

Proceedings of the Iowa Academy of Science

Volume 35 | Annual Issue

Article 28

1928

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Recommended Citation

Pammel, L. H.; King, C. M.; and Hayden, Ada (1928) "March Cress, Its Geography and Ecology in Iowa," *Proceedings of the Iowa Academy of Science*, 35(1), 157-167.

Available at: <https://scholarworks.uni.edu/pias/vol35/iss1/28>

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MARSH CRESS, ITS GEOGRAPHY AND ECOLOGY IN IOWA

L. H. PAMMEL, C. M. KING, ADA HAYDEN

Early in the spring of 1927 our attention was called to the prevalence of marsh cress in the state. This is not the first season that this weed has been so common. Apparently its appearance is more or less periodic or sporadic, depending upon weather conditions of the previous season.

It was found to occur generally in meadows, in barley and corn fields and particularly among oats. It seriously interfered with the mowing of oats.

Barley grew so much more rapidly than oats that damage from the weed was less. It was rarely found in wheat fields but was abundant in corn fields. In one alfalfa field near Story City we observed that marsh cress had completely crowded out the alfalfa. Occasionally as in Story county it occurred in pastures.

Many letters of inquiry were received from April to July, of which the following are examples:

LaPorte City, Iowa,
June 17, 1927

This weed attached is infesting the oat fields in this vicinity, in some places taking the field.

Fairfield, Iowa
June 24, 1927

I am sending a weed which is very prevalent in oats fields in the country and threatens to kill out a great percentage of the oats. The farmers state they have never before been troubled with it. Is it a weed which thrives only under exceedingly wet conditions?

Hampton, Iowa
May 21, 1927

The field was in corn last year, but the owner saw none of these weeds. The year before they showed up in the same field, but this year they are so thick they will take the stand of oats.

From our study of the weed this year and previous years, marsh cress appears most abundant in northern Iowa, especially in low or flat areas. Some years ago it was very prevalent in Cerro Gordo and Mitchell counties. It was abundant last year in Allamakee and Clayton counties, especially in little depressions and swales. In this section of Iowa it is called Canadian kale.

MARSH CRESS, *Cress. Radicula palustris* (L.) Moench

A well known annual, winter annual, or biennial, an erect mus-

tard, closely related to the horseradish. Stem nearly smooth, one to three feet high or slightly more; leaves smooth, from three to seven inches long, deeply divided or cleft, the upper lobes cut into narrow divisions.

Flowers small, yellow, in rather dense clusters. Flower stalks as long as the flowers. Style short, more or less oblique. Pods ovoid.



Fig. 1. *Radicula palustris*. Rosette. (Photo by A. Hayden)

The weed occurs in Europe and Asia as well as in North America. The plant collection at Iowa State College contains specimens of marsh cress from Colorado, Illinois, Iowa, Louisiana, Minnesota, New York, Oregon, South Dakota, Washington and Wisconsin.

Iowa localities are represented by specimens as follows: Ames (C. E. Bessey); Decatur county (J. P. Anderson); Jordan (C. M. Bartrey); Coon river, associated with ironweed, *Vernonia fasciculata*, and smartweed, *Polygonum acre* (L. H. Pammel); Mason City, common on borders of ponds in low grounds, associated with ironweed (*Vernonia fasciculata*) (L. H. Pammel); Ames (C. R. Ball and Robt. Combs); Auburn, Middle River, Hamburg, Forest City, Turin 1894, Marshalltown, Badger, Ames (L. H. Pammel); Muscatine, Little Rock (C. R. Ball); Emmet county, Clear Lake, Algona 1918, low ground (R. I. Cratty); Fayette 1893 and 1894 (B. Fink); Kelly (Pearl Clayton); Spencer (Edington); Ledges, Boone county (L. H. Pammel, R. E. Buchanan and C. M. King); College Park (Fred Rolfs); Charles City (Mrs. F. M. Tuttle); Ames (C. M. King); Ames (F. C. Stewart 1892); Lebanon (A. F. Sample); Eagle Grove (R. E. Buchanan

1902); Northeastern Iowa (H. Goddard 1895); Ames (L. H. Pammel and Harriet Pammel); Kalona (J. C. Preston).

We are indebted to Lucy M. Cavanaugh of the Department of Botany of the State University for the following list of localities for marsh cress in Iowa.

