9 months after lime application).
3. Surface (0- to 1-inch depth) pH is adequate, but the 0- to 6-inch soil zone has a low pH. In this case, the legumes might be no-tillage seeded with a slightly lower overall pH or without waiting as long for the lime to react as when both zones have a low soil pH.

2.12.4 Points to Remember When Using Lime Guidelines Without Buffer pH Data

1. If a complete soil test result is not available, you can use Tables 2.12.3 through 2.12.5 for lime rates but keep in mind that these guidelines are less accurate than would be obtained with an actual soil analysis of the soil's buffering capacity (buffer pH).
2. Rates in tables 2.12.3 through 2.12.5 are based on an 8-inch plow depth. Reduce or increase guidelines by 12 percent for each inch that the plow depth differs from 8 inches. Decrease the lime rate by one-third if the soil is gravelly or stony.
3. The lime guidelines in the tables assume 100 percent effective neutralizing value (ENV). The rate applied must be changed if a different ENV limestone is used (the actual rate of a specific lime material is calculated by dividing the rate provided for 100% ENV lime by the actual ENV of the lime material being used).

appropriate location at Cornell University, Ithaca, NY 14853: diseased crop samples to 334 Plant Science Building; insect samples to 2144 Comstock Hall; and weed samples to Cornell Soil and Crop Sciences Section, 238A Emerson Hall. Information on how to collect and submit a sample is available through your local Cornell Cooperative Extension office and through the diagnostic clinic websites.

2.14.2 Sampling

Is the pest found in isolated areas, associated with a particular field pattern, or abundant or rare throughout the field? Effective sampling methods have been developed for many pests, particularly insects, to ensure an objective, **representative** assessment of pest infestations. Should problems be significant but primarily limited to specific areas within the field, localized treatments may be possible. Notes and field map drawings of the location of significant pest problems should be kept to compare pest findings over time.

Sampling methods for specific pest problems are presented throughout this publication. Additional information on sampling, also called crop scouting, is available in fact sheets for managing specific pest problems, and in IPM scouting procedures for various field crops. Information on these materials is available through your local Cornell Cooperative Extension office. Field crop IPM monitoring procedures can be found at: nysipm.cornell.edu/fieldcrops/.

2.14.3 Analysis

The mere presence of a pest, with rare exceptions, is generally not cause for immediate concern. Healthy crops tolerate a modest amount of pest damage before net profitability is affected. Below a certain pest population / infestation level, the costs of control would exceed actual crop losses. The concept of economic threshold, basic to using IPM, defines the point at which the benefits of control outweigh the costs. Threshold guidelines to evaluate the potential impact of specific field crop pests are presented throughout this publication.

2.14.4 Management Alternatives

A variety of cultural, biological, and chemical management alternatives may be available to minimize the impacts of different pests. Appropriate control measures may vary with each pest and field situation, but early detection often provides more opportunities for managing pests so that least-toxic approaches can be used. In choosing the most appropriate pest control option, consider both the short-term and long-term implications of the proposed action.

Many important factors should be considered in selecting a control measure. These include, but are not limited to, pest and crop stage of development; intended use or value of the crop; availability of alternatives; time until harvest; soil type; weather conditions; and future crop rotational plans. Considerations and guidelines to help in this selection process are provided in each pest management section.

2.14.5 Implementation

Once a management alternative has been chosen, it must be implemented in a complete and timely manner to obtain the maximum benefit. For example, if early harvest is employed to manage a potato leafhopper infestation, the whole field should be harvested at the same time to eliminate potential refuge areas. If a pesticide is applied, application equipment must be calibrated and adjusted to ensure proper coverage and rate of application.

If appropriate to the situation, consider including a non-treated strip to help evaluate the effectiveness of the action taken. Documentation of pest management activities is highly recommended to help evaluate the effectiveness of pest control actions. In addition, documentation is useful in determining net profitability of crop production and could be helpful in liability cases. Pesticide use information should be recorded at the time of implementation. Items to be recorded include the name of the pesticide used, the target pest(s), the total quantity used, the method of application, the rate of application, the place and date of treatment, and any pertinent comments such as weather conditions, crop growth stage, efficacy, and name of applicator.

2.14.6 Evaluation

How effective were any pest management actions taken? Were there major successes, or do some areas need improvement? Documenting the process of crop protection decisions provides important feedback for assessing the value and impact of actions taken and for optimizing future management decisions.

IPM can help improve the economic and environmental efficiency of crop protection decisions if the steps outlined above are followed. For additional information on implementing an IPM program for alfalfa, field corn, soybean, winter wheat, and dairy cattle, contact the Field Crops IPM Coordinator, IPM Program, Cornell AgriTech, Geneva, NY 14456. For further information on integrated pest management (IPM) and the Cornell IPM Program, visit our web site: www.nysipm.cornell.edu.

	For the most current information on field crop pest activity during the growing season see the Cornell IPM Weekly Field Crop Pest Report: (blogs.cornell.edu/ipmwpr).

2.15 Integrated Management of Field Crop Diseases

Efficient management of diseases affecting field crops in New York principally involves the sowing of seeds of disease-resistant crop varieties (where available and appropriate) and the employment of sound agronomic practices. Although the bulk of the following sections deal with chemical disease control tactics, it should be

3 Corn Guidelines

High-yielding corn requires moderately well-drained or well-drained soil with a pH above 6.0 as well as timely and skillful management practices. Management practices to consider carefully include planting techniques, hybrid selection, fertilization, and control of insects, weeds, and diseases. Correct management of all these practices is essential for maximum economic yield.

3.1 Planting Techniques

Early planting usually, but not always, results in maximum corn yields. Under central and western New York conditions, corn planted in late April or early May typically out yields either grain or silage corn planted after mid-May (Figure 3.1.1). Early-planted corn also matures earlier, resulting in lower moisture and grain drying costs at harvest, and lodges less. A general guideline for the best time to begin planting corn is about 10 days before the average date of the last 32°F temperature in the spring. If soil conditions are too wet at this time, wait until soil conditions improve. Corn planted in late May under dry soil conditions will consistently out yield corn planted in late April under wet soil conditions. Conversely, if it is warm and dry any time after April 15th in central/western NY, corn growers should be ready to begin planting. Modern corn hybrids tolerate cold soil conditions and seed treatments protect corn from soil pest problems under extended emergence time due to cold soil temperatures. Planting depths of about 1.5 inches for silty clay or clay loam soils and 1.75 to 2.0 inches for silt loam and gravelly loam soils are recommended for April or early May-planted corn. Planting depths of about 1.75 to 2.0 inches for silty clay or clay loam soils and 2.0 to 2.5 inches for silt loam and gravelly loam soils are recommended for most planting dates in May. If soil conditions are dry in the top 2 inches in late May and early June, corn can be safely planted to a depth of 3 inches on silt loam and gravelly loam soils.

To achieve the full yield potential of an early planting date, full-season hybrids (hybrids that match the growing degree days in a region) are necessary (Figure 3.1.1). After the first or second week of May, however, the yield advantage of full-season vs. medium-season hybrids decreases when planted for grain. Furthermore, full-season hybrids may not mature, resulting in low test weight, and/or will have high grain moisture at harvest, if planted after the second week of May. Therefore, for grain production, full-season hybrids should be planted only in late April or during the first 2 weeks of May. For silage production, full-season hybrids can be planted until about May 20. Growers should not plant more than 30% of their crop to full-season hybrids. The majority of corn acreage (~60%) should be planted to medium-season hybrids (100 and 200 growing degree days less than the growing degree days in a region for silage and grain, respectively). If planting must be delayed until early June, early-season hybrids (300-400 growing degree days less than the growing degree days in a region for silage and grain, respectively) are recommended.

The optimal corn population depends on soil type, hybrid selection, and crop use. For many New York soils (well-to moderately well-drained to somewhat poorly drained silt or clay loams), numerous Cornell experiments have shown that modern hybrids still require a harvest population of only 26,000 to 28,000 plants per acre for maximum economic grain yields (Table 3.1.1). Droughty soils, however, cannot support high populations, and plant populations should be adjusted downward (Table 3.1.1). Likewise, hybrids differ in their response to plant populations, so hybrid selection should influence whether the harvest population is at the high or low end of the recommended range for each particular soil condition (Table 3.1.1). Also, most hybrids require higher harvest populations for silage than for grain production, about 5,000 more plants per acre (Table 3.1.1).

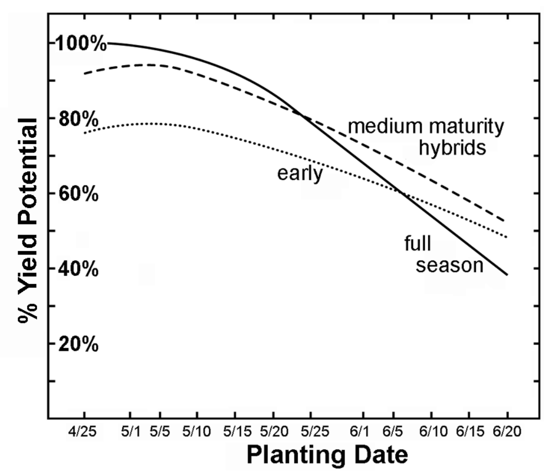


Figure 3.1.1. Effect of planting date on grain yields.

Planting date, tillage practices, pest problems, planter performance, and hybrid selection influence actual corn populations obtained in the field. To compensate for potential problems, it should be assumed that only 90 percent of the kernels planted actually emerge and survive to become harvestable plants in the fall. To obtain 27,000 plants per acre at harvest on a moderately well-drained silt-loam soil, the planting rate should be about 30,000 plants per acre (27,000 divided by 0.90). In some situations such as a no-till situation or an April planting date, it should be assumed that only 85 percent of the kernels will emerge and survive. The planting rate in these situations on a moderately well-drained silt-loam soil should be about 31,765 plants per acre (27,000 divided by 0.85).

Table 3.2.2. Corn silage hybrids, 95-98 days relative maturity.

Company/Brand	Hybrid	Days to Relative Maturity	2023 Comparative Crop Yield, ton/acre at 35% DM[1]	2023 Comparative Milk Yield, lb/day[1]	All Years Comparative Crop Yield, ton/acre at 35% DM[1]	All Years Comparative Milk Yield, lb/day[1]	No. Environments[2,3]
Pioneer	P9823Q	98	1.06	0.97			1
Dekalb	DKC48-34RIB	98	1.08	1.05	1.06	1.06	3
Dekalb	DKC098-55RIB	98	1.03	1.07			1
Seedway	SW 9726TR	98	0.98	0.97	0.98	0.97	3
Channel	198-99SSPRIB	98	1.02	1.02	1.02	1.02	3

[1]Comparative yield ratings are obtained in Cornell statewide tests from yields adjusted to an average of 1.00. A hybrid with a rating of 1.10 has performed 10% above average

[2]Environments are site-year combinations: all hybrids listed were tested at one site in 2023, while hybrids tested in two or more environments were evaluated at each location over multiple years from 2016 to 2023.

[3]All hybrids entered in 2023 were also planted at the Willsboro, NY location; however, extreme weather events made the location unharvestable.

[4]Seed Consultants SC954Q was entered in the 2023 Evaluation Program but was damaged by wildlife and results are not reported here.

