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A Comprehensive Guide to Cover Crop Species Used in the Northeast United States

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The following sections include 22 species that are used throughout the Northeast as cover crops. After each section and at the end of this review, the sources of information used are listed. Each reference will provide a more in depth description for the values given. This is a guide, based on literature from books, journal articles, and web sites, and will differ based on location and annual climatic differences.

Annual Ryegrass or Italian Ryegrass *(Lolium multiflorum)*

~annual, cool season, winter or spring annual (bunchgrass)

Planting Dates:	**Source**
mid-summer-early fall (@ least 40d before frost)	11
Mar 15- May 1 or July 20- Sept 15	3, 42, 76
Seeding Rates (lbs/A):	
20-30 bc; 10-20 dr; 8-15 mix	3, 11
12-15 mix; 20-25	42
(depends on use)	
Seeding Depth (in):	
.25-.5	3,11
Flowering Dates:	
June-Aug	71
Root System:	
shallow, dense fibrous	3, 91, 71
Winter-Kill Temp:	
will over winter	3, 71
Competition with weeds	
excellent	11, 3, 71
Total Dry Matter Biomass (lbs/A)	
2600 (OSU Extension)	90
3300-4000 (seeded early spring or late summer in ME)	20
1840 (Nov planted, seeded in March)	71
4000-8000 (multi-cut system, over full season with high moisture and fertility)	11
1300-2000 (fall seeded)	91
Root Biomass (lbs/A):	
778 (Nov planted, harvest in March	71

Percent N (%):	**Source**
2.1-2.4	90, 71
ave 1.5 (fall seeded)	91
1.37	71
C:N Ratio:	
20:1-31:1	49,71
lbs/bu:	
24-26	
seeds/lb:	
217000-230000	71,77, 42, 49
Re-seeding Characteristics:	
very high, if not killed	11, 3, 71
Mix with:	
legumes, grasses	11
Soils:	
wide range, best in loam	3
5-8 pH	71
Shade Tolerance:	
intolerant	71
N (lbs/A): (high N user)	
43 (takeup) (if survives winter, CA Study from UCSARP)	11,71
62 (recycled)	90
~60 by mid-May following corn in MD study	11

Additional Comments:

~good for erosion control, improving aggregate stability

~can tolerate some flooding

~uses of a lot of water and N

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Austrian Winter Pea *(Pisum sativum)*

~summer annual legume (north)

Planting Dates:	**Source**
early spring as early as possible	11, 20
Mar-Apr or Sept-Oct	2
Aug or spring	66
Seeding Rates (lbs/A):	
60-90 dr	91
30-40; 20-30 mix	2, 77
140	3
100-220	20
Seeding Depth (in):	
.25-2	2, 51, 71
Inoculants:	
Rhizobium leguminosarum biovar viceae	77
Flowering Dates:	
32-55 d after seeding	71
Canopy Cover:	
26-36" fall	11
Root System:	
Shallow fibrous	66, 71
Winter-Kill Temp:	
will winter kill, but generally winter hardy (10 F)	11,71
sustained below 18 F	11
Will not overwinter N of MD	66
Competition with weeds:	
high	11
Total Dry Matter Biomass (lbs/A)	
4000 (aboveground, in North East)	41, 67
5100-6200 (ME seeded early spring))	20, 90
5000 (planted in spring) (North East)	11, 41
3000 (NY)	30

Root Biomass (lbs/A):	**Source**
350-1000	88
Percent N:	
2.6	90
3-4	71
N (lbs/A) (producing):	
170-190 (PA)	66
90-150 (depending on incorporation)	11
119 (Southern Tier NY)	30
ave 99	26
50-150 (PA)	51
C:N Ratio:	
9:1-11:1	26
17:1	90
lbs/bu:	
60	2
seeds/lb:	
18000	76
Re-seeding Characteristics:	
does not re-seed well	32
Mix with:	
cereals, brassicas, and other legumes	66, 71
Soils:	
4.2-8.3 pH	71
well limed, well drained clay or heavy	
Shade Tolerance:	
Semi-tolerant	11
Cost ($/lb)	
.60-1.20	11

Additional Comments:

~decomposes fast (low C:N ratio)

~reduces soil erosion, and supplies N to soil

~intolerant to salinity, drought, or water-logged soils

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Barley *(Hordeum vulgare)*

~spring, cool season annual, cereal grass

Planting Dates:	Source
Apr-May or Aug-Oct	2, 64
spring or summer	33, 43
spring	11, 20, 42
Sept 10-Sept 30	51
Seeding Rates (lbs/A):	
80-120 or 60-90 mix (bc)	2, 20
50-100 dr; 80-125 bc; 25-50 mix (spring)	11
50-125	43
72-96	42
90-120	64
Seeding Depth (in):	
.75-2	2, 43, 51, 11
Flowering Dates:	
mid-late summer	71
Root System:	
fibrous	11
Winter-Kill Temp:	
17.6 F	71
Competition with weeds:	
excellent	43, 71
Total Dry Matter Biomass (lbs/A):	
4500 (aboveground, killed end of Apr)	51
2570 (cut May 9 PA, seeded in fall)	92
3000-10000 (aboveground, grown until full bloom, SE US)	43
ave 8800 (spring seeded in ME)	20

