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Early Season Sampling of Three  
Pests of Oilseed Brassica Crops  
(False Chinch Bug, *Phyllotreta* Flea  
Beetles, *Lygus* spp.) on  
Cultivated and Non-cultivated Plants

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(False Chinch Bug, *Phyllotreta* Flea Beetles,  
*Lygus* spp.) on Cultivated and Non-cultivated Plants

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## Abstract

The three most damaging insect pests of oilseed brassica crops in Colorado are the false chinch bug (FCB), *Nysius raphanus* (Howard) (Hemiptera: Lygaeidae), the crucifer feeding flea beetles (CFB) *Phyllotreta pusilla* Horn and *P. cruciferae* (Goeze) (Coleoptera: Chrysomelidae) and plant bugs of the genus *Lygus* (LB) (Hemiptera: Miridae). These insects also commonly damage a wide range of other crops in Colorado. However, there is little information on their early season biology prior to migration to crops. Therefore, a 3-year (2000-2002) sampling study was conducted in Larimer and Weld counties.

Early in the season, high populations of FCB were observed in association with the winter annual mustard flixweed, *Descurainia sophia* (L.). False chinch bugs were collected on the first sampling date in 2000, 18-April, but were not caught until the 25-April and 8-May sampling in the subsequent two years, suggesting that movement from overwintering sites and active feeding on hosts may begin over a nearly month-long period in mid-spring, depending on the season. High densities of nymphs, as well as adults, were captured subsequent to the first collections, indicating the sampled sites (e.g., alfalfa, flixweed) reflect areas of early season FCB population development. Very large differences in numbers of false chinch bugs were collected - numbers in 2000 were 162X and 42X higher than in 2001 and 2002, respectively. Over the three years of sampling peak FCB numbers occurred over a two-week range - 23-May 2000, 6-Jun 2001, and 27-May 2002. The dramatic decline in FCB captures that occurred shortly following peak capture can largely be attributable to the first cutting of alfalfa that forces early season migration of this species.

Flea beetles were recovered from the first, April samples in all three seasons, indicating very early season movement of overwintered adults. They were subsequently found at each site and sampling date in all years. Greatest numbers were recovered in 2000, with total capture 10X and 1.6X greater than in 2001 and 2002, respectively. Sites dominated by flixweed, both *D. sophia*, and *D. pinnata*, supported large early season *Phyllotreta* spp. populations, indicating winter annual mustards are early season hosts. When flixweed was present in alfalfa, cutting of the crop appeared to trigger migration.

Early season populations of *Lygus* spp. were more consistently associated with alfalfa than with weedy hosts. However, the winter annual mustards were also important early season hosts. Cutting of alfalfa fields precipitated *Lygus* migration, as previously reported.

## Introduction

The three most damaging groups of insect pests of oilseed brassica crops in Colorado are the false chinch bug (FCB), *Nysius raphanus* (Howard) (Hemiptera: Lygaeidae), crucifer feeding flea beetles (CFB) of the genus *Phyllotreta* (Coleoptera: Chrysomelidae) and plant bugs of the genus *Lygus* (LB) (Hemiptera: Miridae).

The false chinch bug is the most serious pest among North America species of *Nysius* (Ashlock 1977, Sweet 2000). False chinch bug has a broad host range (Knowlton 1934, Knowlton and Wood 1943, Barnes 1970, Tappan 1970, Sweet 2000). In addition to canola, FCB has been observed to damage lettuce, potato, quinoa, and radish in Colorado. Plant damage usually results when masses congregate upon plants, which cause wilting (Milliken 1918, Knowlton 1934, Smith 1942, Knowlton and Wood 1943, Leigh 1961, Byers 1973, Young and Teetes 1977).

The western black flea genus *Phyllotreta* contains several important agricultural pest species that mainly attack cruciferous host plants (Chittenden 1909, Chittenden and Marsh 1920, Newton 1928). The western black flea beetle (*P. pusilla* Horn) has long been recognized as the most important pest of seedling stage cruciferous plants grown in Colorado (Chittenden and Marsh 1920, Al-Doghairi 2000). More recently established in Colorado is the crucifer flea beetle, *P. cruciferae* Goeze, a native of Europe. Damage to plants by both species is almost entirely due to adult feeding; larval feeding on roots is considered negligible.