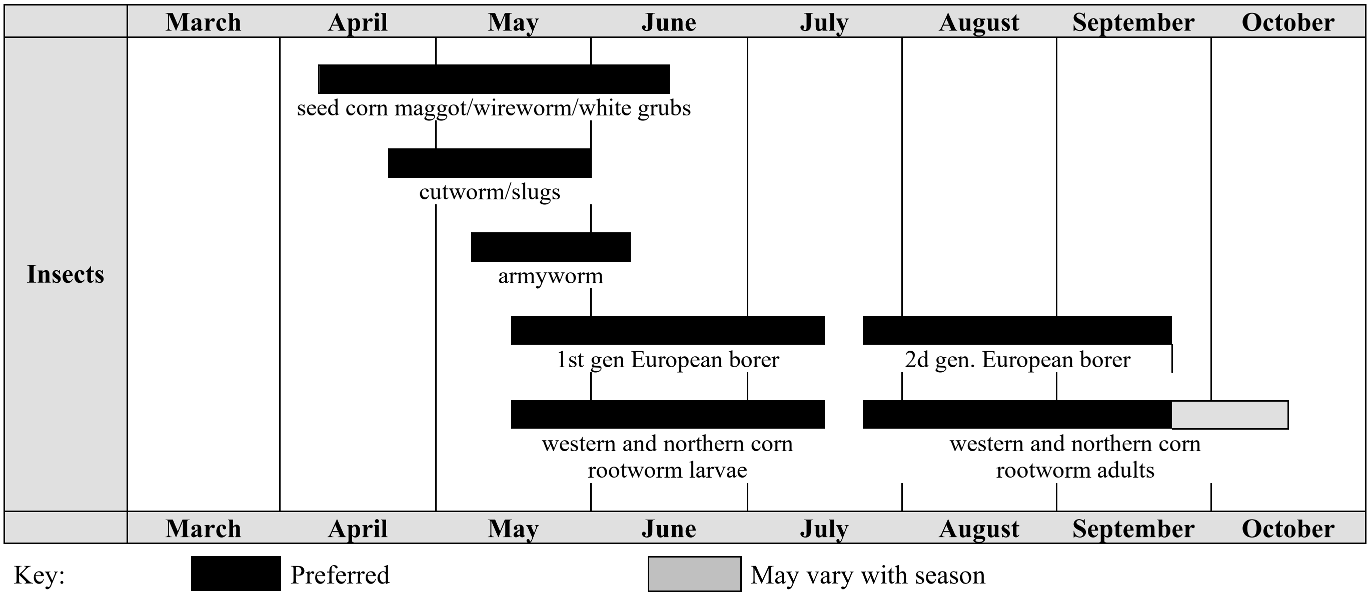
Table 3.2.3. Corn silage hybrids, 99-103 days relative maturity.

Company/Brand	Hybrid	Days to Relative Maturity	2023 Comparative Crop Yield, ton/acre at 35% DM[1]	2023 Comparative Milk Yield, lb/day[1]	All Years Comparative Crop Yield, ton/acre at 35% DM[1]	All Years Comparative Milk Yield, lb/day[1]	No. Environments[2]
Masters Choice	MCT4981-D	99	0.92	0.95			1
Stine Seed	9444-22	99	0.88	0.96			1
Brevant Seed	B99A24Q	99	1.04	0.96			2
Growmark, Inc.	FS 4927T RIB	99	0.98	0.87	1.02	0.89	4
Syngenta Seeds	NK0007-AA-EZ1	100	0.92	0.99			2
Seedway	SW 0030SS	100	1.04	1.05	1.03	1.05	6
Growmark, Inc.	FS 5101X RIB	100	0.99	1.02	1.04	1.01	8
Redtail (King's Agri-seeds)	RT 51T86-PC	101	0.92	0.91			2
Hubner Seed	H0151P	101	1.00	0.94			2
Growmark, Inc.	FS 5115X RIB	101	1.02	1.01	0.99	1.01	4
Seed Consultants, Inc.	SC1018AM	101	1.12	1.08	1.06	1.11	6
Dekalb	DKC101-33RIB	101	1.02	1.05			2
Channel	201-07SSPRIB	101	0.92	1.08	0.95	1.05	4
Syngenta Seeds	NK0295-AA	102	0.90	0.95			2
Revere Seed	Revere 0297 VT2P	102	1.07	0.99			2
Seedway	SW 0321SS	103	1.01	0.98	1.03	0.99	4
Dekalb	DKC53-94RIB	103	0.95	1.00	0.95	0.99	4
Seedway	SW 0345DV	103	1.02	0.88			2

[1]Comparative yield ratings are obtained in Cornell statewide tests from yields adjusted to an average of 1.00. A hybrid with a rating of 1.10 has performed 10% above average

[2]Environments are site-year combinations: all hybrids listed were tested at two sites in 2023, while hybrids tested in two or more environments were evaluated at each location over multiple years from 2016 to 2023.

Figure 3.4.1. Field corn IPM scouting calendar.



3.5 Managing Diseases of Corn

Diseases of corn in New York are sometimes dramatically obvious and may constitute an important production constraint because they can reduce yield and quality of grain and silage. Fungal leaf blights, stalk rots, and ear rots are the major diseases affecting New York corn. Check with your local Cornell Cooperative Extension office, and the Cornell Field Crops Website (cals.cornell.edu/field-crops/corn/diseases-corn) for fact sheets and other information available to aid in identification of corn diseases. The Crop Protection Network (cropprotectionnetwork.org) is also an excellent source of information on corn diseases and their management.

Integrated corn disease management involves the selection of hybrids with genetic resistance to diseases, application of seed fungicides, the adoption of sound crop management practices, and the occasional application of foliar fungicides when warranted by disease risk.

3.5.1 Seed Treatment Fungicides

During the developmental stage between seed germination and seedling establishment, the corn plant often requires chemical protection from seed decay, seedling blight, and damping-off caused by fungi on seed or in the soil. Treatment of seed with fungicides is always good insurance against these problems, particularly if the soils are cold and wet or excessively dry. Under these conditions the rate of germination and seedling emergence is retarded, and the seed and seedlings are more susceptible to attack. Except for organic seed, all commercial hybrid seed comes pretreated with fungicide. Planter box products are also available for supplemental disease and insect control.

NOTE: Some seed corn is treated with an insecticide before storage to guard against stored grain insects. This chemical treatment does not protect against soilborne insects such as seed corn maggot or wireworms, nor does it protect against seed rots or seedling blights. Also, it is important to pay attention to the percentage of various component chemicals in insecticide-fungicide combination products. Where the percentage of fungicide in the mixture is low, the product may be labeled only for supplementary disease control on seed previously treated with a fungicide. See Section 2.16 of this guide for a listing of some available commercial seed treatments and seed treatment packages.

3.5.2 Selection of Disease-Resistant Varieties

Resistance to several diseases common to New York State is often incorporated in modern hybrids. Because no hybrid is resistant to all diseases, and the importance and prevalence of diseases vary over time and location, it is important to keep up to date on what diseases are currently causing problems in your area. Even a moderate level of resistance is enough to prevent economical losses to certain diseases; other diseases warrant the highest level of resistance available. Hybrids can also be selected for tolerance - the ability to produce acceptable yields even though symptoms develop. Your seed dealer can help you select hybrids that have appropriate levels of resistance or tolerance to specific diseases.

All New York hybrids should possess good standability. Strong stalk rind characteristics may be as important as, or more important than, resistance to internal stalk-rotting organisms, although hybrids do vary in stalk-rot resistance. Gibberella stalk rot is endemic in New York and harvest losses occur annually, especially in fields that are otherwise stressed. Anthracnose stalk rot can be severe in certain

Table 3.5.1 Efficacy of fungicides for corn disease control based on appropriate application timing*

Fungicide(s)				Anthracnose leaf blight	Common rust	Eyespot	Gray leaf spot	Northern leaf blight	Southern rust	Tar spot	Harvest Restriction[2]
Class	**Active ingredient (%)**	**Product/ Trade name[1]**	**Rate/A (fl oz)**								
Mixed modes of action	**pyraclostrobin 13.6% metconazole 5.1%**	**Headline AMP 1.68 SC[3]**	**10.0-14.4**	U	E	E	E	VG	G	NL	20 days
	trifloxystrobin 32.3% prothioconazole 10.8%	**Stratego YLD 4.18 SC[4]**	**4.0-5.0**	VG	E	VG	E	VG	G	NL	14 days
	tetraconazole 7.48% azoxystrobin 9.35%	**Affiance 1.5 SC**	**10.0-14.0**	U	G-VG	U	G-VG	G-VG	G	G (2ee NYS)	7 days
	flutriafol 18.63% azoxystrobin 25.30%	***†TopGuard EQ**	**5.0-7.0**	U	F	U	VG	G-VG	G-VG	G-VG (2ee NYS	45 days
	mefentriflucon-azole 17.56a5 pyraclostrobin 17.56%	***†Veltyma 3.34 SC[3]**	**7.0-10.0**	U	U	U	VG-E	VG-E	VG-E	VG	21 days
	mefentriflucon-azole 11.61% pyraclostrobin 15.49% fluxapyroxad 7.74%	**Revytek 4.44 SC[3]**	**8.0-15.0**	U	U	U	VG-E	VG-E	VG	VG	21 days

This information was adapted for New York from information developed by the national Corn Disease Working Group (CDWG) on fungicide efficacy for control of major corn diseases in the United States. The complete document, CPN-2011-W, can be found at: cropprotectionnetwork.org. Efficacy ratings for each fungicide listed in the table were determined by field-testing the materials over multiple years and locations by the members of the committee. Efficacy ratings are based upon level of disease control achieved by product and are not necessarily reflective of yield increases obtained from product application. Efficacy depends upon proper application timing, rate, and application method to achieve optimum effectiveness of the fungicide as determined by labeled instructions and overall level of disease in the field at the time of application. Differences in efficacy among fungicide products were determined by direct comparisons among products in field tests and are based on a single application of the labeled rate as listed in the table. Table includes systemic fungicides available that have been tested over multiple years and locations. The table is not intended to be a list of all labeled products[1].* ***Efficacy categories: NR=Not Recommended; P=Poor; F=Fair; G=Good; VG=Very Good; E=Excellent; NL=Not Labeled for use against this disease;U (unknown efficacy)=Insufficient data to make statement about efficacy of this product for this disease.* *Many products have specific use restrictions about the amount of active ingredient that can be applied within a period of time or the amount of sequential applications that can occur. Please read and follow all specific use label restrictions prior to fungicide use. This information is provided only as a guide. It is the responsibility of the pesticide applicator by law to read and follow all current label directions. Reference to products in this publication is not intended to be an endorsement to the exclusion of others that may be similar. Persons using such products assume responsibility for their use in accordance with current directions of the manufacturer. Members or participants in the CDWG assume no liability resulting from the use of these products.*

* Restricted use pesticide.

† Not for sale or use in Nassau or Suffolk Counties.

[1] Additional fungicides are labeled for disease on corn, including contact fungicides such as chlorothalonil. Certain fungicides may be available for diseases not listed in the table, including Gibberella and Fusarium ear rot.

[2] Harvest restrictions are listed for field corn harvested for grain. Restrictions may vary for other types of corn (sweet, seed or popcorn, etc.), and corn for other uses such as forage or fodder.

[3] No aerial application within 100 feet of aquatic habitats.