Percent N:	Source
3.5 (PA Rodale)	92
1.2	71
N (lbs/A):	
38 (PA, Rodale)	92
45-50 (killed end of Apr)	51
62 (top N) (seeded fall; killed in May)	26, 29
C:N Ratio:	
20:1	71
medium	78
lbs/bu:	
48	2, 51
seeds/lb:	
13500-14000	2, 42, 51
Re-seeding Characteristics:	
does not re-seed well	71
Mix with:	
annual legumes, other small grains	11
Soils:	
5-8.5 pH	78
light soils	11
Shade Tolerance:	
intolerant	78
Cost $/lb:	
.17-.37	11

Additional Comments:

~drought tolerant, high salt tolerance; quick growing, reduces soil erosion

~does not tolerate wet soils, low fertile soils, good salinity tolerance

~scavenger of excess nutrients and adds OM

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Brown Mustard *(Brassica juncea)*

~annual cool season forb

Planting Dates:	**Source**
Apr-May 15 (summer cover crop)	48
mid July-Aug (after cash crop)	3
mid May-June	11
spring (less in MI) or summer-fall (better)	33, 11
Seeding Rates (lbs/A):	
10-12 dr; 10-15 bc	71
5-12 dr; 10-15bc	3, 11
6-8	48, 33
Seeding Depth (in):	
.5-1.5	3, 48
Flowering Dates:	
Mid to late May	3
4-6 wks after planting	3, 71
Root System:	
taproot	59, 71
Winter-Kill Temp:	
17-25 F	11, 71, 78
Competition with weeds:	
allelopathic; very high	3, 30, 71
Total Dry Matter Biomass (lbs/A):	
8500 (Salinas Valley, CA)	11
Root Biomass (lbs/A):	
700 lbs/A (East Lansing MI)	61

	Source
N content (lbs/A):	
328 on high residual N veg ground	11
C:N Ratio:	
15:1; low	71, 78
lbs/bu:	
18	78
seeds/lb:	
200000-230000	48,78
Re-seeding Characteristics:	
high, do not let go to seed	3
Mix with:	
cereals, vetch	71
Soils:	
loam to heavy soils	59
pH 5.5-7.5	11
Shade Tolerance:	
intolerant	78
Cost /lb ($):	
1.50-3.00	11
66/A	11

Additional Comments:

~do NOT use in rotations with other Brassicas

~good for weed suppression, nematode and soil fungal control, breaking up compacted soils, organic matter

~flowers will attract honey bees

~breaks down fast

~cannot tolerate flooding

~do not over-seed, too much will infect leaves with diseases

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Rapeseed or Canola *(Brassica napus)*

~annual spring forb (winter-types are Brassica rapa)

~canola is rapeseed that has been bred to have low conc. of glucosinates and erucic acid in the seed

Planting Dates:	**Source**
6 wks prior to killing frost	59, 87
Apr 1- May 1 or Aug 1- Sept 1	2, 71, 76
spring around corn time planting	59
Aug	3, 84
Seeding Rates (lbs/A):	
4-12	51
5-10 dr; 8-14 bc	3, 11, 87
5-8 dr; 4-6 mix	2, 72
Seeding Depth (in):	
.25-1	3, 71
Flowering Dates:	
early spring	76
Canopy Cover:	
80% or more	11
Root System:	
deep taproot	11
Winter-Kill Temp:	
low temps ~10 F (winter-type cultivars)	11
In ME will winter kill	
Competition with weeds:	
high (rapeseed)	59, 71
Total Dry Matter Biomass (lbs/A)	
1500-2500 lbs/A (ND)	48
4000-6700 lbs/A (seeded mid-June, harvested Sept)	3, 73
6200-8000 lbs/A 90d after seeding	30, 59
2500-3500 (MD)	84, 87

Root Biomass (lbs/A)	**Source**
4000-7600 (MA; MD)	72, 82
1000 (MD sampled in fall)	94
Percent N:	
low	78
Biomass of N (lbs/A)(accumulate):	
120 lbs/A	11
C:N Ratio:	
20:1-30:1 shoots: 10:1-20:1 roots	11
lbs/bu:	
50	48
seeds/lb:	
140000-157000	48, 49, 76
Re-seeding Characteristics:	
high in proper conditions	59, 76
Mix with:	
small grains	59
Soils:	
pH above 6	87
coarse textured	84
Shade Tolerance:	
intolerant	11
Cost/lb ($)	
1.00-2.00; 80-100 $/A	11, 30

