2023
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.

2023 Cornell Guide for Integrated Field Crop Management

Authors

Jenn Thomas-Murphy (Soil and Crop Sciences Section; *contact editor*)
Joseph Amsili (Soil and Crop Sciences Section; *soil health/management*)
Gary Bergstrom (Plant Pathology and Plant-Microbe Biology Section; *disease management*)
Jerry Cherney (Soil and Crop Sciences Section; *forage production/variety selection*)
Julie Hansen (Plant Breeding and Genetics Section; *forage production/variety selection*)
Michael Helms (Cornell Cooperative Extension Pesticide Safety Education Program (CCE-PSEP); *pesticide information)*
Michael Hunter (CCE North Country Regional Ag Team; *weed management*)
Quirine Ketterings (Department of Animal Science; *soil fertility/nutrient management*)
Joe Lawrence (PRO-Dairy Program; *silage corn hybrids*)
Harold van Es (Soil and Crop Sciences Section; *soil health/management*)
Erik Smith (CCE Central New York Dairy, Livestock, and Field Crop Program; *insect, slug, and nematode management*)
Margaret Smith (Plant Breeding and Genetics Section; *grain corn hybrids/small grain variety selection*)
Michael Stanyard (CCE Northwest NY Regional Ag Team; *weed management*)
Kirsten Workman (PRO-Dairy Program; *soil fertility/nutrient management*)

Special Appreciation

Special appreciation is extended to Bill Cox, Russell Hahn, Murray McBride, Robert Schindelbeck, and Elson Shields for their contributions to this publication.

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 (November, 2022). Changes in pesticide registrations, regulations, and guidelines occurring after publication are available in county Cornell Cooperative Extension offices or from the Cornell Cooperative Extension Pesticide Safety Education Program (CCE-PSEP) (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: Attendees of the 2022 Small Grains Management Field Day explore plots at Poormon Farms in Seneca Falls, NY.
(Photo by: Jenn Thomas-Murphy)

1 PESTICIDE INFORMATION 1
1.1 Pesticide Classification and Certification 1
1.2 Use Pesticides Properly 1
1.2.1 Plan Ahead 1
1.2.2 Move Pesticides Safely 1
1.2.3 Personal Protective Equipment and Engineering Controls 1
1.2.4 Avoid Drift, Runoff, and Spills 1
1.2.5 Avoid Equipment Accidents 2
1.2.6 Pesticide Storage 2
1.3 Pollinator Protection 2
1.4 New York State Pesticide Use Restrictions 2
1.4.1 Restricted-Use Pesticides 2
1.4.2 Additional Use Restrictions 3
1.5 Verifying Pesticide Registration 3
1.6 Check Label for Site and Pest 3
1.7 Pesticide Recordkeeping/Reporting 3
1.7.1 New York State Reporting Requirements 3
1.7.2 New York State Recordkeeping Requirements 4
1.7.3 Federal Private Applicator Recordkeeping Requirements 4
1.8 EPA Worker Protection Standard (WPS) for Agricultural Pesticides 4
1.9 Reduced-risk Pesticides, Minimum-risk Pesticides, and Biopesticides 4
1.9.1 Reduced-risk Pesticides 4
1.9.2 Minimum-risk Pesticides 4
1.9.3 Biopesticides 5
1.10 FIFRA 2(ee) Recommendations 5

2 GENERAL INFORMATION FOR CROP PRODUCTION 6
2.1 Introduction 6
2.2 New York State Climate 6
2.2.1 Growing Degree Days for Corn and Soybeans 6
2.3 Soil Surveys 7
2.4 Soils and Soil Management Groups of New York State 9
2.4.1 Soil Management Group I 9
2.4.2 Soil Management Group II 10
2.4.3 Soil Management Group III 11
2.4.4 Soil Management Group IV 12
2.4.5 Soil Management Group V 12
2.4.6 Other Areas 12
2.5 Soil Health 13
2.5.1 The Cornell Soil Health Test 14
2.6 Runoff and Soil Erosion 16
2.6.1 Tillage Erosion 17
2.6.2 Solving Erosion Problems 17
2.6.3 Wind Erosion 18
2.7 Soil Compaction 18
2.7.1 Effects of Soil Compaction on Crops 19
2.7.2 Diagnosing Plow Layer and Subsoil Compaction 20
2.7.3 Addressing Soil Compaction Problems 21
2.8 Tillage 23
2.8.1 Full-Width Primary Tillage Systems 23
2.8.2 Secondary Tillage 24
2.8.3 Restricted-Tillage Systems 24
2.8.4 Deep Tillage 25
2.8.5 Frost Tillage 25
2.8.6 Selecting a Tillage System 26
2.9 Nutrients and the Environment 29
2.9.1 Nitrate Leaching Index (NLI) 29
2.9.2 NY Phosphorus Index 2.0 30

2 GENERAL INFORMATION FOR CROP PRODUCTION *(continued)*

2.9 Nutrients and the Environment *(continued)*
2.9.3 Groundwater Protection Guidelines....31
2.9.4 Manure Spreading Guidelines During Adverse Weather Conditions....31
2.10 Soil Testing....34
2.10.1 Why Test Soil?....34
2.10.2 What is a Soil Testing Program?....35
2.10.3 How Does a Soil Test Work?....35
2.10.4 How to Collect and Submit a Soil Sample....35
2.10.5 How Often Should Samples be Taken?....36
2.10.6 Variable Rate Management....36
2.10.7 Interpretation of Soil Test Results....37
2.10.8 Return of Guidelines....37
2.11 Fertilizers....38
2.11.1 Using the Fertilizer Tables....38
2.11.2 Fertilizer Materials....39
2.11.3 Fertilizer Injury....39
2.11.4 Secondary Macronutrients and Micronutrients....40
2.12 Lime Guidelines....41
2.12.1 Lime Rate Table....41
2.12.2 Lime Applications....42
2.12.3 Liming for No-Tillage Production....42
2.12.4 Points to Remember When Using Lime Guidelines Without Buffer pH Data....43
2.12.5 Calcium and Magnesium Content of Limestones....44
2.13 Land Application of Sewage Sludges....44
2.13.1 Application Rates....46
2.13.2 Nutrients....46
2.13.3 Metals....46
2.13.4 Synthetic Organic Chemicals....47
2.13.5 Pathogens....48
2.13.6 Sludge Guidelines....48
2.14 Integrated Pest Management for Field Crops....49
2.14.1 Identification....50
2.14.2 Sampling....50
2.14.3 Analysis....50
2.14.4 Management Alternatives....50
2.14.5 Implementation....51
2.14.6 Evaluation....51
2.15 Integrated Management of Field Crop Diseases....51
2.16 Managing Insects and Diseases with Seed Treatments....51