[4] Aerial application is not allowed in New York.

[5] Labeled for suppression of Fusarium and Gibberella ear rots and associated mycotoxins when applied at R1 to R2 stages.

[6] No application within 100 ft of coastal marsh.

[7] Labeled for suppression of ear rots caused by *Fusarium* spp. when applied at VT to R1 stages.

3.6 Managing Insects, Slugs, and Nematodes in Corn

Crop systems support a diversity of life forms, very few of which are really pests. This means that it is essential for you to learn to recognize the various pests and to associate specific damage symptoms with what is actually causing that damage. Positive identification of pests is important because different species have vastly different life habits, and very different techniques for their management and control may be necessary.

A species that may at times become a pest is not always of economic significance. Plants, especially field crops, can and those interested should contact their local CCE specialist for the latest information on availability for farm applications.

3.6.3 Seed Corn Maggot

3.6.3.1 Description

Adult seed corn maggots are medium-sized flies that are very similar in appearance to the common house fly. Adult flies are present throughout the growing season and locate egg-laying sites by flying alternately close to the ground's surface or searching the moist soil cracks on the soil surface. The adult female flies search for egg-laying sites close to decaying plant material or germinating seeds to provide a food source for the newly hatched larvae. Adult flies lay eggs in moist soil cracks near these potential food sources, and typical-looking fly larvae (maggots) hatch from the eggs within a few days. After hatching, larvae move through the soil searching for decaying plant matter or germinating seeds to feed on.

Large-seeded crops like corn or soybeans are susceptible to seed corn maggot attack, potentially resulting in significant stand losses. Germinating corn seeds are often killed or severely injured, thereby reducing plant populations within an area of the field or throughout the entire field. Losses typically range from 3,000 to 8,000 plants per acre. Historically, fields in which animal or green manure crops have been used were thought to have a greater potential for seed corn maggot attack than fields not using these manures. However, current research shows that non-manured fields are also at risk from seed corn maggot damage if conditions are favorable.

3.6.3.2 Management

Seed corn maggot is highly mobile and feeds on numerous crops and decaying organic matter, so crop rotation is not effective. Damage may be mitigated by delaying planting until soils are warm enough to allow rapid seed germination and emergence. Insecticide seed treatments are commonly used to manage seedcorn maggot in conventional crops. The insecticide is applied by the seed supplier before purchase. See section 2.16 of this guide for a listing of commercially available seed treatments.

3.6.4 Cutworms

3.6.4.1 Description

Several species of cutworms are found in New York; the black cutworm is most commonly found in corn. The adults (moths) migrate into the state from the southern overwintering sites on the spring storms and are attracted to weeds on which they lay their eggs. One or more generations may occur per year, but it is the first generation which causes economic loss in NY corn. Cutworm larvae are large (1 to 2 inches long when fully grown), smooth, dull-colored caterpillars, which curl tightly when handled. They hide in the soil during the day and feed at night at the base of small corn plants during May and June. Symptoms include missing, cut, or wilted plants. The large, nearly mature larvae do most of the feeding damage. Each one is capable of destroying several plants, and damage may appear very suddenly as the larvae grow larger.

3.6.4.2 Management

The key to cutworm control is to monitor emerging and growing plants closely, particularly in fields with conditions favoring cutworm outbreaks. These conditions include late planting; weed infestations; low, wet areas; and fields previously in pasture or sod. Cutworm problems may be worse in fields planted with minimum or no tillage. Plowing, good weed control, and early planting should help reduce cutworm problems. Check fields every two or three days until plants are well established for signs of missing, cut, or wilted plants. Search for the larvae in the soil near damaged plants. Treatment is suggested (Table 3.6.1) if 5 percent or more of the plants have been cut. Cutworm larvae should be controlled while small – 1/2 inch long or less. Since the larvae are active at night, chemicals should be applied late in the day. When the soil is dry and crusted, larvae remain beneath the soil surface and will be difficult to control. Only the infested area and a 20- to 40-foot surrounding border need be treated. Direct the spray at the base of the plants. Portions of the field may need to be disked and replanted if damage has gone beyond the point of control.

Application of soil insecticides at planting does not provide effective control of cutworms despite claims by the insecticide manufacturer.

3.6.5 Armyworms

Armyworms are occasionally a problem in corn, especially in weedy fields, in fields near severely infested small grain, grass pastures and in no-tillage corn established in grain stubble. Armyworm moths are long-range migrants which arrive on the spring storms from their southern overwintering locations. While there are more than one generation per season of armyworms once they arrive, it is the first generation which causes economic losses in NY. Check fields regularly for ragged holes chewed from the leaf margins and pellet-like droppings (frass) in the whorls and scattered on the ground. The larvae will be found in the leaf whorls or at the surface of the soil.

For whorl-stage corn, apply an insecticide (Table 3.6.1) only if most plants show damage and about three larvae per plant are found. Tall corn will seldom need to be treated unless the leaves above the ear are also damaged. Only the infested portion of the field and a 20- to 40-foot border around it need be treated. A border 20 to 40 feet wide treated with insecticide will prevent armyworms from invading from an adjacent infested field. Because the larvae are active at night, apply treatments late in the day.

Table 3.7.3. Chemical weed control in corn.

Weed Situation	Amount of Product(s) per Acre	Remarks and Limitations
Conventional corn hybrids		
PRE Programs Annual grass and broadleaf weeds	2.3 qt. *†Harness Xtra **or** 2.3 qt. *†Keystone LA NXT **or** 3.0 qt. *†Degree Xtra **or** 3.0 qt. *†FulTime NXT	**GROUP 5 and 15 HERBICIDES•** Apply preemergence or early postemergence. If used postemergence, apply prior to the 2-leaf grass stage and before corn is 11 in. tall. Good choice if triazine-resistant smooth pigweed or tall waterhemp are problems. *†Harness Xtra, *†Keystone LA NXT, and other acetochlor products are **not** for use in Nassau and Suffolk Counties. See label for special groundwater protection requirements.
	10-18 fl oz *†Verdict	**GROUP 14 and 15 HERBICIDES•** Apply prior to crop emergence. Application after emergence will cause crop injury. A postemergence treatment may be required for full-season weed control. Note that rates vary depending on soil texture. Will control triazine-resistant lambsquarters, smooth pigweed or tall waterhemp. *†Verdict is **not** for use in Nassau and Suffolk Counties.
	18 oz. *†Outlook + 1 qt. *†Atrazine 4L	**GROUP 5 and 15 HERBICIDES• Apply preemergence** or early postemergence to corn up to 5 in. tall. A lower rate of *†Outlook should be used on sandy and/or low organic matter soils. Good choice if triazine-resistant smooth pigweed or tall waterhemp are problems. *†Outlook and *†Atrazine 4L are **not** for use in Nassau and Suffolk Counties.
	1.5 qt. *†Bicep Lite II Magnum **or** 1.5 qt. *†Cinch ATZ Lite	**GROUP 5 and 15 HERBICIDES• Apply preemergence** or early postemergence to corn up to 5 in. tall. A lower rate of *†Bicep Lite II Magnum **or** *†Cinch ATZ Lite should be used on sandy and/or low organic matter soils. Good choice if triazine-resistant smooth pigweed or tall waterhemp are problems. *†Bicep Lite II Magnum **and** *†Cinch ATZ Lite are **not** for use in Nassau and Suffolk Counties.
	1.5 qt. *†Bicep Lite II Magnum **or** 1.5 qt. *†Cinch ATZ Lite + 1 qt. *†Princep 4L/ *†Simazine 4L	**GROUP 5 and 15 HERBICIDES•** Preemergence only. Use with heavy infestations of crabgrass or fall panicum. Good choice if triazine-resistant smooth pigweed or tall waterhemp are problems. *Atrazine and (or) *†Princep/*†Simazine carryover may injure triazine-sensitive rotational crops. *†Bicep Lite II Magnum **and** *†Cinch ATZ Lite are **not** for use in Nassau and Suffolk Counties.
	64-75 oz. *†Harness Max + 1 qt. *†Atrazine 4L	**GROUP 5, 15 and 27 HERBICIDES• Apply preemergence** or early postemergence to corn up to 11 tall. Use the lower rate if soil organic matter content is less than 3 percent and the higher rate if soil organic matter content is 3 percent or greater. The addition of 1 pt./A of *Atrazine will improve common ragweed control. Good choice if triazine-resistant lambsquarters, smooth pigweed or tall waterhemp are problems. *†Harness Max is **not** for use in Nassau and Suffolk Counties. See label for special groundwater protection requirements.
	2.5-3 qt. *†Acuron	**GROUP 5, 15 and 27 HERBICIDES• Apply preemergence** or early postemergence before corn reaches 12 in. in height. Use the lower rate if soil organic matter content is less than 3 percent and the higher rate if soil organic matter content is 3 percent or greater. Good choice if triazine-resistant lambsquarters, smooth pigweed or tall waterhemp are problems. *†Acuron is **not** for use in Nassau and Suffolk Counties.
	2.7-3.25 qt. *†Lumax EZ	**GROUP 5, 15 and 27 HERBICIDES• Apply preemergence** or early postemergence before corn reaches 5 in. in height. Use the lower rate if soil organic matter content is less than 3 percent and the higher rate if soil organic matter content is 3 percent or greater. The addition of 1 pt./A of *Atrazine will improve common ragweed control. Good choice if triazine-resistant lambsquarters, smooth pigweed or tall waterhemp are problems. *†Lumax EZ is **not** for use in Nassau and Suffolk Counties.

Table continued on next page.

4 Forage Crops Guidelines

4.1 Forage Varieties

4.1.1 Alfalfa

Often called the queen of the forages, alfalfa tops all other perennial forage crops as a producer of homegrown feed. High-yielding and versatile, alfalfa serves well for hay, silage, green chop, and pasture. It produces high-protein and palatable feed, which livestock like and do well on. Alfalfa also fills an important role in crop rotations, improving soil structure and building soil fertility for future grass and grain crops.

Alfalfa is a deep-rooted, drought-tolerant crop that does best on deep, well-drained soils. Alfalfa also needs a well-limed soil; it gives top performance on soils with pH levels of 6.5 or higher. It does poorly on acidic soils, and soil acidity is often noted as the major limiting factor on alfalfa growth in New York. Acidic soils must be limed to a pH of 6.5 or higher to maintain high-yielding alfalfa stands.

On well-drained soils, alfalfa can produce high yields for many years, but it will yield poorly and die soon on poorly drained soils. Tile and other drainage aids can improve the soil's ability to grow good alfalfa. Trefoil and red clover offer better choices for good production on sites with poor or spotty drainage patterns.

Alfalfa seedlings need phosphorus and potassium at planting time. Older stands need topdressing to maintain high yields. An ample fertility program provides nutrients for recovery after harvest, good winter survival, and high yields. Phosphorus and potassium are musts, but nitrogen rarely, if ever, pays on alfalfa because nitrogen-fixing bacteria in root nodules can provide enough nitrogen for top yields. For details on fertilizer suggestions, see Table 4.6.1.

Insect pests cause sporadic damage in alfalfa, varying with season and locality. Potato leafhopper feeding can lower second-cut yields in some years. The alfalfa weevil and blotch leaf miner, formerly serious, are now largely controlled through introduced insect parasites and predators. The alfalfa snout beetle can cause severe damage in the several counties where it occurs. Clover root curculios are unbiquitous in alfalfa growing regions. Larvae feed on alfalfa roots and reduce plant productivity. Check control guidelines in the section "Management of Insects in Forage Crops (section 4.10)."