The genus *Lygus* Hahn (Hemiptera: Miridae) contains plant bugs generally referred to as *Lygus* bugs. Several economically important species occur in the United States (Schuh and Slater 1995, Wheeler 2000, Wheeler 2001). In Colorado the most common species are the pale legume bug, *Lygus elisus* Van Duzee, the tarnished plant bug, *Lygus lineolaris* (Palisot de Beauvois), and the western tarnished plant bug, *Lygus hesperus* Knight (Kelton 1975). *Lygus* spp. are generalist plant feeders that are important pests of Colorado fruit crops and occasionally damage potato, alfalfa and many other crops.

All of these insects are highly mobile and annually migrate to crop areas. However, there is little information on the early season biology of these species in Colorado. Much of this takes place in area outside of susceptible crops, including oilseed brassicas. Furthermore, management of these areas, such as mowing/cutting, can greatly influence timing and intensity of migrations. Therefore, a study of populations of key canola pests outside of canola can be useful in understanding factors contributing to damaging outbreaks. A three-year survey was conducted for this study.

## Materials and Methods

Annual surveys were conducted in 2000, 2001, and 2002. Sampling began in spring with active growth of winter annuals and herbaceous perennials (e.g., alfalfa) - 18-April to 2-August in 2000, 18 April to 14 August in 2001 and 18 April to 13 August in 2002. All sampling took place in Larimer County and western Weld County (Table 1). In 2000, the samples were collected from 13 sites with a combination of vegetation including alfalfa fields, weedy sites dominated by flixweed (*Descurainia* spp.), and mixed grasses and weeds along a roadside. At flixweed sites, all were predominantly the introduced European species, *D. sophia* (L.) except one site; the native *D. pinnata* (Walt.) (tansy mustard) was dominant at a location adjacent to a feed lot. Relative amounts of flixweed in alfalfa were categorized as 'some' and 'little': alfalfa fields where flixweed was common throughout the field were described as having 'some flixweed', fields where flixweed was present but uncommon were described as having 'little flixweed'. In 2001, 10 sites were sampled, and the majority of the sites were similar to the 2000 sites. In the final survey year of 2002, all 13 sites took place in alfalfa fields, which mostly supported substantial weed populations, including flixweed.

For these surveys, sampling was done by sweep net. The sweep net is very widely used for collecting different insect species on different types of vegetation. Deficiencies and biases of sweep net sampling have been reviewed by Southwood (1978) and others. However, sweep net sampling has strong advantages of ease of use, the ability to sample different vegetation, and the relatively low cost. It can be particularly useful when comparing relative numbers of insects over time.

All samples were done using a 15-in diameter sweep-net, taking 20 (back-forth) sweep samples per site. Sampling took place between 10:00-16:00 to account for insect movement (Southwood 1978). All samples were conducted by the same individual, utilizing a straight line transect across the sample site. Samples were immediately placed into plastic bags and returned to the lab for evaluation. Counts of false chinch bugs and *Lygus* spp. included nymphs and adults. Adults only of flea beetles were counted, as larval stages occur in soil.