3 CORN GUIDELINES....56

3.1 Planting Techniques....56
3.2 Hybrid Selection....57
3.2.1 Corn Silage Hybrids....57
3.2.2 Corn Grain Hybrids....60
3.3 Fertilizers for Corn....62
3.3.1 Band Rates....62
3.3.2 Efficient Nitrogen Use....62
3.3.3 Nitrogen Status of the Corn Crop....65
3.3.4 Adaptive Management Process....66
3.4 Managing Field Corn Pest Problems in New York....67
3.5 Managing Diseases of Corn....68
3.5.1 Seed Treatment Fungicides....68
3.5.2 Selection of Disease-Resistant Varieties....69
3.5.3 Sound Crop Management....69
3.5.4 Foliar and Soil at-planting Fungicide Application....69

3 CORN GUIDELINES *(continued)*

3.6 Managing Insects, Slugs, and Nematodes in Corn 72
3.6.1 European Corn Borer 72
3.6.2 Northern and Western Corn Rootworms 73
3.6.3 Seed Corn Maggot 75
3.6.4 Cutworms 75
3.6.5 Armyworms 76
3.6.6 Wireworms and White Grubs 76
3.6.7 Potato Stem Borer and Hopvine Borer 76
3.6.8 Western Bean Cutworm 76
3.6.9 Slugs 77
3.6.10 Nematodes 77
3.7 Managing Weeds in Corn 78
3.7.1 Weed Management Methods 78
3.7.2 Factors Affecting Soil-Applied Herbicides 79
3.7.3 Herbicide Resistance Management 79
3.7.4 Weed Control in Zone/No-Tillage Corn 80
3.7.5 Prepackaged Herbicide Mixtures 80
3.7.6 Atrazine Application Rates 80

4 FORAGE CROPS GUIDELINES 90

4.1 Forage Varieties 90
4.1.1 Alfalfa 90
4.1.2 Birdsfoot Trefoil 90
4.1.3 Red Clover 91
4.1.4 Alsike Clover 91
4.1.5 Crownvetch 91
4.1.6 Results from Forage Trials Harvested in 2021 (Trials Sown in 2018, 2019, and 2020) 91
4.2 Perennial Grasses 95
4.2.1 Reed Canarygrass 96
4.2.2 Timothy 96
4.2.3 Smooth Bromegrass 96
4.2.4 Orchardgrass 96
4.2.5 Ryegrasses 96
4.2.6 Meadow Fescue 96
4.2.7 Tall Fescue 97
4.2.8 Festulolium 97
4.2.9 Perennial Forage Variety Selection 97
4.3 Annual Crops for Forage 102
4.3.1 Sudangrass and Forage Sorghums 102
4.3.2 BMR Sorghum-Sudangrass Hybrids 102
4.3.3 Anti-Quality Components 103
4.3.4 Millets 103
4.3.5 Oats and Spring Triticales 103
4.3.6 Winter Wheat, Barley, Rye, and Triticales 103
4.4 Planting Perennial Legumes and Grasses 104
4.4.1 Seedbed Preparation 104
4.4.2 Date of Seeding 104
4.4.3 Inoculation 104
4.4.4 Fertilizers and Lime for Legume Establishment 104
4.4.5 Companion Crops 104
4.4.6 Species Selection 104
4.5 Harvest Schedules 104
4.5.1 Alfalfa 104
4.5.2 Perennial Grasses 105

4 FORAGE CROPS GUIDELINES *(continued)*

4.6 Forage Fertilization 105
4.6.1 Alfalfa/grass....105
4.6.2 Winter cereals grown as forage double crop....106
4.6.3 Considerations for Manure Use for Alfalfa-Grass production....106
4.7 Forages for Conservation....108
4.8 Managing Alfalfa Pest Problems in New York....109
4.9 Managing Diseases of Perennial Forage Legumes....111
4.9.1 Vascular Wilts....111
4.9.2 Root, Crown, and Stem Rots....111
4.9.3 Leaf and Stem Blights....112
4.9.4 Seed Fungicides....112
4.9.5 Selection of Disease-Resistant Varieties....112
4.9.6 Sound Stand Management....112
4.10 Managing Insects in Forage Crops....113
4.10.1 Alfalfa Weevil....113
4.10.2 Potato Leafhopper....114
4.10.3 Alfalfa Snout Beetle....115
4.11 Weed Control in Forages....117
4.11.1 Herbicide Resistance Management....117
4.12 Minimum-Tillage Forage Seedings....121
4.12.1 Vegetation Control....121
4.12.2 Seeding Methods....121
4.12.3 Insect Control....121
4.13 Perennial Forages for Pasture....121
4.13.1 Ladino White Clover (*Trifolium repens* L.)....122
4.13.2 Kentucky Bluegrass (*Poa pratensis* L.)....122
4.13.3 Tall Fescue (*Festuca arundinacea* Schreb)....122
4.13.4 Use of Pastures....122
4.13.5 Grass-Legume Mixtures....122
4.14 Weed Control in Grass Pastures....123
4.14.1 Herbicide Resistance Management....123