New York alfalfa trials test yield of new varieties (Tables 4.1.1 to 4.1.6). Modern alfalfa varieties have been bred for resistance to five or more diseases that can thin alfalfa stands in New York. These diseases include **bacterial wilt**, caused by bacteria present in most New York alfalfa soils; **Verticillium wilt**, a soilborne disease that can kill susceptible plants in their second or third year; **Phytophthora** root rot, caused by a soilborne water mold often found in wet areas of fields; **anthracnose**, found in warmer areas of the state, particularly the Hudson Valley; and **Fusarium wilt**, common in New York soils and may occur but is not documented as a widespread problem in New York. Phytophthora hits hardest in the seedling year, and the other diseases affect mature stands in their second and third years of production.

Check for variety reactions to these specific diseases as well as for yield and fall dormancy ratings. Choose varieties that are listed as R (resistant) or HR (highly resistant) for diseases found in your area. View resources online and table 4.1.6 to determine disease resistance ratings and other characteristics for alfalfa varieties. View tables 4.1.1 to 4.1.2 to compare variety yields within trials. Both Aphanomyces root rot and pea aphid occur here but the value of varietal resistance may not be established for these and some other pests.

Several varieties have been developed at Cornell for specific adaptation to New York State conditions. These include ReGen and Seedway 9558 SBR (selected for resistance to alfalfa snout beetle).

Improved feeding value has been a goal of alfalfa breeders for years. Several recent varieties have been released with claims of improved feeding quality. Our tests show that minor differences in feeding quality do exist. However, effects on milk production have yet to be established. Timely cutting and leaf-saving harvest practices are far more important in affecting forage quality than leaf or plant type. Choose varieties with strong disease resistance and high yield potential that are well adapted to your farm and needs. Optimal yield and forage quality is at the one-tenth bloom stage.

Leafhopper-resistant varieties are available that have improved resistance and agronomic characteristics (see Table 4.1.2). Leafhopper resistance comes from fine hairs on stems and leaves, and results in significantly lower numbers of hoppers in resistant alfalfa stands compared to conventional alfalfa. Resistant varieties will surpass other strains when leafhopper pressure is heavy. Spraying in the seeding year may still pay under heavy hopper pressure.

4.1.2 Birdsfoot Trefoil

Birdsfoot trefoil is a long-lived legume with high yield potential on slightly acidic soils with drainage less than the best for alfalfa. Trefoil also does well as perennial forage on hard-to-plow meadows and pastures. Trefoil is bloat free, and no case of bloat has ever been recorded in animals grazing on trefoil. On fields where drainage is a problem, trefoil can outlive alfalfa and red clover by many years. Birdsfoot trefoil should be planted with a perennial forage grass and at harvest time, leave 5 to 6 inches of stubble to allow for regrowth of the trefoil.

Table 4.1.2. 2023 Yields of alfalfa varieties with resistance to potato leafhoppers in trials planted in 2020 in Central New York (CNY – Ithaca). *Company contact information in Table 4.1.5. Oneida VR and Vernal are susceptible to potato leafhopper.*

Released and Experimental Varieties	Tons per acre dry matter 2023 Total	3-Yr Total	% of Trial Mean 2023 Total	3-Yr Total	PLH Damage Score
	T/A	T/A			
55H96	4.01	12.69	112	111	1.2
SW4602LH*	3.94	12.28	110	108	1.1
BLUEBIRD	3.46	11.38	97	100	3.0
ONEIDA VR	3.40	10.72	95	94	4.1
VERNAL	3.17	10.47	88	92	4.4
Trial Mean (T/A)	*3.58*	*11.39*	*3.58 t/a*	*11.39 t/a*	*2.3*
5% LSD	*0.42*	*1.03*			*0.8*
CV (%)	*8.2*	*6.3*			*23.5*

Summary statistics are for 13 trial entries. PLH damage score: 1= minor to no damage to 5=severe damage.

Table 4.1.3. 2023 Yields of Red Clover varieties in trials planted in 2021 (Second Production Year) in Central New York (CNY – Ithaca). Check cultivars are Marathon and Cinnamon Plus. *Company contact in Table 4.2.3.*

Released and Experimental Varieties	2023 Total	2-Yr. Total	% of Checks Mean 2023 Total	% of Checks Mean 2-Yr. Total
	T/A	T/A		
DESIRE	4.79	8.55	106	105
CINNAMON PLUS	4.61	8.41	102	103
FREEDOM!MR	4.53	8.39	100	103
CW040040	4.83	8.34	106	102
RAPTOR	4.55	8.32	100	102
BAR TP10	4.48	8.30	99	102
CW30091	4.59	8.29	101	102
REDKIN	4.69	8.29	103	102
BLAZE	4.44	8.17	98	100
TP-12	4.50	8.17	99	100
EVOLVE	4.43	8.15	98	100
MARATHON	4.46	7.88	98	97
BARDURO	3.58	6.88	79	84
Trial Mean (T/A/Yr)	*4.49*	*8.15*	*Ck. Mean*	*Ck. Mean*
5% LSD	*0.47*	*0.70*	*4.54 t/a*	*8.15 t/a*
CV (%)	*7.4*	*6.1*		

Summary statistics are for 16 trial entries

Table 4.1.4. 2023 Yields of Red Clover varieties in trials planted in 2022 (First Production Year) in Central New York (CNY – Ithaca). Check cultivars are Marathon and Cinnamon Plus. *Company contact in Table 4.2.3.*

Released and Experimental Varieties	2023 Total (T/A)	% of Checks Mean	Released and Experimental Varieties (continued)	2023 Total (T/A)	% of Checks Mean
RUBY RED	4.90	127	EVOLVE	4.03	105
20-LARC-1	4.44	115	MARATHON	3.95	103

Table continued on next page.

Table 4.6.1. Fertilizers for forages.[1]

		Fertilizer Nutrients to be Added (lb./A)											
		Nitrogen (N)		*Phosphorus (P_2O_5)*					*Potassium (K_2O)*				
				Soil Test Levels[2]					Soil Test Levels[2]				
Crop to Be Grown	*Soil Management Group*	*No Manure*	*Manure*	*Low*	*Medium*	*Optimum*	*High*	*Very High*	*Very Low*	*Low*	*Medium*	*Optimum*	*Very High*
Topdressing grasses: 4–5-cut system[4]	I	125–275	50–175	50	10	0	0	0	100	70	30	20	0
	II	125–275	50–175	50	10	0	0	0	120	100	50	20	0
	III	125–275	50–175	50	10	0	0	0	140	120	60	20	0
	IV	125–275	50–175	50	10	0	0	0	160	140	70	20	0
	V	125–275	50–175	50	10	0	0	0	170	140	70	20	0
Topdressing pastures: native grasses	I	50–75	20–40	50	10	0	0	0	40	20	15	10	0
	II	50–75	20–40	50	10	0	0	0	45	20	15	10	0
	III	50–75	20–40	50	10	0	0	0	50	30	15	10	0
	IV	50–75	20–40	50	10	0	0	0	60	45	15	10	0
	V	50–75	20–40	50	10	0	0	0	75	50	25	10	0
Topdressing pastures: primarily legumes or legume-grass stands	I	20–40	0	50	10	0	0	0	45	40	20	20	0
	II	20–40	0	50	10	0	0	0	50	40	20	20	0
	III	20–40	0	50	10	0	0	0	70	60	30	20	0
	IV	20–40	0	50	10	0	0	0	90	80	40	20	0
	V	20–40	0	50	10	0	0	0	100	80	60	20	0
Topdressing pastures: intensively managed grasses, rotational grazing	I	125–150	0–100	50	10	0	0	0	45	40	20	20	0
	II	125–150	80–100	50	10	0	0	0	50	40	20	20	0
	III	125–150	80–100	50	10	0	0	0	70	60	30	20	0
	IV	125–150	80–100	50	10	0	0	0	90	80	40	20	0
	V	125–150	80–100	50	10	0	0	0	100	80	60	20	0
Other forages:													
triticale	I–V	60–80	30–50	65	40	20	20	0	50	40	20	20	0
triticale-peas	I–V	60–80	30–50	85	60	40	40	20	70	60	30	20	0

[1]A more specific guideline will be obtained from a complete Cornell Morgan soil test analysis.

[2]See Table 2.10.1 for the soil test values within each level.

[3]Apply 75 lbs of nitrogen in early spring at green up and 25–50 lbs before each successive cutting for a total of 225 pounds of N per acre.

[4] As with the 3-4 cut system, N allocation for a 4-5 cut system can be 75-100 pounds of fertilizer N per acre at green-up, followed by 50-75 pounds of N per acre after first cutting, and 50 pounds N per acre after subsequent cuttings for a total of 275 pounds of N per acre. Research suggests that the N allocation after each cutting is less important than the total N applied at green up and after first cutting, so producers can choose to shift the N allocation per cutting, using 275 pounds of N per acre from manure and/or fertilizer as an annual upper limit. For example, an application of 125, 100 and 50 pounds of N per acre could be made at green-up, after first, and after second cutting, respectively.

4.7 Forages for Conservation

Table 4.7.1 lists grasses and legumes useful for permanent cover and conservation plantings. Use those species best adapted to existing soil conditions. If possible, use species with rhizomes, for they tend to spread and fill in bare spots.