**Table 1.** Sites used in surveys of false chinch bugs, *Phyllotreta* flea beetles, and *Lygus* spp. in 2000-2002.

Site	Location	Predominant Vegetation <sup>1</sup>
<i>2000 Surveys</i>		
ARDEC A	Colorado State Agricultural Research Development and Education Center (ARDEC), Larimer County	Flixweed
ARDEC B	ARDEC	Flixweed
ARDEC C	Immediately southwest of ARDEC along CR 56	Alfalfa with little flixweed
HortFarm	Colorado State Horticulture Research Farm	Alfalfa with little flixweed
CR15 A	Weld County Rd 15, 1.5 miles to East 14	Mixed roadside weeds, predominantly grasses
CR15 B	Weld County Rd 15, 2 miles to East 14	Mixed roadside weeds, predominantly flixweed
CR15 C	Weld County Rd 15, intersection of Hwy 86	Alfalfa field with some flixweed
H257 A	Southeast corner, Hwy 257 and 14-intersection	Alfalfa field with some flixweed
H257 B	Weld County Hwy 257, 2 miles south of Hwy 14	Flixweed
Severance A	Two blocks NW of downtown Severance center	Abandoned garden overrun with flixweed
Severance B	Adjacent to above Severance site	Alfalfa field with some flixweed
EI25	One half mile east of I25, on right of Strauss Cabin Rd.	Alfalfa field with some flixweed
CORF	Cargill Oilseed Research Center, Ft. Collins	Alfalfa field with some flixweed
<i>2001 Surveys</i>		
ARDEC A	ARDEC, Larimer County	Alfalfa, with little flixweed
ARDEC B	ARDEC	Alfalfa, with some flixweed
HortFarm	Colorado State Horticulture Research Farm	Alfalfa with little flixweed
CR15	Weld County Rd 15, intersection of Hwy 86	Alfalfa field with some flixweed
H257 A	Weld County Hwy 257, 2 miles south of Hwy 14	Flixweed
H257 B	Weld County Hwy 257 intersection at CR 80	Alfalfa field with little flixweed
Severance A	Two blocks NW of downtown	Abandoned garden overrun

Severance B	Severance center Adjacent to above Severance site	with flixweed Alfalfa field with some flixweed
EI25	One half mile east of I25, on right of Strauss Cabin Rd.	Alfalfa field with some flixweed
CORF	Cargill Oilseed Research Center, Ft. Collins	Alfalfa field with some flixweed

*2002 Surveys*

ARDEC A	Southwest of ARDEC at intersection of Larimer County Rd 56 and Frontage Rd	Alfalfa field with little flixweed
ARDEC B	Immediately west of ARDEC A	Alfalfa field with some flixweed
HortFarm	Colorado State Horticulture Research Farm	Alfalfa field with little flixweed
N. Bud	Larimer County Rd 54, north of Budweiser Plant	Alfalfa field with little flixweed
Mtn Vista	Corner of Mountain Vista Rd and Timberline Rd	Alfalfa field with little flixweed
CR15	Weld County Rd 15, intersection of Hwy 86	Alfalfa field with some flixweed
H257	Weld County Hwy 257 intersection at CR 80	Alfalfa field with little flixweed
Severance	Two blocks NW of downtown Severance center	Alfalfa field with some flixweed
EI25	One half mile east of I25, on right of Strauss Cabin Rd.	Alfalfa field with some flixweed
CORF	Cargill Oilseed Research Center, Ft. Collins	Alfalfa field with some flixweed
BayFarm A	Colorado State University Bay Farm	Alfalfa field
BayFarm B	Colorado State University Bay Farm	Alfalfa field
CSFS Nurs	Colorado State Forest Service Nursery	Alfalfa field

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<sup>1</sup> Flixweed at all other sites was predominantly the introduced European species, *Descurainia sophia* (L.) Webb. ex Prantl.

## Results and Discussion

**False Chinch Bug.** High numbers of FCB were collected on 18-April, the first sampling date in 2000 (Table 2), but were not caught until the 25-April 2001 and 8-May 2002 (Tables 3, 4). This suggests that movement from overwintering sites and active feeding on hosts may begin over a month-long period in mid-spring, depending on the season.

Large numbers of nymphs, as well as adults, were captured during these surveys. This indicates that the sampled sites (e.g., alfalfa, flixweed) reflect areas of early season FCB population development.

Substantial differences in numbers of FCB were collected during the three years. Much higher populations were present in 2000 than in the following two seasons (Tables 2-4). Total numbers of FCB caught during 2000 were 162X and 42X higher in than in 2001 and 2002, respectively. In part, higher FCB captures during 2000 may be related to the excellent growing conditions for winter annual mustards, notably flixweed. Also, more sites with flixweed present were sampled during 2000.