5 SMALL GRAIN CROPS GUIDELINES....125

5.1 Planting Techniques....125
5.1.1 Winter Grains....125
5.1.2 Spring Grains....125
5.2 Variety Selection....125
5.2.1 Winter Wheat....125
5.2.2 Hybrid Winter Rye....126
5.2.3 Spring Oat....126
5.2.4 Winter Malting Barley....126
5.2.5 Spring Malting Barley....127
5.2.6 Triticale....127
5.2.7 Spelt....127
5.2.8 Buckwheat....127
5.2.9 Other Grain-Type Crops....127
5.3 Why We Recommend Certified Seed....131
5.4 Growth Stages in Small Grains....132
5.4.1 Winter Wheat....132
5.4.2 Spring Grains....132
5.5 Fertilizers for Small Grains....132
5.5.1 Lodging Control in Wheat or Barley....134
5.6 Managing Winter Wheat Pest Problems in New York....134
5.7 Managing Diseases of Small Grain Cereals....136
5.7.1 Selection of Disease-Resistant or Disease-Tolerant Varieties....137
5.7.2 Seed Treatment....137
5.7.3 Foliar Fungicides....137

5 SMALL GRAIN CROPS GUIDELINES *(continued)*

5.7 Managing Diseases of Small Grain Cereals *(continued)*
5.7.4 Guidelines for Wheat Fungicide Decisions 137
5.7.5 Sound Agronomic Practices 138
5.8 Managing Insects in Small Grains 142
5.8.1 Armyworms 142
5.8.2 Cereal Leaf Beetle 142
5.8.3 Hessian Fly 142
5.8.4 Stored Grain Insect Management 143
5.9 Weed Control in Small Grains 145
5.9.1 Herbicide Resistance Management 145

6 SOYBEAN GUIDELINES 148

6.1 Soybean Maturity Group Selection 148
6.2 Soybean Planting 148
6.3 Managing the Crop 149
6.4 Managing Soybean Pest Problems in New York 150
6.5 Managing Diseases of Soybeans 152
6.5.1 Fungicidal Seed Treatment 152
6.5.2 Foliar Fungicides 152
6.5.3 Soybean Rust 153
6.5.4 Soybean Cyst Nematode 153
6.6 Managing Insects in Soybeans 156
6.6.1 Seed Corn Maggot 156
6.6.2 Soybean Aphid 157
6.6.3 Two-spotted Spider Mites 157
6.7 Weed Control in Soybeans 158
6.7.1 Herbicide Resistance Management 158

7 TOTAL VEGETATION CONTROL 165

7.1 Total Vegetation Control 165

8 APPENDIX 166

8.1 Trade and Common Names of Field Crop Pesticides 166
8.2 Herbicide Site of Action Groups and Site of Action Information. 171

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 (www.dec.ny.gov/about/558.html), the Pesticide Applicator Training Manuals (www.cornellstore.com/books/cornell-cooperative-ext-pmep-manuals), or the Cornell Cooperative Extension 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, 607-255-2177. For further information on any topic in this booklet, you may contact your local Cornell Cooperative Extension office or write to the Section of Soil and Crop Sciences Extension Office, 237 Emerson Hall, Cornell University, Ithaca, NY 14853.

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.

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 2.12.1. Minimum and desired pH for common field crops in New York State.

Crops	Cornell Crop Codes	Desired pH	Minimum pH
Alfalfa, Alfalfa/grass, Alfalfa/trefoil	ABE, ABT, AGE, AGT, ALE, ALT	7.0	6.7
Soybeans	SOY	7.0	6.7
Birdsfoot trefoil	BCE, BCT, BGE, BGT, BSE, BST, BTE, BTT	6.5	6.4
Barley	BSP, BSS	6.5	6.4
Wheat	WHT	6.5	6.4
Triticale	TRP	6.5	6.4
Sunflower	SUN	6.5	6.4
Buckwheat	BUK	6.2	6.0
Clover	CGE, CGT, CLE, CLT, CSE, CST	6.2	6.0
Corn	COS, COG	6.2	6.0
Crownvetch	CVE, CVT	6.2	6.0
Grass	GIE, GIT, GRE, GRT	6.2	6.0
Pasture	PGE, PGT, PIE, PIT, PLE, PLT, PNE, PNT	6.2	6.0
Rye	RYC, RYS	6.2	6.0
Millet	MIL	6.2	6.0
Oats	OAS, OAT	6.2	6.0
Sorghum, sorghum sudangrass	SOF, FOG, SSH, SUD	6.2	6.0
Wheat with legume	WHS	6.2	6.0

Table 2.12.2. Lime recommendations 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

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

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.

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.

Table 2.16.1 Commonly Available Seed Treatments *(continued)*

Type key: I = insecticide; F = fungicide; N = nematicide; P = plant growth regulator
Crop key: A = alfalfa; C = corn; S = soybean; SG = small grains; W = wheat

Type	Active Ingredient(s)	Product Name	Crop(s)
I	mefenoxam, fludioxonil, sedaxane, Pasteuria nishizawae-Pn1, thiamethoxam	Clariva Elite Beans[2]	S
I	difenoconazole, mefenoxam, sedaxane, thiabendazole, thiamethoxam	Seed Shield MAX Cereals[2]	SG
I	azoxystrobin, fludioxonil, mefenoxam, sedaxane, thiamethoxam	Seed Shield MAX Beans[2]	S
I	fludioxonil, mefenoxam, sedaxane, thiabendazole, thiamethoxam	Equity VIP[2]	S
	abamectin, azoxystrobin, fludioxonil, mefenoxam, thiabendazole, thiamethoxam	*Avicta Complete Corn 250	C
P	difenoconazole, mefenoxam, sedaxane, thiamethoxam, cytokinin, gibberellic acid, indole butyric acid	Warden Cereals 360[2]	SG

This table was modified by NYS IPM from the "What's on Your Seed?" table prepared by D. Smith and R. Proost at University of Wisconsin-Madison, to reflect only products available in New York State. See the full table at ipcm.wisc.edu/download/pubsPM/Whats_on_your_seed_web.pdf.