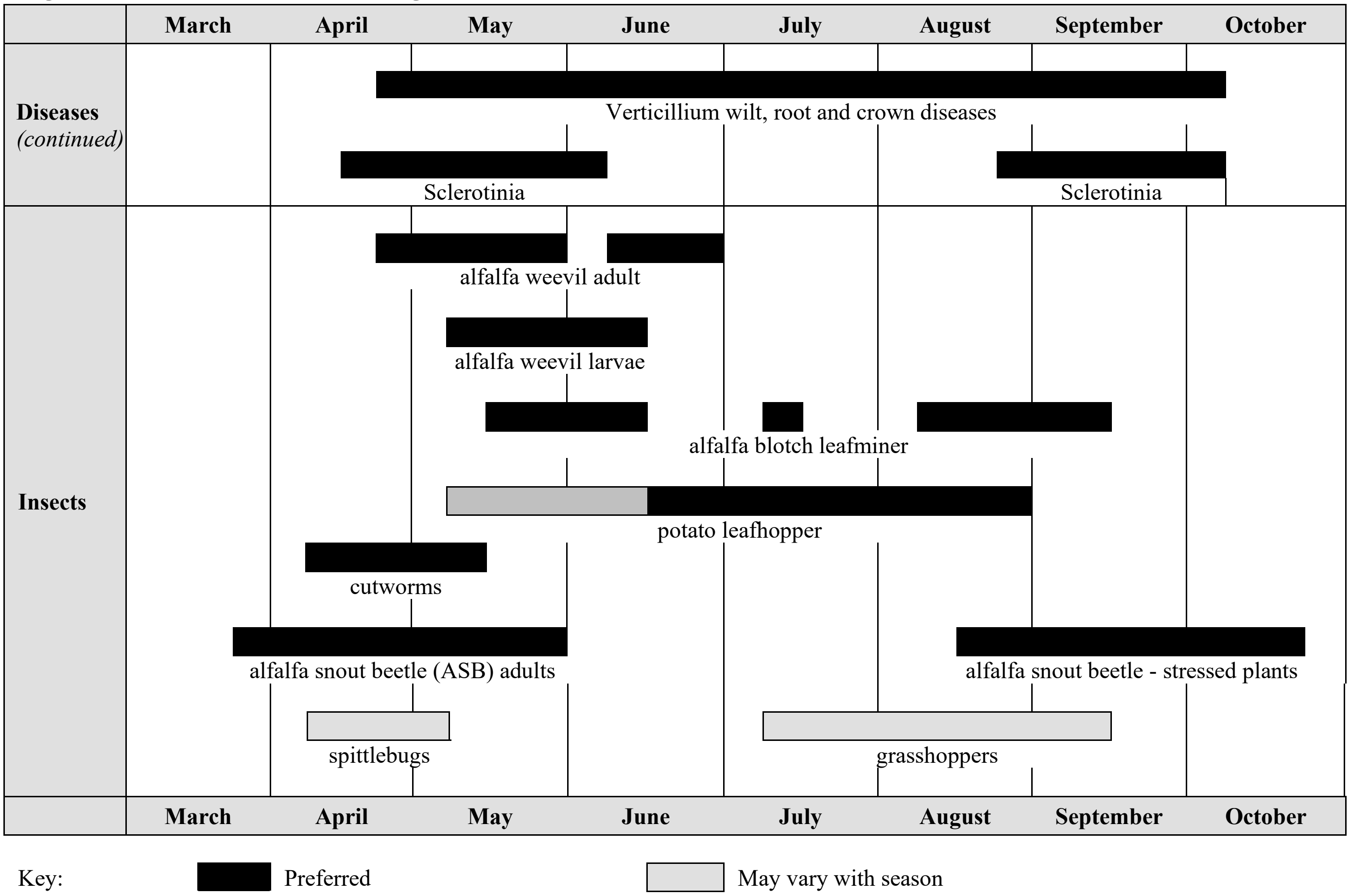
Seeding rates in pounds per acre can be converted to pounds per 1,000 square feet by multiplying pounds per acre by the factor 0.023. For example, 15 pounds of seed per acre x 0.023 = 0.34 pound of seed per 1,000 square feet.

Table 4.7.1. Grasses and legumes used for conservation plantings.

Crops	Remarks
Agrostis alba L. (Redtop)	Quite tolerant of acidic, poorly drained soils. Emerges quickly to form protective cover. Is low growing and spreads by stolons or creeping stems. Although vigorous in the seedling stage, redtop does not seriously compete with slower-growing species. Seed 5 to 10 lb. per acre.
Alopecurus arundinaceus Poir. (Creeping Foxtail)	A broadleaf, cool-season grass that grows well on wet, acidic soils. Plants are strongly rhizomatous and start growth early in the spring. Light, fluffy seeds and slow seedling development sometimes make planting and establishment difficult. Seed 5 to 10 lb. per acre.

Table continued on next page.

Figure 4.8.1. Alfalfa IPM scouting calendar.



4.9 Managing Diseases of Perennial Forage Legumes

Because of the dominance of alfalfa as a forage legume in New York State, disease management in alfalfa alone will be discussed. The same disease management strategies, however, can be applied to birdsfoot trefoil, clovers, and mixed legume-grass forage stands.

Diseases of alfalfa are common in our area, but as a rule they do not consistently cause severe losses within a single crop growth (cutting) period. Rather, they weaken plants over time, and along with other stress factors they contribute to reduced stand longevity. Infectious diseases contribute significantly to the death of alfalfa plants over the winter dormant period.

Management of alfalfa diseases in New York does not involve chemicals, except for limited use of fungicidal seed treatment, but relies instead on sound crop management and the use of varieties resistant to a few serious diseases. Diseases of importance include vascular wilts; root, crown, and stem rots; and foliar diseases. Check with your local Cornell Cooperative Extension office, fieldcrops.org (fieldcrops.cals.cornell.edu/forages/diseases-forage-crops/), or Cornell IPM to aid in scouting, identification and control of forage legume diseases.

4.9.1 Vascular Wilts

Vascular wilt diseases pose the greatest threat to alfalfa yields. These diseases result when the plant's vascular (water-conducting) tissues are colonized by pathogens and become plugged. This prevents water and nutrients from moving into the shoots and the plants wilt and eventually die. Varietal resistance is the single most important means of controlling vascular wilts. The bacterial wilt pathogen is endemic in New York soils, and all adapted varieties need to possess a high level of bacterial wilt resistance. Verticillium wilt occurred widely throughout New York State in the 1980s; it is advisable that any variety grown in New York possess at least a moderate level of Verticillium wilt resistance. Recent evidence indicates that Fusarium wilt may also be a problem in the state, but the need for resistance has not yet been established. Fortunately, most modern alfalfa varieties are at least moderately resistant to Fusarium wilt (Table 4.2.3).

Table 4.11.2. Chemical weed control for no-tillage forage establishment.

Situation	Amount of Product(s) per Acre	Remarks and Limitations
***Seedings in small-grain stubble and cornstalks** (continued)*		
Burndown of annual grasses, annual broadleaf weeds, and volunteer small grains at time of seeding	22 fl. oz. Roundup PowerMax **or 2**0 fl. oz. Roundup PowerMax 3	**GROUP 9 HERBICIDES•** Apply as a foliar spray before seeding. Do not graze or harvest forage within 8 weeks of application.
Annual broadleaf weeds emerging after seeding	2 qt. Butyrac 200	**GROUP 4 HERBICIDE•** Apply postemergence when weeds are no more than 2–3 in. high or rosettes are less than 2 in. across. Will not control wild radish. Do not graze seedling alfalfa, or birdsfoot trefoil within 60 days after application. There is no preharvest interval for haylage or dray hay; however, harvested forage should not be fed within 60 days after application.
	1 pt. of 2 lb./gal. Bromoxynil	**GROUP 6 HERBICIDE•** Labeled for alfalfa only. Apply when alfalfa has a minimum of 4 trifoliolate leaves. Weeds should not exceed the 4-leaf stage or 2 in. in height, whichever comes first, or apply before rosettes are 1 in. in diameter. Applications should not be made when temperatures exceed 70° F at and 3 days following application. Do not cut for feed or graze within 30 days following treatment.
Volunteer small grains and annual grasses emerging after seeding	1.5 pt. Poast	**GROUP 1 HERBICIDE•** Apply before small grains tiller (2–4 in. tall) and before over-wintering. Do not apply within 7 days of grazing, feeding, or cutting for undried forage or within 20 days of cutting alfalfa for dry hay.
	9-16 fl. oz. *Select Max	**GROUP 1 HERBICIDE•** Apply before small grains tiller (2-6 in. tall). Do not apply within 15 days of grazing, feeding, or harvesting for forage or hay.
Annual grasses and broadleaf weeds emerging after seeding **Roundup Ready Alfalfa**	22-44 fl. oz. Roundup PowerMax **or** 20-40 fl. oz. Roundup PowerMax 3	**GROUP 9 HERBICIDE• For use with Roundup Ready alfalfa only.** Apply 22 to 44 fl. oz. up to 4 trifoliolate leaves. Apply up to 44 fl. oz. from 5 trifoliolate leaves up to 5 days before first cutting. Up to 10 percent of the alfalfa seedlings might not contain the Roundup Ready gene and will not survive after the first application of this product.
Sod seeding		
Biennial and perennial broadleaf weeds before seeding	1 qt. of 3.8 lb./gal. 2, 4-D **or** 1 pt. Banvel	**GROUP 4 HERBICIDES•** Apply 2, 4-D or Banvel in summer or fall of the year before seeding.
Burndown/control of forage grasses	44 fl. oz. Roundup PowerMax **or** 40 fl. oz. Roundup PowerMax 3 **or** 48 fl. oz. Durango DMA	**GROUP 9 HERBICIDES•** Apply these or other glyphosate products as a foliar spray in the fall or spring (see text) when sod has made 8 or more in. of growth and is actively growing. Label includes all forage grasses and forage legumes. Seeding should be delayed several days after spraying to allow sod to deteriorate. Good choice if quackgrass is a problem. Do not graze or harvest forage within 8 weeks after application.
Annual broadleaf weeds emerging after seeding	2 qt. Butyrac 200	**GROUP 4 HERBICIDE•** Apply postemergence when weeds are no more than 2–3 in. high or rosettes are less than 2 in. across. Will not control wild radish. Do not graze seedling alfalfa, or birdsfoot trefoil within 60 days after application. There is no preharvest interval for haylage or dry hay; however, harvested forage should not be fed within 60 days after application.
	1 pt. of 2 lb./gal. Bromoxynil	**GROUP 6 HERBICIDE•** Labeled for alfalfa only. Apply when alfalfa has a minimum of 4 trifoliolate leaves. Weeds should not exceed the 4-leaf stage or 2 in. in diameter. Applications should not be made when temperatures exceed 70° F at and 3 days following application. Do not cut for feed or graze within 30 days following treatment.

Table continued on next page.

5 Small Grain Crops Guidelines

Small grains, which include winter and spring wheat, winter and spring barley, oats, and rye, play an important role in crop rotations on many New York farms. Under good soil conditions and management practices, small grains can produce profitable yields of grain for the cash market or farm feeding. Equally important is the value of the straw crop.

Oats and rye tolerate acid or poorly drained soils better than wheat or barley does. Nevertheless, maximum yields of both crops are attained on moderately well-drained or well-drained soils with a pH above 5.8. For maximum wheat production, wheat must be cropped on moderately well-drained or well-drained soils with a pH above 6.0. Barley requires well-drained soils with a pH above 6.3, the same as needed for alfalfa production.

5.1 Planting Techniques

5.1.1 Winter Grains

Winter wheat should be planted with a grain drill to a depth of 1 to 1-1/2 inches during the couple of weeks after the Hessian fly-free date. The optimal planting is thus from mid-September until early October in most regions of winter wheat production. Depending upon the fall or winter conditions, wheat can be successfully planted until early November but at a lower yield potential. Soft white winter wheat has a broad optimum seeding rate range and rates of about 120 pounds or 2 bushels per acre usually result in the highest grain and straw yields. If planting is delayed beyond early October, the optimal rate is 150 pounds or 2-1/2 bushels per acre. Soft red winter wheat also has a broad optimum seeding rate range and rates between 1,000,000 and 1,300,000 seeds per acre result in highest grain yields when planted in September and about 1,500,000 seeds/acre for highest straw yields. If planting is delayed after mid-October, soft red winter wheat should be seeded at rates of 1,500,000 seeds for acre if just for grain and 1,800,000 seeds/acre if the straw is also harvested.

Barley is less hardy than wheat and is not susceptible to Hessian fly. Winter barley can thus be planted a few days earlier than wheat, that is, from September 10 to September 20. Because barley is very susceptible to barley yellow dwarf virus, planting before this time is strongly discouraged. It is best to sow the seed with a grain drill at a depth of 1 to 1-1/2 inches. Seeding rates should be in the 96 to 120 pounds per acre or 2- to 2-1/2-bushel range.

Rye is the hardiest of all winter grains and thus can be successfully established with an early to mid-October planting date. For seed production, rye should be sown with a grain drill at a depth of 1 to 1-1/2 inches. The seeding rate should be in the 110 pounds or 2-bushel range.