Additional Comments:

~supplies organic matter, weeds suppression, enhances soil properties, captures nitrate, erosion control, use as forage

~does not perform well on poorly drained soils

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Turnips *(Brassica rapa)*

~annual, biennial cool season forb

Planting Dates:	Source
Aug-fall	3
spring-fall	87
~4wks prior to ave date of first 28 F	11
Seeding Rates (lbs/A):	
4-7 dr; 10-12 bc	3, 11
1.5-2	87
2-8 alone; 1-2 mix	
Seeding Depth (in):	
.25-.75	3
Flowering Dates:	
late spring	78
Root System:	
taproot	11
Winter-Kill Temp:	
yes- below 25 F	11
Competition with weeds:	
high	3, 11, 49
Total Dry Matter Biomass (lbs/A):	
4000-6700 lbs/A (seeded mid-June, harvested Sept, WI)	73
6200-8000 in PA	59
Root Biomass (lbs/A):	

C:N Ratio:	Source
20-30 shoots; 10-20 roots	11
lbs/bu:	
55	
seeds/lb:	
140000-220000	49, 77, 78
Re-seeding Characteristics:	
Will re-seed	
Mix with:	
cereals, vetch	11
Soils:	
5-8 pH	78
5.5-8.5	11
Shade Tolerance:	
intolerant	
Cost/lb ($):	
1.00-2.00	11

Additional Comments:

~grows very fast and alleviates soil compaction

~low drought tolerance and a high fertility requirement

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Buckwheat (*Fagopyrum esculentum*)

~annual warm season forb/green manure

Planting Dates:	Source
12 wks prior to 1st frost	51, 48, 59, 71
June 15-Aug 15	33, 43, 64, 73
June	55
June-July	2,3
Seeding Rates (lbs/A):	73
30-50	2,3, 71
50dr; 70 bc	55
36-72	32
60-80	43, 51, 48, 64
50-60 dr; up to 96 bc	11
Seeding Depth (in):	
.5-1	2, 3, 43, 51
1-2	48, 55
Flowering Dates:	
mid summer	78
4-6 wks after seeding	17, 64, 71
Root System:	48
fine, extensive, fibrous, superficial	14, 64, 59, 71
Winter-Kill Temp:	
frost intolerant	71
Competition with weeds:	
it sown well, excellent	71
Canopy Cover:	55
dense	
Total Dry Matter Biomass (lbs/A):	
2000-3000 (NC)	14,17,43
1200-1800 lbs/A (PA, WI)	51, 55
4000-6000 (6-8 weeks after seeding)	11
Root Biomass (lbs/A):	

Percent N:	Source
1.25	17, 71
N (lbs/A):	
43 aboveground (NC)	14
C:N Ratio:	
34:1 (NC)	14
lbs/bu:	
48-52	2
seeds/lb:	
15000-20000	2, 78
Re-seeding Characteristics:	
yes, incorporate after 1 week flowering	14
~mow at 40 days	
Mix with:	
cowpeas, sesbina	71
Soils:	
most, poor on heavy limestone	51
avoid wet soils	
Shade Tolerance:	
intolerant	71
Cost ($/A):	
30	14
30-32	11
11.00-12.50/bu	66

Additional Comments:

~use as smother crop, bee pasture, weed suppression, nutrient scavenging
~absorbs Ca, P

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Camelina sativa

~annual, summer oilseed crop or winter annual in warmer climates

Planting Dates:	**Source**
spring when soil temp is at least 38-40 F	87
Can be frost seeded in late Nov-Dec	96
Seeding Rates (lbs/A):	
3-5	87
Seeding Depth (in):	
.25-.50	
Flowering Dates:	
42-45 days from planting	96
Root System:	
Tap root	
Winter-Kill Temp:	
12	87
Competition with weeds	
good	87
Total Dry Matter Biomass (lbs/A):	
1800-2000 lbs of seed/A (sowed mid-march-april, harvested sept)	87
1000-1100 at 45 degrees N latitiude	96

Percent N:	**Source**
2.42-2.73 (shoots)	Xue Pan, Nova Scotia University
C:N Ratio:	
High; due to its high cellulose content	
lbs/bu:	
50	
Institute of Agricultural and Trade Policy (http://www.iatp.org/iatp/publications.cfm?accountID=258&refID=97279)	
seeds/lb:	
225000-550000	87
Re-seeding Characteristics:	
Will produce viable seeds	96
Mix with:	
Legumes, spring wheat	87
Soils:	
Marginal lands	96
Shade Tolerance:	
Low-medium	
Cost:	
$4.00/ lb	Ernst
$45-$65/A (reference directly below0	
Institute of Agricultural and Trade Policy (http://www.iatp.org/iatp/publications.cfm?accountID=258&refID=97279)	

Additional Comments:

~tolerates drought stress
~Germinates and emerges in early spring before cereal grains.