[1] Product must be used to treat seed outside of New York State.

[2] Effective January 1, 2023, this product will be classified as a restricted-use pesticide in New York State.

* Restricted-use pesticide.

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

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).

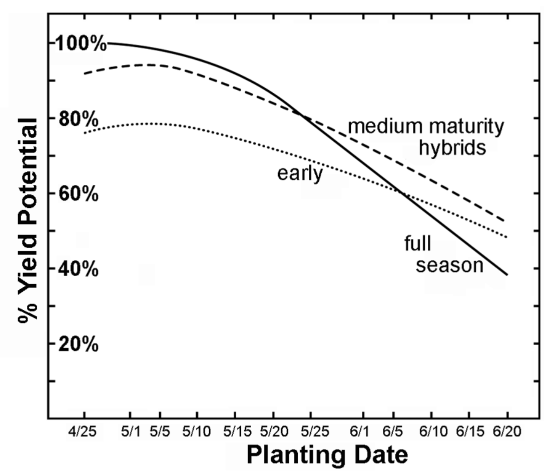


Figure 3.1.1. Effect of planting date on grain yields.

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 3.2.4. Corn silage hybrids, 103-110 days relative maturity. *(continued)*

			2021		All Years		
Company/Brand	Hybrid	Days to Relative Maturity	Comparative Crop Yield, ton/acre at 35% DM[1]	Comparative Milk Yield, lb/day[1]	Comparative Crop Yield, ton/acre at 35% DM[1]	Comparative Milk Yield, lb/day[1]	No. Environments[2]
Dekalb	DKC58-64RIB	108	1.01	0.93			2
Dekalb	DKC59-07RIB	109	1.00	0.88	1.03	0.97	7

[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 test at two sites in 2021, while hybrids tested in more than two environments were evaluated at each location over multiple years from 2016 to 2021.

3.2.2 Corn Grain Hybrids

Tables 3.2.5 and 3.2.6 summarize the performance of corn hybrids included in recent Cornell grain trials. We have designed this information to help you choose corn hybrids for your farm. You also should consider your own experience, along with that of your neighbors. Your corn seed salesperson and your Cornell Cooperative Extension office also can supply helpful information.

Please note the following points when using the grain hybrid tables. Hybrids are listed in order of maturity, from early to late, and placed in two tables, one each for medium early-season and long-season areas.

Growing degree days are measurements of heat accumulation for corn growth. These are explained further in Section 2.2.1: Growing Degree Days for Corn and Soybeans. Check Figure 2.2.1 to note the approximate number of growing degree days in your area. Choose hybrids that can mature in the degree days available on your farm. Avoid hybrids that require more growing degree days than your average. These are risky and may not mature in a cool season or an early fall. In addition, their higher moisture levels will require more energy and thus greater cost for drying. Subtract 100 to 200 growing degree days for hybrids to be grown in frost pockets or other areas subject to early frost. Do the same in selecting hybrids for late planting or early harvest.

Compare hybrids only with others in the same table. Comparisons of ratings between tables can be misleading because they are not tested under the same conditions. Earlier hybrids are tested at short-season locations, and later hybrids at sites with a moderate to long growing season. High-yielding hybrids in the short-season group are likely to do poorly in long-season areas and vice versa.

All ratings included in these tests are based on at least three tests with three replications each, or a minimum of nine comparisons for each hybrid against other hybrids in the same table. Test sites are widespread in New York and represent a broad range of environments. The number of tests in which each hybrid appeared is noted in the tables.

The more tests, the more precise the hybrid ratings. The same is true for the number of years a hybrid has been tested. A number of hybrids are rated with only one year in tests; such ratings are less valuable than those covering two or more years. In developing these tables, we included only those hybrids that performed at or above 85 percent of the test average

The tables report how these hybrids performed in our trials. They may or may not perform the same on your farm. For further help in selecting hybrids specifically suited to your needs, check with your Cornell Cooperative Extension office and with seed company representatives.

Table 3.2.5. Medium early-season hybrids for grain (1800–2400 growing degree days1, 80–100 days relative maturity).

Hybrids in order of maturity							
Brand or Source	Hybrid	Transgenic Traits[2]	Moisture Diff. from Mean (%)[3]	Comparative Yield[4]	Percent Stalk Lodging[5]	Years in Tests	No. Tests
Seed Consultants	SC851AM	RR, LL, CB*, Lep*	85	-1.5	1	2	5
Seed Consultants	SC931Q	RR, LL, CB, RW*, Lep*	99	-1.2	0	2	5
Dyna-Gro Seed 0110	D36VC66	RR, CB, Lep*	103	-.7	0	1	3
Local Seed Company	LC9108 VT2PRIB	RR, CB, Lep*	107	-.4	0	1	3

through kernel blister stage (R2) to control foliar fungal diseases, in particular gray leaf spot, northern leaf blight, and tar spot, on the upper leaves during grain filling may be warranted. The primary fungicides being applied in New York are products that combine fungicides with different modes of action. The cost of product plus application is currently in the range of $35 to $50 per acre. There are no firm disease thresholds to guide fungicide application at this time, though foliar fungicide application is generally indicated in situations where fungal diseases have developed in a majority of plants at or just below the ear leaf by the time of tassel emergence (VT). The risk of foliar diseases (and therefore the potential benefit of fungicide) is increased in susceptible hybrids, in continuous corn under reduced tillage, where there is a previous history of disease, and in humid environments with persistent morning dew. Since economic return on foliar fungicide investment is still poorly understood and inconsistent, growers who apply fungicide are urged to leave non-sprayed strips in their fields for comparison of yield and disease severity. Two triazole (Group 3) products, †Xyway LFR and †Xyway 3D, are labeled for application to soil at the time of planting for systemic control of foliar diseases. Table 3.5.1 lists labeled fungicides based on their relative efficacy in controlling foliar diseases that occur in New York. Follow label directions carefully for all fungicide applications. Indiscriminate application of fungicides to all corn acres would likely hasten the development of pathogen strains that are resistant to these fungicides and is therefore discouraged.