5.1.2 Spring Grains

Spring grains should be sown as early in the spring as possible. In central New York, a yield decrease of about 1 bushel per acre per day can be expected in oats and barley for each day the crop is planted after April 15. With spring wheat, a yield loss of about 1/2 bushel per acre per day can be expected if planting occurs after April 15. All spring grains should be sown with a grain drill to a depth of 1 to 1-1/2 inches. The optimal seeding rate for oats is 96 pounds or 3 bushels per acre, whereas spring barley and spring wheat do best at 2 bushels per acre. If oats or barley is to be used in forage seeding, seeding rates should be reduced by 50 percent.

See the *Cornell Field Crops and Soils Handbook* for more detailed planting information.

5.2 Variety Selection

5.2.1 Winter Wheat

Wheat is an important cash crop in central and western New York. Most New York wheat is classified as soft red winter wheat, but some soft white winter wheat is also grown. Millers use the soft wheats to produce high-quality, low-protein flours for use in pastries, crackers, cookies, and breakfast cereals. Soft red wheats are inherently more resistant to pre-harvest sprouting than soft white wheats.

Winter wheat varieties are tested every year in Cornell trials, and results of multiyear evaluations are shown for soft white wheat varieties from Cornell's breeding program in Table 5.2.1 and for both Cornell and commercial soft red wheat varieties in Table 5.2.2. Please note the following points when using these tables. Varieties are in order from those that have been tested the longest to those most recently entered into the testing program. For each trait, the number of years of data used to assess that trait are noted at the top of the table. The more years of evaluation, the more precise the data will be. The **table includes only varieties that have been tested for at least two years in Cornell trials**. All the winter wheat varieties reported in these tables are good options for New York growers. Their yields are good and all have acceptable milling and baking quality, test weight, and lodging resistance.

5.2.1.1 Soft White Winter Wheat

Only varieties developed by Cornell University's soft white wheat breeding program are evaluated in Cornell trials at this time. Results of variety evaluations are reported in Table 5.2.1. Special traits of some of these varieties are noted below, but recall that **all the varieties listed in the Table are good options for New York growers**.

Caledonia is a good yielder with excellent standability. It has attractive, light-colored straw.

5.6 Managing Winter Wheat Pest Problems in New York

Several important disease, insect, and weed problems can affect profitability of winter wheat production in New York. The most important pests are armyworm, cereal leaf beetle, aphids, seedling blights, smuts and bunts, leaf and glume spots, leaf rust, stripe rust, powdery mildew, scab, yellow dwarf virus, wheat spindle streak mosaic virus, and weeds. Integrated pest management (IPM) methods can be used to help minimize the impact of these pests (see Section 2.14: "Integrated Pest Management for Field Crops"). Figure 5.6.1 contains valuable information on when key pests of winter wheat can be expected to occur under New York conditions. Pest monitoring activities for winter wheat problems are closely linked to critical crop growth stages (GS).
Pre- and postseason weed surveys are recommended to identify current and future weed control needs. Early-season weed monitoring should be conducted while wheat is at the emergence through tillering stages (GS 5, 4 to 8 inches tall with 12 or more leaves) and while annual broadleaf weeds are less than 1.5 inches. Postseason weed surveys can be conducted at or after time of harvest. Disease assessments should be made from late April through early June (GS 3 to 5) for wheat spindle streak mosaic, yellow dwarf, and eyespot. Foliar fungal diseases (powdery mildew, leaf spots and rusts) should be assessed from late April through mid-June (GS 6 to 10.5, stem elongation: first node through heading stage).

Check fields for insect pests while monitoring for disease problems. Additional field monitoring should be conducted during the heading growth stages (10.1 to 11) to check for diseases of grain heads and the presence of armyworm or fall armyworm.

Information on significant pest damage, including field location, should be recorded to help improve efficiency of future pest management decisions.

For the most current information on field crop pest activity during the growing season see the Cornell IPM Weekly Field Crop Pest Report: (blogs.cornell.edu/ipmwpr/).

The following sections contain much useful information for managing specific pest problems.

Table 5.6.1. Winter wheat pests and crop monitoring activities.

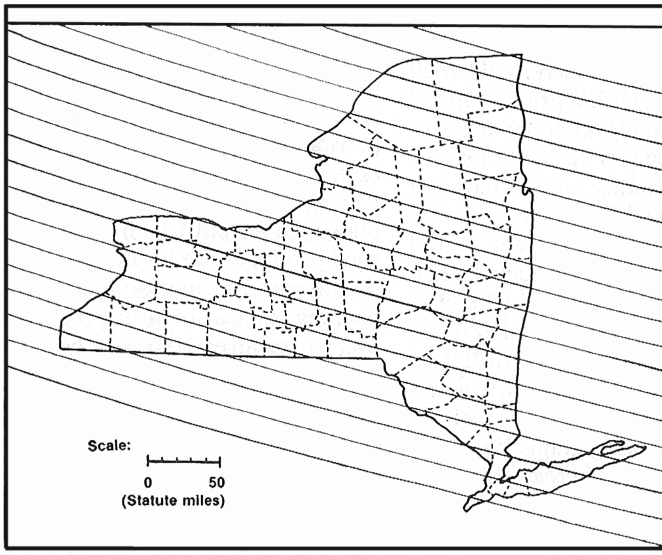
Routine	Occasional
Planting to Freeze Dormancy	
Weed survey, stand count, establishment problems, seed diseases/damping off (Pythium, Phytophthora, Rhizoctonia), aphids, watch for "occasional" pests/problems	Planter problems, poor seed germination, poor soil conditions, vertebrate damage (birds, rodents), herbicide injury, cereal leaf beetle, Hessian fly
Early Spring (break dormancy to tillering)	
Stand count, overwintering problems, weed survey, virus diseases (soil borne viruses, wheat spindle steak mosaic, yellow dwarf), eyespot, powdery mildew, white grub, wireworm, aphids, cutworms, armyworm, cereal leaf beetles, vertebrate damage (geese), watch for "occasional" pests/problems	Snow mold, herbicide injury, hail, frost/freeze, drought
Stem extension (jointing to boot stage)	
Leaf spots (Septoria/Stagonospora blotches, tan spot, powdery mildew, leaf rust, stripe rust), cereal leaf beetles, watch for "occasional" pests/problems	Herbicide injury, hail, frost/freeze, drought, armyworm, aphids, cutworms, fall armyworm, grasshoppers
Flowering to Grain Ripening	
Root and crown rots, cutworms, armyworm, Fusarium head blight / scab, leaf spots (powdery mildew, Septoria and Stagonospora blotches, Tan spot), leaf and stripe rust, cereal leaf beetles, watch for "occasional" pests/problems	Wind, excessive nitrogen, lodging, nutrient deficiency, viruses, smut, bunt, armyworm, stalk borer, European corn borer, fall armyworm, wheat stem sawfly, grasshoppers, white grub, wireworm, flea beetles

"flaxseeds" for their resemblance to the flat spindle- shaped seeds of flax) deep within the sheaths of the lower leaves in the weeks just before wheat harvest.

No insecticides are recommended for control of the Hessian fly. Plow under stubble of infested grain at least 6 inches immediately after harvest. Destroy all volunteer wheat by disking when the plants are small. Plant wheat only after the fly-free date for your area but as soon after that date as possible (see Figure 5.8.1 for Hessian Fly free dates predicted for NY). Ask your seed dealer about the availability of Hessian fly-resistant varieties.

5.8.4 Stored Grain Insect Management

Table 5.8.1 provides options for managing stored grain insects.



ALTITUDE IN FEET (Above Sea Level)						
200	400	800	1200	1600	2000	2400
	Sept. Sept. 7–17	Sept. Sept. 3–13	Aug. Sept. 30–9			
	8–18	4–14	31–10			
	9–19	5–15	Sept. 1–11	Aug. Sept. 28–7		
	10–20	6–16	2–12	29–8		
	11–21	7–17	3–13	30–9		
	12–22	8–18	4–14	31–10		
	13–23	9–19	5–15	Sept. 1–11	Aug. Sept. 28–7	
	14–24	10–20	6–16	2–12	29–8	
	15–25	11–21	7–17	3–13	30–9	
	16–26	12–22	8–18	4–14	31–10	Aug. Sept. 27–6
	17–27	13–23	9–19	5–15	Sept. 1–11	28–7
	18–28	14–24	10–20	6–16	2–12	29–8
	19–29	15–25	11–21	7–17	3–13	30–9
	20–30	16–26	12–22	8–18	4–14	31–10
Sept. Oct. 25–5	Oct. 21–1	17–27	13–23	9–19	5–15	Sept. 1–11
26–6	22–2	18–28	14–24	10–20	6–16	2–12
27–7	23–3	19–29	15–25	11–21	7–17	3–13
28–8						

Figure 5.8.1. Hessian fly-free dates.

Table 5.8.1. Stored grain insecticides registered for use in New York state

Note that this is not an exhaustive list; other product options may be available.

		Labeled Use							
Active Ingredient	**Trade Name**	***Empty Bin Treatment***	***Corn***	***Barley***	***Oats***	***Rye***	***Soy-bean***	***Wheat***	***Comments***
aluminum phosphide (phosphine gas)	*Degesch Phostoxin Pellets		X	X	X	X	X	X	See label for pests.
	*Degesch Phostoxin Tablet Prepac		X	X	X	X	X	X	See label for pests.
	*Detiaphos Pellets		X	X	X	X	X	X	See label for pests.
	*Weevil-Cide Pellets		X	X	X	X	X	X	See label for pests.
	*Weevil-Cide Tablets		X	X	X	X	X	X	See label for pests.
Bacillus thuringiensis	Dipel DF		X	X	X	X	X	X	Indian meal moth, almond moth
	Javelin WG		X	X	X	X	X	X	Indian meal moth, almond moth
beta-cyfluthrin	Tempo SC Ultra	X							See label for pests.
diatomaceous earth (silicon dioxide)	Desect Diatomaceous Earth Insecticide	X	X	X	X	X	X	X	See label for pests.
	Dryacide 100	X	X	X	X	X	X	X	For any stored grain insect.

Table continued on next page.

6 Soybean Guidelines

6.1 Soybean Maturity Group Selection

Varieties of soybeans differ in maturity as much as corn varieties do, but they are classified by a different maturity system. The varieties that require the least heat to mature are placed in Group 00. In progressively warmer parts of our state, the appropriate maturities are Group 0, Group I, and Group II and early Group III. Early Group III and late mid to late Group II varieties mature dependably only in the warmer parts of central and western New York.

In the warmer regions of central and western New York, we recommend planting most of the crop with mid-Group II to early Group III varieties with a May planting date. If fields are to be planted to wheat after soybean harvest, growers should consider early Group II or late Group I varieties to insure planting wheat before mid-October. If planting occurs during the first 10 days of June, we recommend planting about 50% to early Group II and about 50% of the acreage to late Group I varieties with mid or early Group I varieties in fields that will have a subsequent wheat crop. If planting is delayed beyond June 10, we recommend planting early Group I or Group 0 varieties in central and western New York. We do not recommend planting soybeans after June 20 in these regions.