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Cereal Rye *(Secale cereale)*

~winter annual cereal grain (mainly for NE cv. 'Aroostook")

Planting Dates:	**Source**
Aug 1- Sept 30	75
late summer-fall	74
Late Aug-early Oct	64
2wks before kill frost/ 4wks after	18
Seeding Rates (lbs/A):	
90-120 (winter rye)	42
100-140; 50-60 mix	64
60-120 dr; 90-120 broadcast	3, 11
60-200	59
112-168	18
Seeding Depth (in):	
.75-2	55
Flowering Dates:	
early spring (Apr-May)	71, 78
Root System:	
extensive, fibrous	11, 71
Winter-Kill Temp:	
will over winter	11
Competition with weeds:	
high	11, 71
Total Dry Matter Biomass (lbs/A):	
2800-4000 (in ME seeded late summer/fall)	11, 90, 20, 79
6000-7000 (planted Sept, harvested mid-May WI)	29, 73
4000 lbs/A aboveground	18
1600 lbs/A top	51
Root Biomass (lbs/A):	
848 lbs/A 5 months after seeding	71
600 lbs/A	18, 89

Percent N:	**Source**
.89-1	90, 71
N (lbs/A):	
40-45 lbs/A N uptake	26
171 lbs/A of N in roots	71
313 lbs of N/A in tissue	71
80 accumulated(by May 19 plowdown in NY)	74
C:N Ratio:	
40:1 monoculture	71
25:1 biculture	71
40:1 @ boot; 14:1 young	51
48:1-50:1	14, 90
35:1	74
lbs/bu:	
56	
seeds/lb:	
15000-18000	42, 48, 55 ,77 ,78
Re-seeding Characteristics:	
high if let go to seed	71
Mix with:	
legumes, other grasses, vetches, brassica	11, 71
Soils:	
4.5-8.2 pH range	71, 78
low fertile	55
light loams, sandy	11
Shade Tolerance:	
intolerant	
Cost/lb ($);	
.18-50	11
6.00-8.0/ bu	66

Additional Comments:

~prevents soil erosion, quick forage for grazing

~excellent scavenger for N and K, adds organic matter, suppresses weeds

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Forage Radish *(Raphanus sativus)*; Oilseed Radish

~Annual cool season Forb

Planting Dates:	**Source**
late summer-fall	3, 43
4-10 wks before killing frost in fall	59
Seeding Rates (lbs/A):	
7-10 dr; 10-13 bc	3,43
Seeding Depth (in):	
.25-.5	10, 43
Flowering Dates:	
50-60days	
(Lesley Campbell, and Allison Snow OSU)	
Root System:	
Taproot (8-14 inches)	3, 59
Winter-Kill Temp:	
20-25 F (Dec-Jan)	82, 11
Competition with weeds:	
yes; allelopathic	87
Total Dry Matter Biomass (lbs/A):	
3000 lbs/A for late Aug planting	87
3600 lbs/A aboveground	46, 81, 82
3000lbs/A in 60d	10
6500	90
Canopy Cover:	
within 1-4 months closed canopy (depends on growing conditions)	71
Root Biomass (lbs/A):	
3000 (MD, sampled at max growth in fall)	94
as high as 3700 (belowground)	11

Percent N:	**Source**
2.67	36
2.11	90
N (lbs/A):	
140(in MI and in MD)-200 lbs/A of N released in early spring	11, 71, 94
170 (in MD)	
184 N recycling	90
C:N Ratio:	
13:1	36, 71
19.5	90
lbs/bu:	
50	48
seeds/lb:	
140000	48, 77
Re-seeding Characteristics:	11
Will re-seed in warmer climates	
Mix with:	
other brassicas, mustards, small grains or crimson clover	11
Soils:	
well drained, pH 5.5-8.5	10
Shade Tolerance:	
intolerant	
Cost/lb ($):	
1.5-2.50	11
Cultivars:	
Groundhog Forage Radish	

Additional Comments:

~quick forage for grazing, high N,P, S, Ca, B content

~significant amounts of N may be lost if next crop not planted in time to recapture N

~not recommended for planting in either corn or soybeans

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Hairy Vetch *(Vicia villosa)*

~winter annual legume

Planting Dates:	Source
Aug 1-Sept	2, 3, 38, 51, 64, 66, 71, 75, 77, 87
sow by Oct 15	71
@ least 30-40d before killing frost	59
Inoculants:	
Type "C" Nitragen	71
Seeding Rates (lbs/A):	
25-40 dr	2
15-20 dr; 25-30 bc	3, 11
20-40 dr	66
Seeding Depth (in):	
.25-1.5	2, 51, 71, 77,87
Flowering Dates:	
May-July	59, 71, 78
mid July-Aug	
Root System:	
taproot	71
Winter-Kill Temp:	
will survive winter if planted 30-40d before frost	66
Competition with weeds	
high, once established	2
Total Dry Matter Biomass (lbs/A):	
2000-5000	8, 29, 90
4000 aboveground (PA, drilled at end of Sept)	66
4300-7000 lbs/A	71
3000-4000 lbs/A (normal, fall seeded in ME)	20, 30, 51, 59, 67