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)**								
QoI Strobilurins Group 11	**azoxystrobin 22.9%**	**Quadris Flowable 2.08 SC Multiple Generics**	**6.0-15.5**	VG	E	VG	E	G	VG	NL	7 days
	pyraclostrobin 23.6%	**Headline 2.09 SC[3]**	**6.0-12.0**	VG	E	E	E	VG	VG	NL	7 days
	picoxystrobin 22.5%	***†Aproach 2.08 SC[3]**	**3.0-12.0**	VG	VG-E	VG	F-VG	VG	G	NL in NYS	7 days
DMI Triazoles Group 3	**flutriafol 20.9%**	**†Xyway LFR 1.92 SC**	**7.6-15.2**	NL	U	NL	G	VG	NL	NL	N/A
	flutriafol 26.4%	**†Xyway 3D 2.5 SC**	**5.8-11.8**	NL	U	NL	G	VG	NL	NL	N/A
	propiconazole 41.8%	**Tilt 3.6 EC Multiple Generics**	**2.0-4.0**	NL	VG	E	G	G	F	NL	30 days
DMI Triazoles Group 3	**prothioconazole 41.0%**	**Proline 480 SC[5]**	**5.7**	U	VG	E	U	VG	G	NL	14 days
	tetraconazole 20.5%	**Domark 230 ME**	**4.0-6.0**	U	U	U	E	VG	G	NL in NYS	R3 (milk)
Mixed modes of action	**azoxystrobin 13.5% propiconazole 11.7%**	**Quilt Xcel 2.2 SE Aframe Plus 2.2 SE**	**10.5-14.0**	VG	VG-E	VG-E	E	VG	VG	NL	30 days
	benzovindiflupyr 2.9% azoxystrobin 10.5% propiconazole 11.9%	**Trivapro 2.21 SE[4]**	**13.7**	U	U	U	E	VG	E	G-VG	30 days
	cyproconazole 7.71% picoxystrobin 17.94%	***†Aproach Prima 2.34 SC[3]**	**3.4-6.8**	U	U	U	E	VG	G	NL in NYS	30 days

Table 3.6.1 Summary of insecticides available for corn insect control, including seed treatments. *(continued)*

Active Ingredient (Example Product(s))	True Army-worm	Black Cut-worm	Corn Root-worm Adults	Corn Root-worm Larvae	Seed Corn Maggot	Two Spotted Spider Mites	Western Bean Cut-worm	White Grubs	Wire-worm	Comments
Seed Treatments										
clothianidin (Poncho, 0.25 mg ai per seed)	X				X		X	X	X	Poncho not registered in New York State. Can be used if applied to seed outside New York State. Little impact on corn rootworm at this low rate
thiamethoxam (†Cruiser, 0.25 mg ai per seed)					X			X	X	Little impact on corn rootworm at this low rate

* Restricted-use pesticide
† Not for sale or use in Nassau or Suffolk Counties

3.7 Managing Weeds in Corn

Weed identification is the key to an effective corn weed management program. Incorrect identification of problem weeds can mean the difference between profit and loss. Although a weed's life cycle, including its method(s) of reproduction, is the most important identifying characteristic, it is sometimes necessary to know the exact species before selecting weed management measures.

Corn growers should make a weed inventory to aid in the selection of weed control programs. By tailoring programs to fit the weeds in each field, growers can minimize weed control costs while maximizing yields and profits. An inventory can be made by scouting each field two or three times during the year and recording the types (such as broadleaf annuals or annual grasses) of weeds present.

The first observation should be made by the time corn is 4 to 6 inches tall. These early-season observations reveal how effective preplant or preemergence herbicides, if used, have been and suggest the possible need for cultivation or for postemergence herbicide applications. A second look at the fields in midsummer (before the corn is waist high) can provide information on the overall effectiveness of weed control practices and provide clues on how the program might be adjusted in future years. This is a good time to record the types and numbers of weeds present and to map the location of special problem areas in the field. Additional notes on weed types and numbers can be taken at harvest to complete the weed inventory.

3.7.1 Weed Management Methods

Although herbicides can provide effective weed management, corn growers should not depend on herbicides alone. Growers should use good cultural practices so the corn is competitive with weeds and should integrate chemical control programs with cultivation, especially with difficult-to-control weeds or when weather conditions reduce herbicide effectiveness.

The first step in cultural weed control is the selection of a corn hybrid that is adapted to local growing conditions. Timely planting along with proper fitting in tilled situations or proper adjustment of no-tillage planters ensures rapid germination and a competitive advantage for the corn. Another cultural practice that favors rapid establishment of corn is proper band application of fertilizer at planting.

All primary (plowing) and secondary (fitting) tillage operations help provide a weed-free seedbed. Cultivation of row crops is an effective way to control annual weeds between corn rows. Band application of herbicides over the row at planting, combined with one or two cultivations, provides good control of annual weeds such as common lambsquarters and foxtails. Although rotary hoes effectively destroy weed seedlings in small corn, a row cultivator adjusted to minimize pruning of corn roots should be used after corn is 5 or 6 inches tall. Creeping perennials such as common milkweed and quackgrass are not adequately controlled by one or two cultivations. These weeds regrow from rhizomes (underground stems) following cultivation and are controlled with tillage only if the operations are repeated over long periods. Biennial (wild carrot, etc.) and simple perennial (dandelion, etc.) weeds do not persist in fields that are plowed but can be a problem in reduced and zone/no-tillage fields.