Peak FCB numbers occurred over a two-week range - 23-May 2000, 6-Jun 2001, and 27-May 2002. Dramatic declines in FCB captures occurred shortly following peak capture in 2001 and 2002, and populations declined gradually in 2000. This decrease can largely be attributable to the first cutting of alfalfa. The first cutting of alfalfa occurred 23 May 2000 at ARDEC C; the remaining alfalfa fields were first cut in June (H257 A, June 7; HortFarm, June 14; Severance B, June 14; I25, June 14; W. Cargill, June 14; CR15 C, June 21). The first cutting of alfalfa occurred between the first week and third week of June in 2001 and the second week of June in 2002.

Alfalfa cutting apparently induces migration from fields earlier than would occur in its absence. For example, in 2000, high FCB populations were sustained through late June in the predominantly flixweed sites of ARDEC A, ARDEC B, CR15 B and Severance A (Table 2). Subsequent reductions in FCB numbers in early July reflect drying of these weeds.

Although alfalfa fields do appear to serve as a major source of FCB early in the season, this may be explained by winter annual mustards associated with the crop. During the high FCB population year of 2000, alfalfa fields with little flixweed (ARDEC C, HortFarm) produced far fewer FCB in weekly captures than did alfalfa fields where this weed was more abundant. Also, FCB numbers captured in alfalfa fields declined sharply after late June when flixweed had largely matured and was no longer a suitable host.

Leigh (1961) similarly reported that FCB populations built up on several spring mustards (*Sisymbrium irio* L., *Capsella bursa-pastoris* (L.) Medik., *Lepidium nitidum* Nutt.) prior to migration into cotton fields. The importance of *S. irio* was also noted by Barnes (1970) as the major source of FCB prior to migration into vineyards. In northern Colorado *Descurainia sophia* and, to lesser extent, *D. pinnata* appear to be very important in early season populations of *N. raphanus*.

However, there are some weekly changes in FCB capture that are more difficult to explain. For example, between May-18 and May-27 2002 captures at ARDEC and HortFarm went from 0 to several thousand in one week, whereas ARDEC B showed a reverse of this pattern. This may be due in part to sampling biases inherent in use of the sweep net (Southwood 1978). Also, Capinera (2002) commented that the highly aggregated distribution of FCB requires systematic inspection when doing field survey. Extreme aggregation was visually observed in the course of these samplings, particularly in fields that were predominantly flixweed (e.g., ARDEC A, B in 2000).

Weather conditions can also be a factor in FCB population changes assessed by sweep net sampling. For example, FCB can be hard to find following heavy rainfall (Howard 1872), which was observed in these studies. However, heavy rainfall did not have persistent effect on FCB capture. During sampling, heavy rainfall events occurred at the ARDEC site on 17-May 2000 (0.91 in), on 5-May, and 17-May 2001 (0.94, and 0.33 in), and on 23-May 2002 (1.01 in). There were no consistent trends of lower FCB capture in sample sites at the ARDEC site following these rainfall events.

***Phyllotreta* Flea Beetles.** Western black flea beetle was recovered from the first, April samples in all three seasons (Tables 5-7). This is consistent with the early season movement of adults reported by Chittenden and Marsh (1920).

*Phyllotreta* flea beetles were found at all sampling sites throughout the season for 2000-2002. Greatest numbers were recovered in 2000 with total capture 10X and 1.6X greater than in 2001 and 2002, respectively. Unlike FCB, there were multiple population peaks observed in 2000 (30 May through 29 June) and 2001 (18 April and 29 May). Peak numbers were recovered in mid-May in 2002. Western black flea beetle is reported to have up to three generations per year in Colorado (Chittenden 1909, Chittenden and Marsh 1920). The data collected from these studies showed sustained adult activity that would be consistent with such a life cycle.

Sites dominated by flixweed, both *D. sophia*, and *D. pinnata*, supported large early season *Phyllotreta* spp. populations, suggesting that this winter annual mustard can be an important host plant for this canola pest species, as well as for FCB. Where flixweed occurred in alfalfa, the cutting of the crop appeared to trigger migration, as with FCB. Chittenden and Marsh (1920) reported on winter annual weeds as early season hosts for WBFB.