Percent N:	Source
2.5-4	90, 71, 87
3.76	8
N (lbs/A): (most occurs in May)	3
80-160 lbs/A provide	51
averaging 110 lbs N/A contribution (planted by mid-Sept, N available by mid-May)	11, 59, 67
ave 110-115 (N content)	26, 30, 60
140-150	38
71-85 (NC Coastal Plain)	80
C:N Ratio:	
10:1-15:1	26
8:1-15:1	11
11:1	71
lbs/bu:	
60	2, 51
seeds/lb	
16000-20000	2, 51, 77, 78
Re-seeding Characteristics:	
high, has fraction of hard seed	3, 59, 71
10-20% hard seed	66
Mix with:	
cereal grains, grass, brassicas	11
Soils:	
6-7 pH	11, 71
does not perform well on poorly drained soils	61
does best on sandy loam soils	59, 71
Shade Tolerance:	
tolerant	11
Cost/lb ($)	
1.70-2.50	11
~1.00	66

Additional Comments:

~supplies N to soil, improves soil tilth, erosion control, suppresses weeds

~most useful in veg crop production when sown in late summer

~High P and K requirement

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Japanese Millet *(Echinochloa esculenta)*

~summer annual grass

Planting Dates:	**Source**
after frost	43
June 15-July 15 (in MN and WI)	55
April- July	2,91, 48
Seeding Rates (lbs/A):	
15-30 dr; 25-35 bc; 8-12 mix	2
20-30 best	14, 20, 43, 71
10-15	48, 55, 91
Seeding Depth (in):	
.5-1	2, 43, 55, 71
Flowering Dates:	
Ripe grain after 45 days from seeding	
End of June-Sept (www.ext.msstate.edu/pubs/pub2111.htm)	
Root System:	
Extensive Fibrous	20
Winter-Kill Temp:	
yes	43
Competition with weeds	
high	43, 71
88-91% weed suppression 6wks after seeding	64
Total Dry Matter Biomass (lbs/A):	
3000 (NC)-5000 lbs/A	14, 73
high yields	55

	Source
Biomass of N (lbs/A):	
35 lbs/A aboveground (NC)	14
C:N Ratio:	
42:1 (NC)	14
lbs/bu:	
35	2
50	14
seeds/lb:	
143000	2
Re-seeding Characteristics:	
Medium to high	
Mix with:	
Over seed into spring crop	20
Soils:	
Med-heavy soils	
5.8 or greater pH	
Shade Tolerance:	
Cost ($/A):	
14.50	14

Additional Comments:

~drought tolerant

~late season green forage

~Exceptional wildlife plant

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Oats *(Avena sativa)*

~annual cool season grass

Planting Dates:	**Source**
Mar 15-Apr 25	52, 75, 87
Aug-early Sept	64, 71, 73
early spring-July 1	43
no later than Sept 15	18
Spring (green manure) or fall (winter cover)	3
Seeding Rates (lbs/A):	
80-110 dr; 110-140 bc	3, 87
64-120; or 60-90 mix	2
60-96	42, 48, 51, 73, 75
Seeding Depth (in):	
.5-2	2, 43, 51, 77, 87
Flowering Dates:	
late spring	71, 78
Root System:	
fibrous	
Winter-Kill Temp:	
18 F	71, 87
Competition with weeds	
strong when in a mix; allelopathic	71
Total Dry Matter Biomass (lbs/A)	
2500 lbs/A	18, 46
8000-12000 lbs/A	17, 71
2000-8000 (up to 8000 in spring seeded)	11, 43
5000-6000 (planted mid-Apr, harvested late June, WI)	73
5000 (harvested between boot and dough in VT)	
Root Biomass (lbs/A):	
977 lbs/A	18

Percent N:	**Source**
1.2-1.5	17, 71
Cover:	
80% if planted as early as possible	11
N (lbs/A):	
12 lbs/A catch	71
77 (absorb in 8-10 weeks in NE)	11
C:N Ratio:	
33:1	71
lbs/bu:	
32	2, 48, 87
seeds/lb:	
15500-19400	2, 42, 48, 87
Re-seeding Characteristics:	
low when left over winter	71
Some may survive, incorporate in spring	3
Mix with:	
vetches, brassicas, barley	71
Soils:	
tolerate pH as low as 4.5	71
best on loam-heavy loam	
Shade Tolerance:	
intolerant	
Cost/lb ($):	
.17-37	11
3.85-5.00/bu	66