A variety of herbicides are available for preplant, preemergence, and/or postemergence weed control in corn. These herbicides vary in their effectiveness in controlling different weeds (Table 3.7.1) and in the length of time they remain active in the soil. Some corn herbicides, such as atrazine and *†Princep/simazine, can carry over to affect triazine-sensitive rotational crops such as small-seeded forage legumes, small grains, and soybeans. Knowledge of the weeds present, herbicide effectiveness, and rotational plans should be considered when selecting herbicides.

Cost of chemical weed control dictates that herbicides be applied when they will provide maximum return. Label

Table 3.7.3. Chemical weed control in corn.

Weed Situation	Amount of Product(s) per Acre	Remarks and Limitations
***Conventional corn hybrids** (continued)*		
PRE Programs Annual grass and broadleaf weeds *(continued)*	3.0-3.5 qt. *†Lexar EZ	**GROUP 5, 15, AND 27 HERBICIDES• Apply preemergence** or early postemergence before corn reaches 12 in. in height. Use 3 qt./A if soil organic matter is less than 3% and 3.5 qt./A if soil organic matter is 3% or greater. *†Lexar EZ provides twice as much *Atrazine/A as *†Lumax EZ (see Table 3.7.6 for the amount of *Atrazine at labeled rates of each product). This additional *Atrazine should improve common ragweed control. Good choice if triazine-resistant lambsquarters, smooth pigweed or tall waterhemp are problems. *†Lexar EZ is **not** for use in Nassau and Suffolk Counties.
	2.25-3.0 qt. *†Resicore XL + 1 qt. *†Atrazine 4L[1]	**GROUP 4, 5, 15 and 27 HERBICIDES• Apply preemergence** or early postemergence to corn up to 12 inches tall. Use rates are based on soil texture and organic matter content. Good choice if triazine-resistant lambsquarters, smooth pigweed or tall waterhemp are problems. *†Resicore is **not** for use in Nassau and Suffolk Counties. See label for special groundwater protection requirements.
	3 pt. Prowl H2O **or** 3.6 pt. Prowl 3.3 EC + 1 qt. *†Atrazine 4L[1]	**GROUP 3 and 5 HERBICIDES•** Apply preemergence. Prowl should not be applied preplant incorporated for corn. Plant corn at least 1 1/2 in. deep in fields with adequate seedbed preparation to provide good coverage of the corn seed. Good choice if velvetleaf or triazine-resistant lambsquarters are problems. The addition of 2 to 3 oz. *†Sharpen will provide additional residual control of annual broadleaf weeds, including common ragweed. *†Sharpen rates vary depending on soil texture. *†Sharpen must be applied prior to corn emergence. *†Sharpen is **not** for use in Nassau and Suffolk Counties.
POST Programs Emerged annual grass and broadleaf weeds	1.5 oz. Steadfast Q + 4 fl. oz. Banvel **or** 4 fl. oz. Clarity **or** 4 fl. oz. DiFlexx	**GROUP 2 and 4 HERBICIDES•** Apply early postemergence with crop oil concentrate **or** nonionic surfactant **and** ammonium nitrogen fertilizer to hybrids with a relative maturity (RM) rating of 77 days or more. For best results, apply when annual weeds are 1-2 in. tall and before corn is 12 in. tall. A good choice if foxtails or fall panicum and annual broadleaf weeds have emerged. Not very effective against crabgrass. Rotational interval is 10 months or longer (depending on soil pH) for alfalfa, clovers, and several other crops. Do **not** apply Steadfast Q if corn was treated with Counter 15G (any application method).
	0.75 fl. oz. Impact/Armezon + 1 pt *†Atrazine 4L	**GROUP 27 and 5 HERBICIDES•** Apply early postemergence with methylated seed oil (MSO) or crop oil concentrate **and** ammonium nitrogen fertilizer when annual weeds are 1 - 2 in. tall. Not very effective against fall panicum. May be tank mixed with half rates of preemergence herbicides shown above under **PRE Programs** for added residual weed control. Use COC if tank mixing with Prowl rather than MSO. Rotation interval following Impact application is 3 months for small grains and 9 months for alfalfa, peas, potatoes, and soybeans.
	3 fl. oz. Laudis + 1 pt *†Atrazine 4L	**GROUP 27 and 5 HERBICIDES•** Apply early postemergence with methylated seed oil (MSO) **and** ammonium nitrogen fertilizer when annual weeds are 1 - 3 in. tall. Will not provide acceptable control of fall panicum. May be tank mixed with half rates of preemergence herbicides shown above under **PRE Programs,** except Prowl combinations, for added residual weed control. Rotation interval following Laudis application is 4 months for small grains, 8 months for soybeans, and 10 months for alfalfa, potatoes, and snap beans.

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 4.1.3 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 4.1.1 Yields of Alfalfa Varieties in New York State in 2021 *(continued)*

Ithaca, Tompkins County Sown August 2020 Varieties	**2021 Total**	**2021 % of Cks.**
	- tons per acre -	
SW3407	5.28	127
SW5520Y	5.19	125
SW5509	5.18	125
SW4506	5.18	125
HVS4220Q	5.02	121
SW4513	4.98	120
SW4412Y	4.92	119
SW4107	4.84	117
54VR10	4.81	116
MAGNUM 8-WET	4.78	115
ALFABAR	4.66	113
REGEN	4.54	110
ONEIDA VR	4.28	103
VERNAL	3.99	96
Mean	4.78	*Ck. Mean*
5% LSD	0.40	*4.14 T/A*

Summary statistics are for 20 trial entries

Table 4.1.2. 2021 Yields of alfalfa varieties with resistance to potato leafhoppers in trials planted in 2018 (Third Prod. Yr), 2019 (Second Prod. Yr), and 2020 (First Prod. Yr) in Central New York (CNY – Ithaca).
Company contact information in Table 4.2.3.