***Lygus* species.** *Lygus* spp. was found in every year during the first mid-April surveys (Tables 8-10). This reflects movement of this species from winter shelter by early spring (Kelton 1975). Unlike FCB and *Phyllotreta* flea beetles, densities of *Lygus* spp. did not differ greatly between seasons. The greatest numbers were recovered in 2000 with total capture 2X and 2.9X greater than in 2001 and 2002, respectively.

*Lygus* spp. were found more consistently throughout the season and did not show the sharp decline in populations that occurred each year with FCB and flea beetles after early July. Two peaks were noted in 2001 and 2002, about one month apart, but only a single peak in 2000. 9). This may be because most survey sites including alfalfa, a favored food source of many *Lygus* spp. (Sevacherian and Stern 1974, 1975).

However, flixweed sites, even in the absence of alfalfa were also important in early season populations. For example, in 2000 (ARDEC A, ARDEC B, CR15 C, H257 B, Severance A) and 2001 (H257 A, Severance A) sites with flixweed alone had high *Lygus* populations (Tables 8, 9). *Lygus* collections were a mixture three - pale legume bug, *Lygus elisus* Van Duzee, tarnished plant bug, *Lygus lineolaris* (Palisot de Beauvois), and western tarnished plant bug, *Lygus hesperus* Knight.

Sharp declines in *Lygus* captures occurred after alfalfa cutting. This suggests that alfalfa harvest contributes to *Lygus* migration. Stern et al. (1964) and Stewart and Layton (2000) reported that manipulations of alfalfa through strip harvest can prevent migration of *Lygus* to adjacent crops.

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**Table 2.** Weekly samples of false chinch bugs, *Nysius raphanus* , on different crops at Larimer County in Colorado in 2000.

Site	False Chinch Bugs/20 Sweeps															
	4/18	4/25	5/2	5/9	5/16	5/23	5/30	6/7	6/14	6/21	6/29	7/5	7/11	7/18	7/28	8/2
ARDEC A	7	7	46	51	108	275	791	1,253	97	185	1,502	881	0	0	0	0
ARDEC B	10	14	21	15	34	803	326	12,071	19	163	1,598	388	0	0	0	0
ARDEC C	6	8	8	10	10	0	4	1	0	18	1	8	0	0	0	0
HortFarm	3	89	41	30	58	152	462	180	27	0	0	0	0	0	0	0
CR15 A	0	54	3	2	4	0	1	0	0	0	0	0	0	0	0	0
CR15 B	1	25	32	36	62	380	708	1,416	22	9,469	666	549	0	0	0	0
CR15 C	0	169	44	285	84	5,990	4,002	7,613	1,722	22	23	18	55	14	44	0
H257 A	38	80	115	641	888	3,441	1,368	5	1	15	14	4	1	0	0	0
H257 B	15	45	25	515	321	1,189	770	248	11	0	2	0	0	0	0	0
Severance A	0	850	580	750	390	980	103	425	13,845	11,562	3,416	82	6	6	9	0
Severance B	4	0	0	190	180	835	96	188	25,150	235	87	0	0	0	0	0
EI25	0	201	240	466	475	2,609	895	323	0	3	9	80	0	1	0	4
CORF	635	255	440	454	474	2,437	460	178	47	1,125	176	10,785	19	1	2	2
TOTAL	719	1,797	1,595	3,445	3,088	19,091	9,986	23,901	40,941	22,797	7,494	12,795	81	22	55	6

**Table 3.** Weekly samples of false chinch bugs, *Nysius raphanus* , on different crops at Larimer County in Colorado in 2001.

Site	False Chinch Bugs/20 Sweeps															
	4/18	4/25	5/3	5/8	5/23	5/29	6/7	6/12	6/19	6/27	7/3	7/12	7/21	7/25	8/7	8/14
ARDEC A	0	0	2	7	0	3	0	4	5	7	24	5	0	16	4	3
ARDEC B	0	0	2	0	0	0	0	0	1	0	0	2	1	5	5	5
HortFarm	0	0	0	0	0	0	5	0	0	0	0	3	2	0	0	0
CR15	0	0	0	0	0	1	2	0	0	1	4	16	58	4	0	0
H257 A	0	8	4	0	2	71	2	6	0	0	2	2	0	0	0	0
H257 B	0	3	0	0	0	2	169	30	28	36	25	16	46	13	1	0
Severance A	0	3	4	3	2	1	3	0	1	5	3	0	0	0	0	0
Severance B	0	8	13	4	5	3	4	10	0	2	25	10	2	0	0	0
EI25	0	2	1	0	0	0	0	5	0	1	0	16	1	0	0	0
CORF	0	1	0	1	0	2	0	3	0	1	3	4	2	0	0	0
TOTAL	0	25	26	15	9	83	185	58	35	53	86	74	112	38	10	8