Additional Comments:

~primary use for veg. crops, nurse crop for legumes

~suppresses weeds, erosion control

~quick cover

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Perennial Ryegrass *(Lolium perenne)*

~cool season perennial grass

Planting Dates:	**Source**
April-late Sept	77, 87
Mar-May or Aug 1- Sept 15	71
Feb-May or Aug-Sept	2, 64
early spring	20, 42
Seeding Rates (lbs/A):	
14-25	66
20-40; 4-15 mix	2, 42
15-20; 4-8 mix	87
18-25; 10-15 mix	71
18-20	64
Seeding Depth (in):	
.25-.5	2, 71, 77, 87
Flowering Dates:	
mid-spring	78
May-Sept	71
Root System:	
extensive fibrous	70
Winter-Kill Temp:	
more cold hardy than annual, but will in extreme temps	59, 64
Competition with weeds:	
yes, best in a mix	71
Total Dry Matter Biomass (lbs/A):	
1750 lbs/A	18
3000-4000 (early summer in ME)	20
Root Biomass (lbs/A):	
1500 lbs/A	18
6000 (Sown in corn and sampled following spr. Before plowing, OH; all parts underground) 42 (N content)	60

Percent N:	**Source**
2.3	71
Biomass of N (lbs/A):	
60 lbs/A in aboveground tissue	71
C:N Ratio:	
14-40 (based on plant growth stage)	
lbs/bu:	
24	2, 42, 55, 78
seeds/lb:	
227000-240000	2, 42, 55, 77, 78
Re-seeding Characteristics:	
High, if not winter killed	64
Mix with:	
clovers, trefoil, other grasses	71
Soils:	
not tolerant of pH above 8	71
best on heavy soils with good drainage	
Shade Tolerance:	
tolerant	
Cost/lb ($);	
.7-1.30	11
.44-1.05	66

Additional Comments:

~good nutrient scavenger, establishes readily, excellent wear tolerance, high nutritive value

~great for erosion control

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Phacelia tanacetifolia

~annual cool season forb

Planting Dates:	Source
late spring- summer	
Seeding Rates (lbs/A):	
11-18 7-12 dr	
Seeding Depth (in):	
.25”	
Flowering Dates: (blue flower)	
6-8 weeks after seeding (late aug-sept)	71
Root System:	
extensive fibrous	71
Winter-Kill Temp:	
18 F	
Competition with weeds	
yes, grows quick	71
Total Dry Matter Biomass (lbs/A):	
ave 4000 lbs/A aboveground	71
8500	85
Root Biomass (lbs/A):	
1300 lbs/A in 6 months	71

Percent N:	Source
4	71
Biomass of N (lbs/A):	
94.6 lbs/A supplied to system	71, 85
178 lbs/A N belowground	71
127 lbs/A N aboveground	71
C:N Ratio:	
10-15	
lbs/bu:	
n/a	
seeds/lb:	
235000	
Re-seeding Characteristics:	
low	
Mix with:	
Soils:	
Wide range	
Shade Tolerance:	
Not shade tolerant	
Cost:	
Not widely available, expensive- American Meadows VT $15.95/lb	

Additional Comments:

~N catch crop, nectar source
~Low water use

One of the top producing honey producing flowers for honeybees and is also highly attractive to bumblebees and syriphid flies.

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Red Clover *(Trifolium pratense)*

~short-lived biennial/perennial legume

Planting Dates:	**Source**
Feb-May or Aug-Sept	2, 42
Feb 1-Apr 15 or Aug 1-Sept 15	3
April-May	51
Seeding Rates (lbs/A):	
8-12; 4-8 mix	2
10-15 bc; 6-15 dr	51
10-12; 6-8 mix	42, 87
12-14; 8-10 mix	73
Seeding Depth (in):	
.25-5	2, 42, 51, 77, 87
Inoculants:	
Rhizobium leguminosarium biovar trifoli	
Flowering Dates:	
May	3, 78
Root System:	
thick, deep taproot	51, 59, 66, 87
Winter-Kill Temp:	
low	87
Competition with weeds:	
Total Dry Matter Biomass (lbs/A):	
2000-2500	29,90, 54, 59, 87
4000-8000 full season over wintered	11
4000-6000 (spring, fall seeded in ME)	20
Root Biomass (lbs/A):	
1000 (averaged at 48 dates, OH)	60
(N content in roots 22/A)	