Alfalfa Leafhopper Resistant	**Company**	**Fall Dormancy**	**Yield: Production Year in CNY**		
			Third	**Second**	**First**
			tons per acre dry matter/year		
SCEPTER	GROWMARK FS	4		4.99	
BLUEJAY 4HR	Blue River Organic Seed	3		4.66	
431RRLH	GROWMARK FS/Seedway	4		4.68	
55H96	Pioneer Hi-Bred	5			4.90
SCIMITAR	GROWMARK FS	4	4.29		
SW 315LH	Seedway	3	4.21	4.84	
BLUEBIRD	Blue River Organic Seed	5			4.42
FSG 421LH	Seedway	4	4.91		
# Trial Entries			*11*	*13*	*13*
Conventional Alfalfa (Avg. of 2 to 3 varieties)			*4.59*	*4.41*	*4.13*
Trial Mean (T/A/Yr)			*4.51*	*4.49*	*4.36*
5% LSD			*0.46*	*0.40*	*0.36*

Fall Dormancy ratings indicate forage production in the fall with 1 being the least growth to 5 being the most growth (FD scale goes from 1 to 11, but trial entries with FD > 5 are not in the NY Trials.

Table 4.2.2. 2021 Yields of perennial forage grasses in trials planted in 2018 (third production year), 2019 (second production year), and 2020 (first production year) in New York State. T/A/Yr = average tons per acre dry matter per year. *Company contact information in Table 4.2.3.*

Heading date is date when 5 heads in a 3.5 x 16 foot plot were visible. Ammonium sulfate was applied at 315 lb/acre after each harvest.

LSD(0.05) = to claim statistically significant yield differences between two cultivars, the difference must be equal to or greater than the LSD.
SOILS - 2018: Erie channery silt loam; 2019 Rhinebeck silt loam; 2020 Niagara silt loam.

		2021			2020		2019		
Species/Cultivar	**Marketer**	**Total Season**	**% Stand 21-Nov**	**Heading Date**	**Total Season**	**Heading Date**	**Total Season**	**Heading Date**	**2 or 3 Yr Yield**
		T/A			T/A		T/A		T/A
Annual Grasses		**Sown May 20, 2021**							
AMP	Columbia/Peak Pl.Gen	2.22							
SATSUKIBARE EX	Burlingham Seeds	2.14							
DYNAPLUS	Columbia/Peak Pl.Gen	1.91							
AWESOME	BrettYoung	1.83							
KAIR 12DT	Burlingham Seeds	1.83							
KAIR 12TE	Burlingham Seeds	1.80							
KAIR DS	Burlingham Seeds	1.73							
DENVER	BrettYoung	1.49							
FEAST II	Check	1.46							
	LSD(.05)	0.35							

Table 4.2.3. Companies and contact information

Company	Phone Number	Web Address
Albert Lea Seeds	800-352-5247	www.alseed.com
Alfalfa Partners	720-506-9191	www.alfalfapartners.com
Alforex	877-560-5181	www.alforexseeds.com
Allied Seed, L.L.C.	208-250-6321	www.alliedseed.com
AMPAC Seed Co.	541-928-1651	www.ampacseed.com
Barenbrug USA	800-547-4101	www.barusa.com
Blue River Organic Seed	800-370-7979	www.blueriverorgseed.com
BrettYoung	800-665-5015	www.brettyoung.ca
Burlingham Seeds L.L.C.	800-221-7333	www.burlinghamseeds.com
Chemgro	800-346-4769	www.chemgro.com
Columbia Seeds	888-681-7333	www.columbiaseeds.com
CROPLAN	651-765-5710	www.croplan.com
Dairyland Seed Co.	800-236-0163	www.dairylandseed.com
Dekalb	800-335-2676	www.monsanto.com
DLF USA Inc.	541-369-1813	www.dlforganic.com
Grassland Oregon	503-566-9900	www.grasslandoregon.com
Farm Business Network	844-200-3276	www.fbn.com
GROWMARK FS	800-787-2767	www.growmarkfs.com/midatlantic
Healthy Herd Genetics	315-280-0038	
Interlake Forage Seeds	800-990-1390	www.interlakeforageseeds.com
King's AgriSeeds	717-687-6224	www.kinsagriseeds.com
LaCrosse Seed	800-328-1909	www.lacrosseseed.com
Legacy Seeds	866-791-6390	www.legacyseeds.com
Mountain View Seeds	503-588-7333	www.mtviewseeds.com
Mycogen Seeds	800-MYCOGEN	www.mycogen.com
Nexgrow	800-568-5424	www.plantnexgrow.com
OreGro	541-258-1001	www.oregroseeds.com

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.