**Table 4.** Weekly samples of false chinch bugs, *Nysius raphanus* , on different crops at Larimer County in Colorado in 2002.

Site	False Chinch Bugs/20 Sweeps														
	4/18	4/25	5/2	5/8	5/18	5/27	6/4	6/12	6/18	6/28	7/5	7/12	7/22	8/5	8/13
ARDEC A	0	0	0	0	0	3951	3210	0	0	0	6	0	0	0	0
ARDEC B	0	0	0	249	7,819	3	10	0	0	0	0	0	0	0	0
HortFarm	0	0	0	0	0	7,169	7,101	2	48	0	0	0	0	0	0
N. Bud	0	0	0	0	3	4	3	0	0	0	4	0	0	0	0
Mtn. Vista	0	0	0	0	0	0	0	0	0	4	4	0	0	0	3
CR15	0	0	0	21	435	2,111	2,010	2	0	0	0	0	0	0	1
H257	0	0	0	0	2	0	6	1	4	2	6	0	0	0	0
Severance	0	0	0	2	0	5	2	0	0	0	0	0	0	0	0
I25	0	0	0	0	0	0	0	0	4	0	0	0	0	0	6
CORF	1	0	1	4	0	2	0	10	7	0	0	0	0	0	0
BayFarm A	0	0	0	1	2	210	2	0	0	0	0	0	0	0	0
BayFarm B	0	0	0	0	2	2	1	0	3	0	3	0	0	2	0
CSFS Nurs.	0	0	0	0	1	2	24	0	2	2	7	0	0	0	3
TOTAL	1	0	1	277	8,264	13,459	12,369	15	68	8	30	0	0	2	13

**Table 5.** Weekly samples of *Phyllotreta* spp. flea beetles collected on different crops at Larimer County in Colorado in 2000.<sup>1</sup>

Site	Flea Beetles/20 Sweeps															
	4/18	4/25	5/2	5/9	5/16	5/23	5/30	6/7	6/14	6/21	6/29	7/5	7/11	7/18	7/28	8/2
ARDEC A	25	35	14	75	75	35	511	9	444	26	506	395	0	0	0	0
ARDEC B	14	16	65	33	61	87	270	18	300	775	166	206	0	0	0	0
ARDEC C	44	88	30	18	99	0	1	3	52	0	3	14	0	0	0	0
HortFarm	19	10	73	27	96	86	227	34	16	0	1	1	17	4	4	0
CR15 A	21	12	12	21	30	0	6	0	0	0	0	0	0	0	0	0
CR15 B	65	10	115	44	148	115	137	36	28	72	51	1	0	0	0	0
CR15 C	24	25	13	19	4	25	0	17	145	0	9	9	11	0	9	2
H257 A	10	10	4	75	8	37	180	0	1	1	16	2	0	0	0	0
H257 B	11	10	11	14	32	313	315	33	24	1	1	0	0	0	0	0
Severance A	10	4	25	0	4	50	77	35	144	933	653	153	70	16	4	14
Severance B	9	0	0	18	4	16	73	18	48	8	131	6	0	0	0	0
EI25	0	10	14	18	24	4	645	16	0	1	6	32	16	3	2	16
CORF	5	12	4	13	24	3	832	35	47	229	38	42	16	0	4	9
TOTAL	257	242	380	375	609	771	3,274	254	1,249	2,046	1,581	861	130	23	23	41

<sup>1</sup> The great majority of flea beetles were western black flea beetle, *Phyllotreta pusilla* Horn. A small percentage of the flea beetles on some dates were *P. cruciferae* the non-native crucifer flea beetle