Localities for marsh cress shown by specimens in the Iowa State University Herbarium: Rock Rapids, Granite, Johnson county, Forest City, Hancock county, Keokuk, Mason City, Louisa county, Clayton county, Allamakee county, Winneshiek county (B. Shimek), Winneshiek county (T. J. Fitzpatrick), Emmet county (R. I. Cratty), Skunk river valley, Lee county (Paul Bartsch), Mount Pleasant (H. H. Mills), Muscatine county (F. Reppert).

Radicula palustris var. *hispida*, Rock Rapids, Spirit Lake (B. Shimek)

It has also been observed by the senior author in Winnebago, Kossuth, Emmet, Lyon, Woodbury, Pottawattamie, Fremont, Mills, Appanoose, Davis,



Fig. 2. Marsh cress associated with oats. (Photo by A. Hayden)

Wapello, Van Buren, Johnson, Muscatine, Linn, Mitchell, Howard, Marshall, Hardin, Jones, Dubuque, Jackson, Clayton, Chickasaw, Allamakee counties. The following specific localities were observed for this year (1927): Story City, Jewell, Boone, Nevada, Eldora, Marshalltown, Quarry, LeGrand, Grinnell, Oskaloosa, Ottumwa, Bloomfield, Newton and Winterset. In previous years the following places have been especially noted: Mason City, Charles City, Postville, Waukon, McGregor, Forest City, Algona, Clear Lake, Garner, Britt, Clarion, Eagle Grove, Humboldt, Fort Dodge, Des Moines, Polk City, Cedar Rapids, and Dubuque.

Seeding and germination — Marsh cress produces an enormous number of seeds; these ripen with the oats and are scattered with uncleaned oats. The seed germinates in both fall and spring under favorable moisture conditions. We have seen the weed very common in the fall in cornfields, as for instance, the present year, in Madison county.

SURVEY OF MARSH CRESS

Detailed surveys were made by the senior author in 1927, in Boone, Story, Marshall, Mahaska, Wapello, Appanoose, Johnson and Allamakee counties. One of the junior authors made a survey in several counties in northern Iowa.

Abundance of Marsh Cress in Boone, Polk, Story, Hardin, Hamilton and Webster counties — This year in many poorly tilled oat fields in low grounds marsh cress crowded out oats. While the enumeration as shown in tables elsewhere is not large, the weed

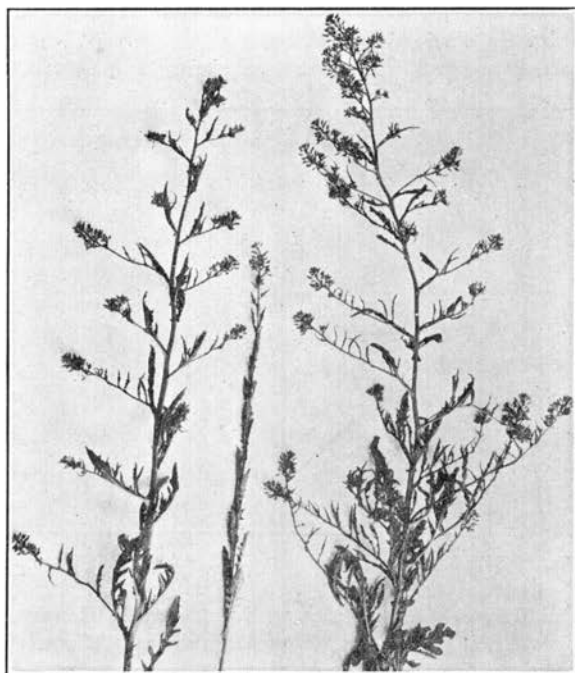


Fig. 3. Marsh cress, *Radicula palustris* (L.) Moench.
(Photo by Photo Section, Ia. Agr. Exp. Sta.)

was sufficiently abundant to interfere with a good crop of oats. These fields had all been in corn the previous year, the oats having been sown in corn stubble.

In Boone county the weed was very abundant in oat fields, especially on low grounds.

In Polk county Mr. I. E. Forbes and the senior author found many fields infested where the oats had been sown on oat stubble. In fields where oats followed crops other than oats, and were sown on plowed ground, there was little or none of the weed. Some of

these fields free from the weed were adjacent to fields containing much of it.

In some oat fields in Story county there was little else than marsh cress. The individual plants grew so much faster than oats that with their spreading habit they overtopped the oats. In disking the oats on the stubble the young plants were not killed.

In Polk and Story counties the season was most unfavorable for putting in oats, consequently the cress soon outgrew the oats.