In areas of northern New York next to the lakes, we recommend planting about 50 percent of the acreage to early Group II and about 50 percent to late Group I varieties with a May planting date. Away from the lakes in northern New York, we recommend planting 70 percent of the acreage to Group I and 30 percent to Group 0 varieties. If planting is delayed until June in northern NY, we recommend planting mostly Group I varieties next to the lakes and Group 0 varieties away from the lakes. We do not recommend planting soybeans in northern NY after June 15.

6.2 Soybean Planting

The best soybean yields occur on well-drained, but not sandy, soils having a pH of 6.5 or above. The critical stage for soybean yield is in August and droughty soils that typically dry out in August will have disappointing yields. Soybeans have a very broad optimal planting date with optimum dates from about May 5-25 in the warmer regions in central and western New York. Soybeans can be successfully planted in late April or early May in these regions but final stands may be more erratic so an insecticide/fungicide seed treatment is recommended for late April and early May plantings. Mid to late Group II and early Group III varieties can be planted in these regions up until about May 20 and then just Group II varieties until June 1. If a wheat crop is to be planted after soybean harvest, then a late Group I vs. a Group II variety planted in late May will mature earlier and allow for a more timely wheat planting date. In the cooler regions in central and western New York and in Northern New York, optimum planting time is during the midlle two weeks of May. Early Group II and Group I soybean varieties should be planted at this time in these regions.

Although soybean yields decline with June plantings, high yields can still be achieved by planting early Group II or Group I varieties in central and western New York and early Group I and Group 0 varieties in Northern New York until about June 15. The earlier-maturing varieties, which tend to be short in stature, yield better at a row spacing of 15 inches or less. Soybean plantings after June 20 in central/western NY and after June 10 in NNY can be risky, even with Group 0 varieties, especially if the remaining part of the growing season is cool or if frost occurs before October 1.

It is important to place the soybean seed into the ground at a precise depth and in firm contact with the soil so choice of planting equipment is especially critical. A corn planter usually does a better job of planting than a grain drill, but soybeans typically yield about 5% less in 30-inch vs. 7.5 inch row spacing in New York even with lower final stands. In addition, modern drills have much better depth control than older grain drills.

Seeding rate depends on both row spacing and seed size. We recommend seeding rates, for seed not treated with insecticide or fungicide, of about 170,000 seeds per acre for 7.5 inch row spacing (~7.5 seeds per 3 ft.), 160,000 seeds/acre for 15-inch row spacing (about 14 seeds per 3 feet), and 150,000 plants per acre for 30-inch row spacing (~26 seeds per 3 ft.). If an insecticide/fungicide seed treatment is used, seeding rates can be reduced by 10,000 to 20,000 seeds per acre. Planting depth should be about 1.25 to 1.5 inches, depending on soil moisture conditions, and should not exceed 2 inches. Soybeans, however, can emerge reasonably well from a 2.5 inch depth, if soil crusting is not prevalent during actual emergence from the soil. Likewise, soybeans can be planted at the 1.0 inch depth, but the seed is susceptible to drying out, if conditions are dry after planting. We recommend the use of inoculum for soybean plantings in New York, especially on fields with a limited soybean history. On fields where soybeans have been grown for more than 20 years, however, inoculum may not be necessary. Likewise, the use of an insecticide/fungicide seed treatment is not necessary but can help stand establishment, especially on early-planted soybeans. Soybeans, however, can fill in the gaps very well and perfect stands are not required for maximum soybean yields.

6.3 Managing the Crop

Use soil test results to determine both lime and fertilizer requirements (see Table 6.3.1). Soybeans do not require supplemental nitrogen fertilizer if optimally fertilized for phosphorus and sulfur and at optimal pH because soybeans can fix nitrogen through a symbiotic relationship with *Bradyrhizobium* bacteria. If used, band-placed fertilizer should be at least 2 inches to the side and 2 inches below

Table 6.5.2. Efficacy of fungicides for soybean disease control based on appropriate application timing[a]

Fungicide(s)				Brown spot	Cercospora leaf blight[2]	Frogeye leaf spot[3]	Pod and stem blight	Soybean rust	White mold[4]	Harvest restriction[5]
Class	Active ingredient (%)	Product/ Trade name	Rate/A (fl oz)							
Mixed Modes of Action	mefentrifluconazole 11.61% pyraclostrobin 15.49% fluxapyroxad 7.74%	Revytek[9]	8.0-15.0	VG	F-VG	G-VG	U	VG-E	P	21 days
	mefentrifluconazole 17.56% pyraclostrobin 17.56%	*†Veltyma[9]	7.0-10.0	U	U	G-VG	U	U	NL	21 days
	tea tree oil 20.4% difenconazole 20.4%	Regev HBX 3.34 EC	4.0-8.5	U	U	G-VG	U	U	U	14 days

[a]*This information was adapted for New York from information developed by the North Central Regional Committee on Soybean Diseases NCERA-137) on foliar fungicide efficacy for control of major foliar soybean diseases in the United States. The complete document, CPN-1019-W, can be found at: cropprotectionnetwork.org. Efficacy ratings for each fungicide listed in the table were determined by field-testing the materials over multiple years and locations by the members of the committee. Efficacy ratings are based upon level of disease control achieved by product and are not necessarily reflective of yield increases obtained from product application. Efficacy depends upon proper application timing, rate, and application method to achieve optimum effectiveness of the fungicide as determined by labeled instructions and overall level of disease in the field at the time of application. Differences in efficacy among fungicide products were determined by direct comparisons among products in field tests and are based on a single application of the labeled rate as listed in the table, unless otherwise noted. Table includes fungicides available that have been tested over multiple years and locations. The table is not intended to be a list of all labeled products[1].* ***Efficacy categories: P=Poor; F=Fair; G=Good; VG=Very Good; E=Excellent; NL=Not Labeled for use against this disease; U=Unknown efficacy or insufficient data to rank product.*** *Many products have specific use restrictions about the amount of active ingredient that can be applied within a period of time or the amount of* ***sequential*** *applications that can occur. Please read and follow all specific use restrictions prior to fungicide use. This information is provided only as a guide. It is the responsibility of the pesticide applicator by law to read and follow all current label directions. Reference to products in this publication is not intended to be an endorsement to the exclusion of others that may be similar. Persons using such products assume responsibility for their use in accordance with current directions of the manufacturer. Members or participants in the NCERA-137 group assume no liability resulting from the use of these products.*

* Restricted use pesticide.

† Not for sale of use in Nassau and Suffolk Counties.

[1]Some fungicides not in this table may be labeled for soybean rust only, powdery mildew, and Alternaria leaf spot. Contact fungicides such as chlorothalonil may also be labeled for use.

[2] Cercospora leaf blight efficacy relies on accurate application timing, and standard R3 application timings may not provide adequate disease control. Fungicide efficacy may improve with later applications.

[3] Fungicides with a solo or mixed QoI mode of action may not be effective in areas where QoI-resistance has been detected in the fungal population that causes frogeye leaf spot. In areas such as New York where QoI-fungicide resistant isolates of the frogeye leaf spot pathogen have not been detected, QoI fungicides may be more effective than indicated in this table.

[4] White mold efficacy is based on an R1 application timing, and lower efficacy is obtained at an R3 application timing, or if disease symptoms are already present at the time of application.

[5] Harvest restrictions are listed for soybean harvested for grain. Restrictions may vary for other types of soybean (edamame, etc.) and soybean for other uses such as forage or fodder.

[6] = Insufficient data is available at this time to make statements about efficacy of these products for diseases listed in the table.

[7]Aerial application not allowed in New York.

[8]No application allowed within 100 feet of coastal marsh.

[9]No application allowed within 100 feet of aquatic habitats.

6.6 Managing Insects in Soybeans

Relatively few insects have been reported to cause significant problems on soybeans in New York. Soybean stands can be reduced by seed corn maggot and yields can be reduced by infestations of soybean aphid and two-spotted spider mite.

6.6.1 Seed Corn Maggot

6.6.1.1 Description

Adult seed corn maggots are medium-sized flies that are very similar in appearance to the common house fly. Adult flies are present throughout the growing season and locate egg-laying sites by flying alternately close to the ground's surface or searching the moist soil cracks on the soil surface. The adult female flies search for egg-laying sites close to decaying plant material or germinating seeds to provide a food source for the newly hatched larvae. Adult flies lay eggs in moist soil cracks near these potential food sources, and typical-looking fly larvae (maggots) hatch from the eggs within a few days. After hatching, larvae move through the soil searching for decaying plant matter or germinating seeds to feed on.

Large-seeded crops like soybeans are very susceptible to seed corn maggot attack, potentially resulting in significant stand losses. Germinating soybean seeds are often killed or severely injured, thereby reducing plant populations within an area of the field or throughout the entire field. Losses use of herbicide combinations that include herbicides with different sites of action (how they affect weeds). These practices will help manage existing herbicide-resistant weed populations and delay development of new resistant weed populations.

To effectively utilize herbicides with different sites of action, everyone involved in decisions about weed management must have the herbicide site of action classification readily available. The Weed Science Society of America (WSSA) has approved a numbering system to classify herbicides by their site of action. A group number is given to all herbicides with the same site of action. These **“GROUP NUMBERS”** are included in the **“Chemical weed control tables”** in each crop section. Since herbicide resistance management is most effective when practiced across all crops in rotation, a list of all herbicides in this guide with their **“GROUP NUMBERS”** can be found in **Table 8.2.1** at the end of this book. Mode of action/site of action and chemical families for site of action GROUPS can be found in **Table 8.2.2** at the end of this book.

Table 6.7.1. Effectiveness of selected soybean herbicides on annual weeds.

Broadleaf Annual Weeds

Herbicides	Common Lambsquarters	Horseweed (Marestail)	Redroot Pigweed	Common Ragweed	Tall Waterhemp	Velvetleaf
Preplant or Preemergence						
*†Dual II Magnum, *†EverpreX, *†Warrant, *†Outlook	Poor	Poor	Good	Poor	Good	None
FirstRate[2]	Good	Good[2]	Good	Good	Good	Good
Lorox/Linex	Good	–	Good	Good	–	Fair
Metribuzin[1]	Good[1]	Good	Good	Good[1]	Good	Fair
*†Pursuit	Good	–	Good	Fair	Good	Good
*†Panther Pro	Good	–	Good	Good	Excel	Good
Prowl/Prowl H2O	Good	–	Good	–	Good	Fair
†Python[2]	Good	Good[2]	Good	Poor	–	Good
Valor SX	Good	Good	Good	Good	Good	Fair
Postemergence						
Basagran 5L	Fair	–	Poor	Fair	–	Good
Classic[2]	Poor	Fair[2]	Good	Fair	Fair[2]	Fair
Cobra	Poor	–	Good	Good	Excel	Good
FirstRate[2]	Poor	Fair[2]	Poor	Excel	Fair[2]	Good
Enlist One[3]	Excel	Good	Good	Good	Excel	Good
Harmony SG[2]	Good	–	Good	Poor	Fair[2]	Poor
†Liberty[4]	Excel	Excel	Excel	Excel	Excel	Good
*†Pursuit	Poor	–	Good	Fair	–	Good
*Reflex/Flexstar	Poor	–	Good	Good	Excel	Poor
Resource	Poor	–	Poor	Fair	–	Excel
Varisto	Good	–	Good	–	–	Good
*†Zalo[4]	Excel	Excel	Excel	Excel	Excel	Good

Annual Grass Weeds

Herbicides	Barnyardgrass	Crabgrass	Foxtails	Fall Panicum	Annual Ryegrass	Witchgrass
Preplant or Preemergence						
*†Dual II Magnum, *†EverpreX, *†Warrant, *†Outlook	Excel	Excel	Excel	Excel	–	Excel
Lorox/Linex	Fair	Fair	Fair	Fair	–	Fair
Metribuzin[1]	Poor	Poor	Poor	Poor	–	Poor
Prowl/Prowl H2O	Good	Good	Good	Good	–	Good
*†Pursuit	Poor	Fair	Fair	Fair	–	–
Valor SX	Poor	Poor	Poor	Poor	–	–

Table continued on next page.