**Table 6.** Weekly samples of *Phyllotreta* spp. flea beetles on different crops, Larimer County, Colorado in 2001.<sup>1</sup>

Site	Flea Beetles/20 Sweeps															
	4/18	4/25	5/3	5/8	5/23	5/29	6/7	6/12	6/19	6/27	7/3	7/12	7/21	7/25	8/7	8/14
ARDEC A	0	2	48	34	0	1	1	6	0	19	0	2	2	0	1	1
ARDEC B	0	0	25	4	0	33	3	7	0	0	3	2	0	0	1	0
HortFarm	0	0	5	1	9	9	0	2	0	1	11	14	0	0	0	0
CR15	0	5	3	14	4	20	2	5	1	6	14	2	0	0	2	0
CORF	0	3	17	4	2	35	1	0	1	0	4	0	0	0	1	1
H257 A	2	4	6	10	7	2	10	3	4	5	0	4	0	0	0	0
H257 B	4	2	6	10	7	2	10	3	4	5	0	4	0	0	0	0
Severance A	92	4	4	29	3	36	24	10	19	6	3	0	0	0	11	3
Severance B	69	17	29	13	2	16	9	8	2	4	5	2	2	0	0	0
EI25	31	4	4	2	0	39	0	2	0	2	2	4	0	0	0	1
TOTAL	198	41	147	121	34	193	60	46	31	48	42	34	4	0	16	6

<sup>1</sup> The great majority of flea beetles were western black flea beetle, *Phyllotreta pusilla* Horn. A small percentage of the flea beetles on some dates were *P. cruciferae*, the non-native crucifer flea beetle

**Table 7.** Weekly samples of *Phyllotreta* spp. flea beetles on different crops, Larimer County, Colorado in 2002.<sup>1</sup>

Site	Flea Beetles/20 Sweeps														
	4/18	4/25	5/2	5/8	5/18	5/27	6/4	6/12	6/18	6/28	7/5	7/12	7/22	8/5	8/13
ARDEC A	0	0	0	0	0	119	97	6	9	0	2	0	0	4	25
ARDEC B	1	0	2	38	1,566	9	16	0	0	0	2	0	0	5	19
HortFarm	0	0	0	193	4	1,322	1,310	4	10	2	4	0	2	2	13
N. Bud	0	0	0	14	2	0	0	4	10	0	0	0	0	3	16
Mtn. Vista	0	0	0	1	31	3	20	2	0	0	2	0	0	0	0
CR15	1	0	0	78	1,770	267	216	0	5	2	2	0	0	0	13
H257	0	0	0	10	6	42	0	6	2	0	5	0	0	0	4
Severance	0	0	0	38	2	77	0	18	0	0	0	0	0	0	2
I25	1	0	3	17	13	2	0	0	0	0	0	0	0	0	10
CORF	0	0	0	6	2	34	0	12	2	0	3	0	0	0	8
BayFarm A	0	0	0	23	0	19	6	0	2	0	3	0	0	0	1
BayFarm B	1	0	0	13	2	42	0	0	0	0	4	0	0	0	2
CSFS Nurs.	0	0	1	5	4	4	0	0	0	0	12	0	0	3	6
TOTAL	4	0	6	436	3,402	1,940	1,665	52	40	4	39	0	2	17	119

<sup>1</sup> The great majority of flea beetles were western black flea beetle, *Phyllotreta pusilla* Horn. A small percentage of the flea beetles on some dates were *P. cruciferae* the non-native crucifer flea beetle

**Table 8.** Weekly samples of *Lygus* spp. (*L. elisus*, *L. hesperus* and *L. lineolaris*) on different crops, Larimer County, Colorado in 2000.