Percent N:	**Source**
2.61-2.77	90, 71
Biomass of N (lbs/A):	
100-150 lbs/A fix	39
70-120 (In OH, PA, over wintered 75 by May 15, up to 120 by June 22)	3,11, 66
125.1 lbs/A in aboveground; 46.3 lbs/A in roots	71
70-80 seeded and turned under in spring	59
C:N Ratio:	
15:1	90, 71
lbs/bu:	
60	
seeds/lb:	
252000-275000	2, 49, 42,51
Re-seeding Characteristics:	
kill before go to seed, will re-seed	63
Mix with:	
small grains, sweetclover, corn, soybeans, grass	11
Soils:	
loams- clays,	43
6.2-7 pH preference	59
Shade Tolerance:	
very tolerant	43, 66
Cost/lb ($):	
1.40-3.30	11
.90-1.30	66
Distinct types:	
Medium, and Mammoth	11

Additional Comments:

~can cause bloat in livestock

~addition of N to system, weed suppression, erosion control

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Sorghum-Sudangrass *(Sorghum bicolor x S. bicolor var. sudanese)*

~warm season summer annual grass

Planting Dates:	**Source**
late spring-midsummer (May 1-July 1)	2, 3, 43, 48, 64, 55, 73, 75
when soil is at least 70 F	43
Seeding Rates (lbs/A):	
25-30	51
20	2, 55, 73, 75
30-40dr; 40-50 bc	43, 71
Seeding Depth (in):	
.5-1	2, 42
Flowering Dates:	
early summer	78
Aug	71
Root System:	
fibrous	71, 75
Winter-Kill Temp:	
very frost sensitive	42, 71
Competition with weeds:	
very high	48, 71
Total Dry Matter Biomass (lbs/A):	
4000-5000 (planted in early summer ME)	20
6000-10000 (seeded July 1, harvested mid-Aug WI)	73
7000 (NC)	14
13000-18000 (potential in WY, planted May-July 1)	59, 93
Root Biomass (lbs/A):	
1350	21

Percent N:	**Source**
.68-1.5	90 71
Biomass of N (lbs/A):	
185 lbs N/A recycled	90
78 aboveground (NC)	14
C:N Ratio:	
63:1	90
50:1	14, 71
lbs/bu:	
56	55, 87
seeds/lb:	
14000-28000	2, 42, 49, 55, 87
Re-seeding Characteristics:	
Low in the northeast	
Mix with:	
buckwheat, sesbina, sunn hemp, soybeans, cowpeas	59
Soils:	
can tolerate 8-9 pH	71
Or as low as 5 pH	11
Shade Tolerance:	
intolerant	
Cost/lb ($):	
.4-1.00	11
16.20/A	14

Additional Comments:

~great use for SOM; Heat and Drought tolerant

~very high salt tolerance

~if stressed or succumb to frost, can produce prussic acid

~great scavenger for residual N, Suppresses weeds, builds soil tilth, breaks up compacted soils

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Yellow Blossom' Sweetclover *(Melilotus officinalis)*

~cool season biennial legume

Planting Dates:	**Source**
Feb1-May or July 20-Aug 30	2. 33, 56, 71, 77, 49
Seeding Rates (lbs/A):	
20-30	33
6-15; 3-8 in a mix	2
10-15	71
9-20	20, 43, 59
Flowering Dates:	
May-Aug (kill before flowering to max N benefit)	71, 78
Late June- July	64
Root System:	
deep taproot	11, 49, 59, 71
Winter-Kill Temp:	
winter hardy	49, 71
Competition with weeds:	
Grow slowly in first 60d	11
Total Dry Matter Biomass (lbs/A):	
2000-6000	54
up to 3000 in establishment year (NE)	11, 67
7500 lbs/A aboveground 2nd year (ME)	20, 59
Root Biomass (lbs/A):	
2640 (Nov seeding yr. OH) 95 (N content)	60
800 (July, yr following seeding, OH) 13 (N content)	90
Inoculant:	
Sinorhizobium meliloti and Rhizobium leguminosarum biovar trifolii	

Percent N:	**Source**
2	71
N (lbs/A):	
90-170 lbs/A fix ((in OH 125 by May 15 to 155 by June 22)	11, 43
130-150 lbs/A fix (NE)	49, 67
averages ~100	59
C:N Ratio:	
12-23	78
lbs/bu:	
60	2, 48, 55
seeds/lb:	
240000-260000	2, 48, 49, 55, 78
Re-seeding Characteristics:	
high (hard seed)	18, 43
Mix with:	
small grains, red clover	11
Soils:	
6.5-7	59
best loam soils, tolerate heavy clay-light sand	59
Shade Tolerance:	
intolerant	
Cost/lb ($):	
1.00-3.00	11

Additional Comments:

~drought, flood, and salt tolerant

~good cover for wildlife, and can be harmful to livestock (Coumadin)

~good smother crop or catch crop, rapid growth rate

~greatest warm weather biomass producer of any legume

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Triticale *(X Triticosecale)*