7 Total Vegetation Control

7.1 Total Vegetation Control

Weed control around farm buildings improves the appearance of the farm and reduces maintenance and labor costs. The chemicals available for this use include those listed in Table 7.1.

Table 7.1.1 Herbicides for total vegetation control.

Amount of Products per Acre	Remarks and Limitations
3-15 lb. Hyvar X IVM **or** 1-1/2-6 gal. Hyvar X-L IVM	**GROUP 5 HERBICIDES•** Apply before weed emergence or when weeds are young and actively growing. Do not apply when ground is frozen. Low rates are for annuals; high rates are for hard-to-control perennials.
4-30 lb. Krovar IVM	**GROUP 5 and 7 HERBICIDES•** Apply before weed emergence or when weeds are young and actively growing. Low rates are for annuals; high rates are for hard-to-control perennials.
5-10 gal. Pramitol 25E	**GROUP 5 HERBICIDE•** Apply before weed emergence or when weeds are young and actively growing. Low rates are for annuals; high rates are for biennials and perennials.
220-400 lb. Pramitol 5PS	**GROUP 5 HERBICIDES•** May be applied before or after plant growth begins. Low rates are for annuals; high rates are for biennials and perennials.
5-7.5 lb. *†Spike 80DF **or** 5-20 lb. *†Spike 20P	**GROUP 7 HERBICIDES•** Apply anytime except when the ground is frozen or the soil is saturated with moisture. For optimal results, applications should be made just before or just after emergence of plants in spring.

* Restricted use pesticide

† Not for use in Nassau and Suffolk Counties

• Refer to Section 6.6.1 for information on herbicide resistance management and site of action groups.

8 Appendix

8.1 Trade and Common Names of Field Crop Pesticides

Table 8.1.1 Fungicides.

Trade Name[1]	EPA Registration Number	Common Name
Absolute 500 SC	264-849	tebuconazole + trifloxystrobin
Affiance 1.5 SC	10163-332	tetraconazole + azoxystrobin
Aframe Plus 2.2 SE	100-1324	propiconazole + azoxystrobin
Alto 100 SL	100-1226	cyproconazole
*†Aproach SC	352-840	picoxystrobin
*†Aproach Prima 2.34 SC	352-883	cyproconazole + picoxystrobin
Avaris 200 SC	100-1178-5905	azoxystrobin + propiconazole
Delaro 325 SC	264-1055	prothioconazole + trifloxystrobin
*†Delaro Complete 3.83 SC	264-1207	fluopyram + trifloxistrobin + prothioconazole
Domark 230 ME	80289-7	tetraconazole
Endura 0.7 DF	7969-197	boscalid
*†Evito 480 SC	66330-64	fuoxystrobin
Excalia 2.84 SC	59639-230	inpyrfluxam
*†Fortix 3.22 SC	66330-409	flutriafol + fluoxastrobin
Headline AMP 1.68 SC	7969-291	pyraclostrobin + metconazole
Headline 2.09	7969-186	pyroclostrobin
Headline 2.09 SC	7969-289	pyraclostrobin
*Miravis Ace SE	100-1645	propiconazole + pydiflumetofen
*Miravis Neo 2.5 SE	100-1605	pydiflumetofen + azoxystrobin + propiconazole
*Miravis Top 1.67 SE	100-1602	pydiflumetofen + difenoconazole
*†Nexicor EC	7969-380	pyraclostrobin + propiconazole + fluxapyroxad
*Omega 500 DF	71512-1	fluazinam
*†Priaxor 4.17 SC	7969-311	pyraclostrobin + fluxapyroxad
Proline 480 SC	264-825	prothioconazole
*†Propulse 3.34 SC	264-1084	fluopyram + prothioconazole
Prosaro 421 SC	264-862	prothioconazole + tebuconazole
*†Prosaro Pro 400 SC	264-1209	prothioconazole + tebuconazole + fluopyram
Quadris Flowable 2.08 SC	100-1098	azoxystrobin
Quadris Top 2.72 SC	100-1313	azoxystrobin + difenconazole
Quilt Xcel 2.2 SE	100-1324	azoxystrobin + propiconazole
Regev HBX 3.34 EC	86182-6-88783	difenoconazole + tea tree oil
*†Revytek 3.33 SC	7969-406	mefentrifluconazole + pyraclostrobin + fluxapyroxad
Sphaerex	7969-473	metconazole + prothioconazole
Stratego YLD 4.18 SC	264-1093	trifloxystrobin + prothioconazole
Tilt 3.6 E	100-617	propiconazole
†Topguard 1.04 SC	279-3557	flutriafol
†Topguard EQ 4.29 SC	279-3596	flutriafol + azoxystrobin
*Trivapro SE	100-1613	benzovindiflupyr + azoxystrobin + propiconazole
*†Veltyma 3.34 SC	7969-409	mefentrifluconazole + pyraclostrobin
†Xyway LFR 1.92 SC	279-9658	flutriafol
†Xyway 3D 2.5 SC	279-9638	flutriafol
*†Zolera FX 3.34 SC	66330-424	fluoxastrobin + tetraconazole

* Restricted use pesticide

† Not for use in Nassau or Suffolk Counties.

[1]Trade names are given for convenience only. No endorsement of products is intended nor is criticism of unnamed products implied.

Table 8.1.4. Stored Grain Insecticides.

Trade Name[1]	EPA Registration Number	Common Name
Prozap Dy-Fly Aerosol Insecticide	47000-69	piperonyl butoxide + pyrethrins
Prozap Insect Guard	5481-533-47000	dichlorvos
*Pyronyl Crop Spray	89459-26	piperonyl butoxide + pyrethrins
Sensat	264-995	spinosad
Stryker Insecticide Concentrate	53883-308	piperonyl butoxide + pyrethrins
*Suspend SC	432-763	deltamethrin
Tempo SC Ultra	432-1363	beta-cyfluthrin
*Weevil-Cide Pellets	70506-14	aluminum phosphide
*Weevil-Cide Tablets	70506-13	aluminum phosphide
Zeposector –S_{II}	1021-2670-1270	piperonyl butoxide + pyrethrins

* Restricted use pesticide

[1]Trade names are given for convenience only. No endorsement of products is intended nor is criticism of unnamed products implied.

8.2 Herbicide Site of Action Groups and Site of Action Information.

Table 8.2.1. Index of herbicide product names with active ingredients and site of action GROUPS.

Trade Name[1]	Active Ingredient(s)	Site of action GROUP(S)
*†AAtrex 4L	atrazine	5
Accent Q	nicosulfuron	2
*†Acuron	atrazine + *S*-metolachlor + bicyclopyrone + mesotrione	5 + 15 + 27 + 27
*†Acuron Flexi	*S*-metolachlor + bicyclopyrone + mesotrione	15 + 27 + 27
*†Acuron GT	*S*-metolachlor + bicyclopyrone + mesotrione + glyphosate	15 + 27 + 27 + 9
Aim EC	carfentrazone-ethyl	14
Armezon	topramezone	27
*†Armezon PRO	topramezone + dimethenamid-P	15 + 27
Assure II	quizalofop	1
*†Atrazine 4L	atrazine	5
Axial Bold	pinoxaden + fenoxaprop-p-ethyl	1 + 1
Axial XL	pinoxaden	1
Balan DF	benefin	3
Banvel	dicamba	4
Basagran 5L	bentazon	6
Basis Blend	rimsulfuron + thifensulfuron	2 + 2
Beyond Xtra	imazamox	2
*†Bicep II Magnum	atrazine + *S*-metolachlor	5 + 15
*†Bicep Lite II Magnum	atrazine + *S*-metolachlor	5 + 15
*†Boundary 6.5EC	metribuzin + *S*-metolachlor	5 + 15
Brox 2EC	bromoxynil	6
Butyrac 200	2,4-DB	4
Callisto	mesotrione	27
*†Capreno	thiencarbazone-methyl + tembotrione	2 + 27
†*Cinch	*S*-metolachlor	15
*†Cinch ATZ	atrazine + *S*-metolachlor	5 + 15
*†Cinch ATZ Lite	atrazine + *S*-metolachlor	5 + 15
Clarity	dicamba	4

Table continued on next page.

Tips for Laundering Pesticide-Contaminated Clothing

Pre-Laundering Information

Remove contaminated clothing **before** entering enclosed tractor cabs.

Remove contaminated clothing **outdoors** or in an entry. If a granular pesticide was used, shake clothing outdoors. **Empty pockets and cuffs.**

Save clothing worn while handling pesticides for that use only. Keep separate from other clothing **before, during, and after** laundering.

Wash contaminated clothing after **each** use. When applying pesticides daily, wash clothing **daily**.

Clean gloves, aprons, boots, rigid hats, respirators, and eyewear by scrubbing with detergent and warm water. Rinse thoroughly and hang in a clean area to dry.

Take these **precautions** when handling contaminated clothing:

- Ventilate area.
- Avoid inhaling steam from washer or dryer.
- Wash hands thoroughly.
- Consider wearing chemical-resistant gloves.
- Keep out of reach of children and pets.

Air

Hang garments outdoors to air.

Pre-rinse

Use one of three methods:

1. Hose off garments outdoors.
2. Rinse in separate tub or pail.
3. Rinse in automatic washer at full water level.

Pretreat (heavily soiled garments)

Use heavy-duty liquid detergent.

Washer Load

Wash garments separate from family wash.

Wash garments contaminated with the same pesticide together.

Never use the “sudsaver” feature on your machine when laundering pesticide-soiled clothes.

Load Size

Wash only a few garments at once.

Water Level

Use full water level.

Water Temperature

Use **hot** water, as hot as possible.

Wash Cycle

Use **regular** wash cycle, at least 12-minutes.

Laundry Detergent

Use a **heavy-duty** detergent.

Use amount recommended on package or more for heavy soil or hard water.

Remember to use high-efficiency (HE) detergents in HE and front-loading washers.

Rinse

Use a **full** warm rinse.

Rewash

Rewash contaminated garments **two or three times** before reuse for more complete pesticide removal.

Dry

Line drying is preferable to avoid contaminating dryer.

Clean Washer

Run complete, but empty, cycle.
Use **hot water and detergent.**

Prepared by Charlotte Coffman, College of Human Ecology, Department of Fiber Science and Apparel Design, Cornell University

PESTICIDE EMERGENCY NUMBERS

Emergency responder information on pesticide spills and accidents…

CHEMTREC 800-424-9300

For pesticide information…

National Pesticide Information Center 800-858-7378

To Report Oil and Hazardous Material Spills in New York State…

NYS Spill Hotline 800-457-7362

Poison Control Centers

Poison Control Centers nationwide 800-222-1222

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