Site	Lygus spp./20 Sweeps															
	4/18	4/25	5/2	5/9	5/16	5/23	5/30	6/7	6/14	6/21	6/29	7/5	7/11	7/18	7/28	8/2
ARDEC A	20	28	77	62	51	110	25	380	83	32	19	9	0	0	0	0
ARDEC B	25	32	34	55	69	143	36	388	87	61	11	5	0	0	0	0
ARDEC C	17	17	51	16	42	0	1	2	3	25	16	17	0	0	0	0
HortFarm	29	18	58	26	47	72	52	133	24	0	0	3	88	31	15	15
CR15 A	9	20	2	0	6	0	4	0	0	0	0	0	0	0	0	0
CR15 B	25	33	49	61	110	65	120	295	268	23	5	3	0	0	0	0
CR15 C	66	55	81	61	1	0	0	33	12	1	1	1	4	0	64	16
H257 A	45	20	25	25	17	0	0	0	1	8	5	13	76	0	0	0
H257 A	71	15	16	42	27	182	51	499	10	3	0	0	0	0	0	0
Severance A	0	10	11	7	60	45	13	493	285	197	11	1	1	31	31	19
Severance B	49	0	0	12	17	54	20	175	42	20	31	1	0	0	0	0
EI25	0	7	7	19	60	267	6	629	0	11	0	37	38	11	54	24
CORF	96	35	9	8	11	150	4	805	271	457	14	66	10	0	10	16
TOTAL	452	290	420	394	518	1,088	332	3,832	1,086	838	113	156	217	73	174	90

**Table 9.** Weekly samples of *Lygus* spp. (*L. elisus*, *L. hesperus*, and *L. lineolaris*) on different crops, Larimer County, Colorado in 2001.

Site	Lygus spp./20 Sweeps															
	4/18	4/25	5/3	5/8	5/23	5/29	6/7	6/12	6/19	6/27	7/3	7/12	7/21	7/25	8/7	8/14
ARDEC A	0	4	15	14	16	21	5	24	7	15	37	36	55	79	6	9
ARDEC B	0	6	15	4	7	26	9	35	0	14	26	18	73	53	18	27
HortFarm	2	8	3	19	20	6	71	2	0	6	14	23	64	24	0	0
CR15	0	10	5	13	2	65	5	15	21	1	6	65	45	64	20	4
CORF	5	13	63	8	3	25	12	3	154	26	74	18	61	7	6	27
H257	91	71	14	31	58	228	18	33	0	8	16	15	0	0	0	0
H257	10	5	11	14	6	8	404	160	42	3	0	10	36	37	17	19
Severance A	51	14	17	12	24	91	65	64	36	24	28	66	108	64	3	19
Severance B	133	64	58	32	44	32	15	36	10	13	89	45	10	14	0	12
EI25	30	39	2	4	10	64	4	43	25	26	35	66	68	7	18	21
TOTAL	322	234	203	151	190	566	608	415	295	136	325	362	520	349	88	138

**Table 10.** Weekly samples of *Lygus* spp. (*L. elisus*, *L. hesperus*, and *L. lineolaris*) on different crops, Larimer County, Colorado in 2002.

Site	Lygus spp./20 Sweeps														
	4/18	4/25	5/2	5/8	5/18	5/27	6/4	6/12	6/18	6/28	7/5	7/12	7/22	8/5	8/13
ARDEC A	4	3	14	11	2	5	10	12	8	18	4	3	69	36	19
ARDEC B	1	2	39	19	101	0	11	3	4	12	4	4	209	19	12
HortFarm	2	0	5	7	10	65	16	25	108	6	22	12	39	14	9
N. Bud	4	4	4	17	13	14	8	21	18	29	25	28	51	76	4
Mtn. Vista	1	1	5	0	2	0	5	18	4	16	8	8	0	0	0
CR15	1	3	2	8	305	23	61	10	24	4	11	0	57	25	9
H257	2	3	12	26	13	12	0	4	18	29	16	25	167	17	2
Severance	0	0	0	7	8	0	16	16	10	2	15	15	16	32	9
I25	3	1	15	28	18	4	7	125	28	10	2	2	10	43	22
CORF	3	0	29	23	25	8	8	25	8	22	9	9	59	5	8
BayFarm A	6	4	3	5	11	14	38	35	3	10	7	7	21	16	2
BayFarm B	4	4	8	15	9	2	22	12	8	6	13	21	54	0	1
CSFS Nurs.	0	0	12	11	10	12	15	10	4	18	6	6	0	10	3
TOTAL	31	25	148	177	527	159	217	316	245	182	142	140	752	293	100