~annual cool season cereal crop

Planting Dates:	**Source**
Aug - Oct 15 (winter crop)	20,43,75,87
late Apr- mid May (spring crop)	48,73
Aug 25-Sept 25 (winter crop)	3
Mar-Apr or Aug-Oct	2
Seeding Rates (lbs/A):	
75-100	20, 48
80 dr; increase 30% if bc	3
90-120; 60-90 mix	2
Seeding Depth (in):	
1.25-2	2,3,48
Flowering Dates:	
48 days to heading	55
Root System:	
fibrous	
Winter-Kill Temp:	
Winter hardy	3
Competition with weeds:	
Moderate, not as good as rye	
Total Dry Matter Biomass (lbs/A):	
6000-7000 (planted Sept, harvested early June WI and in WY)	73, 93
4000-8000 flag leaf stage	3,43,56
2000 (late Aug planting)	87
7000 (harvested June 2 in Arlington, WI)	55
4000 (harvested between boot and dough in VT)	16

Biomass of N (lbs/A):	
Kill before stems elongate for best N value	3
66.2	
C:N Ratio:	
20:1	
lbs/bu:	
48-50	2, 48
seeds/lb:	
15000-18000	2, 49,77
Re-seeding Characteristics:	
high	
Mix with:	
Other winter grains	
Soils:	
fertile, well drained	48
Shade Tolerance:	
Not tolerant	

Additional Comments:

~use as a double crop and erosion control on highly erodible lands

~Good at reducing root rot in vegetables

~Advantage over wheat, can be sown earlier for more fall growth

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Wheat *(Triticum aestivum)*

~annual, winter cereal grain

Planting Dates:	Source
mid Sept-Oct 1	3, 42, 43, 51, 64
Aug 15-Spet 15	
Mar-Apr or Aug-Oct	2
Seeding Rates (lbs/A):	
90-120	42, 51
120-160 dr	87
60-120; 60-90 in a mix	2
80-110	64
Seeding Depth (in):	
1-2	2, 43, 51, 87
Flowering Dates:	
Spring (winter wheat)	
Root System:	
fibrous	
Winter-Kill Temp:	
winter hardy	3
Competition with weeds:	
Low, especially annual grasses	
Total Dry Matter Biomass (lbs/A):	
2500-4500 lbs/A	51,64, 87
3800 (harvested between boot and dough in VT)	16
4000-5500 (if planted in Aug, in CO)	11, 59
3000-7000	43
Root Biomass (lbs/A):	
1300	21

Percent N:	Source
1.67	8
N (lbs/A):	
40-45 lbs/A scavenges	26, 51
50 (tops)	29
C:N Ratio:	
20:1	26
Leaf: 15-29; stem: 31-65; root: 24-74; straw: 80-95 (end of season)	
lbs/bu:	
60	2
seeds/lb:	
11000-18000	2, 42, 77
Re-seeding Characteristics:	
later than ryes	18
Mix with:	
annual legumes, ryegrass, small grains	11
Soils:	
well drained, med texture,	
Shade Tolerance:	
tolerant	78
Cost/lb ($);	
.10-.30	11

Additional Comments:

~good in rotation with veg crops

~excellent N scavenger

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White Clover (*Trifolium repens)*

~perennial, cool season legume
~'Ladino' is longer lived than 'Dutch' or 'New Zealand'

Planting Dates:	**Source**
Feb-May or Aug-Oct	2
early spring-late summer	59, 66
spring or Aug 15-Sept 10	3, 42
Feb 1-May 1 or July 20- Aug 20	77
Seeding Rates (lbs/A):	
4-6; 2-4 in a mix	2, 71
6-14	59, 66
5-9 dr; 7-14 bc	3
8-10; 1-2 mix	42
Seeding Depth (in):	
.25-5	2, 77, 87
Innoculant:	
Rhizobium leguminsarum biovar trifoli	
Flowering Dates:	
late spring- summer	78
Root System:	
shallow, taproot	71, 87
Winter-Kill Temp:	
winter hardy	71
Competition with weeds:	
high (once established)	71
Total Dry Matter Biomass (lbs/A):	
600-1400	90, 54
3000-6500	71
Root Biomass (lbs/A):	

Percent N:	**Source**
2-3	90, 71
N (lbs/A):	
116 lbs/A to the system	71
ave 130 lbs/A (plow at bud or early flower stage and in PA)	11, 59, 66
C:N Ratio:	
13:1	90
12:1	71
lbs/bu:	
60	2, 48
seeds/lb:	
711000-860000	2, 42, 48, 49, 77, 78, 87
Re-seeding Characteristics:	
yes under favorable conditions	71, 87
Also has creeping stolons	3
Mix with:	
grasses	71
Soils:	
6-7 pH	59, 87
tolerate wet, loam clay	.3
Shade Tolerance:	
tolerant	3, 11, 71
Cost/lb ($):	
1.10-4.00	11
2.00-3.00	66

Additional Comments:

~stoloniferous
~thrives in moist, shady condition
~causes bloat in horses
~poor summer growth, low yields

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