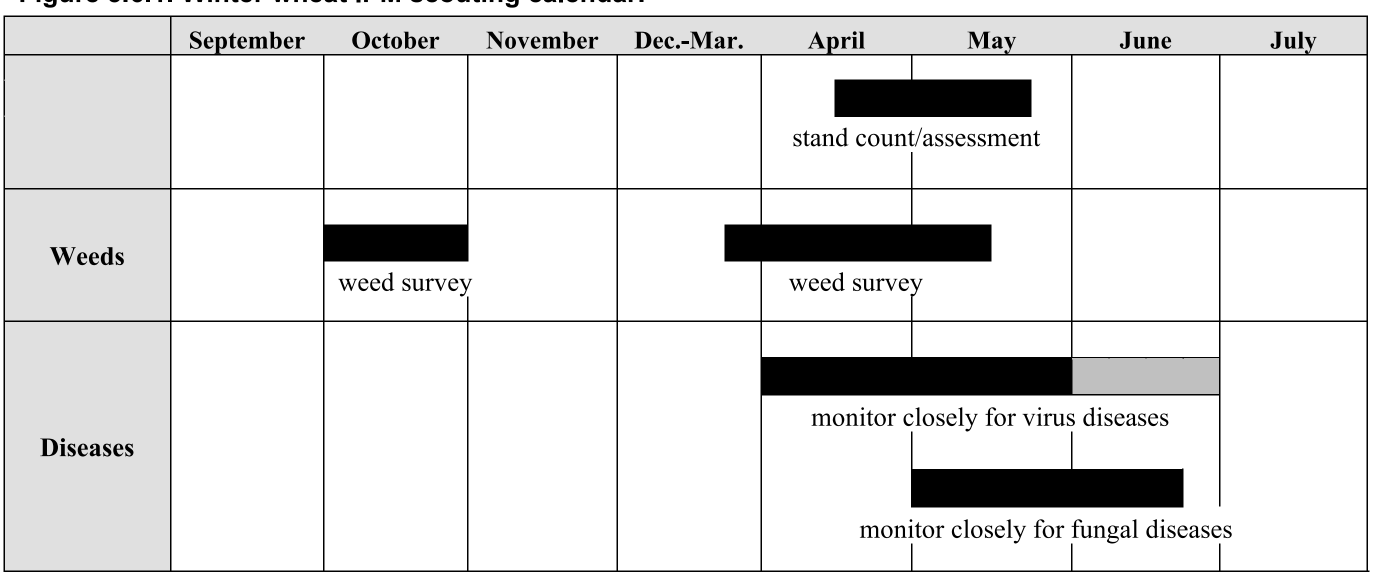
For the most current information on field crop pest activity during the growing season see the NYS IPM Weekly Field Crop Pest Report: (blogs.cornell.edu/ipmwpr/).

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

Figure 5.6.1. Winter wheat IPM scouting calendar.



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.

expanding to the east and north. Tall waterhemp is in the pigweed family and in addition to glyphosate, has been found to be resistant to ALS (Group 2) and triazine (Group 5) herbicides. Resistant tall waterhemp biotypes have been reported in 12 counties in New York (as of February 2020).

Herbicide resistance management involves the use of crop rotation and cultivation along with herbicide rotation and/or 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 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 (Mallory-Smith, C.A. and Retzinger, E.J. 2003. Revised classification of herbicides by site of action for weed resistance management strategies. Weed Technol. 17:605-619). 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	Velvetleaf
Preplant or Preemergence					
*†Dual II Magnum, *†EverpreX, *†Warrant, *†Outlook	Poor	Poor	Good	Poor	None
*Engenia[3]/*XtenidMax[3]	Excel	Good	Good	Good	Good
FirstRate[2]	Good	Good[2]	Good	Good	Good
Lorox/Linex	Good	–	Good	Good	Fair
Metribuzin[1]	Good[1]	Good	Good	Good[1]	Fair
*†Pursuit	Good	–	Good	Fair	Good
Prowl/Prowl H2O	Good	–	Good	–	Fair
†Python[2]	Good	Good[2]	Good	Poor	Good
Valor SX	Good	Good	Good	Good	Fair
Postemergence					
Basagran 5L	Fair	–	Poor	Fair	Good
Classic[2]	Poor	Fair[2]	Good	Fair	Fair
Cobra	Poor	–	Good	Good	Good
*Engenia[3]/*XtenidMax[3]	Excel	Good	Good	Good	Good
FirstRate[2]	Poor	Fair[2]	Poor	Excel	Good
Enlist One[4]	Excel	Good	Good	Good	Good
Harmony SG[2]	Good	–	Good	Poor	Poor
*†Pursuit	Poor	–	Good	Fair	Good
*Reflex/Flexstar	Poor	–	Good	Good	Poor
Resource	Poor	–	Poor	Fair	Excel

Annual Grass Weeds

Herbicides	Barnyardgrass	Crabgrass	Foxtails	Fall Panicum	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	–

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
Acropolis	60063-82	thiophanate-methyl + tetraconazole
Affiance 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
Caramba 0.75 SL	7969-246	metconazole
Delaro	264-1055	prothioconazole +trifloxystrobin
Domark 230 ME	80289-7	tetraconazole
Endura 0.7 DF	7969-197	boscalid
*†Evito 480 SC	66330-64	fuoxystrobin
Fitness	34704-1031	propiconazole
*†Fortix	66330-409	flutriafol + fluoxastrobin
Headline AMP	7969-291	pyraclostrobin + metconazole
Headline EC	7969-186	pyroclostrobin
Headline SC	7969-289	pyraclostrobin
*Miravis Ace	100-1645	propiconazole + pydiflumetofen
*Miravis Neo	100-1605	pydiflumetofen + azoxystrobin + propiconazole
*Miravis Top	100-1602	pydiflumetofen + difenoconazole
*†Nexicor	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	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	100-1313	azoxystrobin + difenconazole
Quilt Xcel	100-1324	azoxystrobin + propiconazole
*†Revytek	7969-406	mefentrifluconazole + pyraclostrobin + fluxapyroxad
Sphaerex	7969-473	metconazole + prothioconazole
Stratego YLD	264-1093	trifloxystrobin + prothioconazole
Tilt 3.6E	100-617	propiconazole
†Topguard	279-3557	flutriafol
†Topguard EQ	279-3596	flutriafol + azoxystrobin
*Trivapro	100-1613	benzovindiflupyr + azoxystrobin + propiconazole
TwinLine 1.75 EC	7969-247	pyraclostrobin + metconazole
*†Veltyma	7969-409	mefentrifluconazole + pyraclostrobin
†Xyway LFR 1.92 SC	279-9658	flutriafol
†Xyway 3D 2.5 SC	279-9638	flutriafol
*†Zolera FX	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.