There is much flat land in Hamilton county and many low fields between the morainic hills; in these low places marsh cress was abundant.

A weed survey with particular reference to marsh cress was made in Marshall, Poweshiek, Mahaska, Wapello, and Davis counties by the senior author and Mr. I. E. Forbes. The weed was found to be not uncommon in Marshall county, especially in low areas, though it was not absent in high grounds.

Marsh cress was less common in Poweshiek and Mahaska counties than in Story and Boone counties, but it occurred in low flat places where it was impossible to properly disk the corn field for oats; as in Polk county, where the oats followed a crop other than corn and where the fields had been plowed instead of disked the weed was not common.

Some of this weed also occurred in barley fields; generally, however, there was not so much in barley fields as in oats in Poweshiek and Mahaska counties. The weed was not as abundant in Davis and Wapello counties as in counties to the north. There were a few fields with marsh cress. The farmers were unable to put in their oats early on account of the cold and wet spring and in spite of the late sowing on oats stubble the weed did not appear. However the previous conditions of the oat field and meadow did have some influence on the abundance of the weed.

Survey of Johnson, Muscatine and Iowa Counties— Marsh cress was not as abundant as in Hamilton, Boone, Story and Cerro Gordo counties, although there were some badly infested fields in each of these counties. As in other parts of the state it is the common practice here to sow oats in the corn stubble. In most seasons much of the marsh cress is killed by disking. This year, however, it was not killed.

Mr. R. P. Adams of the Department of Botany of the State University informs us that he found in examination of many fields of oats in Johnson and Iowa counties that the cress had overgrown the oats.

The senior author and Mr. Adams found oat fields between Iowa City and West Liberty badly infested with cress. The weeds of these fields, given in percentage of occurrence, were as follows :

Marsh cress	3.33	Water smartweed (<i>Polygonum acre</i>)	1.04
Yellow oxalis	3.65	Lady's thumb	1.04
Yellow foxtail	27.08	Speedwell	1.56
Pennsylvania smartweed	9.99	Avens	3.12
Tanweed	3.12	Evening primrose	2.60
Hedge bindweed	2.60	Curled dock	0.78
Greater ragweed	2.60	Velvet weed	1.04
Green foxtail	10.40	Sticktight (<i>Bidens aristosa</i>)	1.56
Rugel's plantain	1.04	Northern nut grass	1.56
Small ragweed	1.56	Pubescent ground cherry	0.56
Barnyard grass	5.98	Peppergrass	1.56
Five-finger	2.60	Indian hemp	0.26
Horseweed	1.56	Prickly lettuce	0.26
Ground cherry	4.68		

The most abundant border weeds were marsh cress, ragweed, dropseed grass, small ragweed, meadow sunflower, yellow foxtail, and sticktight.

FIELD OBSERVATIONS OF WEEDS IN OAT FIELDS

Weeds of Oat Fields, Boone County (L. H. Pammel), June 18, 1927

Common milkweed, 7 out of 9 fields	Occurrence 78 per cent
Wild mustard, 8 out of 14 fields	Occurrence 58 per cent
Marsh cress, 6 out of 8 fields	Occurrence 75 per cent
Curled dock, 5 out of 6 fields	Occurrence 83 per cent

Weeds of Oat Fields, Story County (L. H. Pammel), June 18, 1927

Wild mustard, 6 out of 8 fields	Occurrence 75 per cent
Milkweed, 6 out of 8 fields	Occurrence 75 per cent
Curled dock, 5 out of 9 fields	Occurrence 55 per cent
Marsh cress, 6 out of 8 fields	Occurrence 75 per cent

Weeds of Oat Fields, Hamilton County (L. H. Pammel), June 18, 1927

Wild mustard, 8 out of 10 fields	Occurrence 80 per cent
Milkweed, 5 out of 7 fields	Occurrence 72 per cent
Curled dock, 5 out of 10 fields	Occurrence 50 per cent
Squirrel-tail, 4 out of 6 fields	Occurrence 67 per cent
Marsh cress, 8 out of 10 fields	Occurrence 80 per cent

Oat field, north of Bloomfield, Iowa, July 25, 1927 (L. H. Pammel and I. E. Forbes).

In corn previous year. Oats very poor. Poor cultivation. Marsh cress 3.38 per cent of weeds in the field.

Oat field, south of Grinnell, Iowa, July 25, 1927 (L. H. Pammel and I. E. Forbes) .

Late oats. In corn last year. Field comparatively clean. Marsh cress 3.4 per cent of weeds in the field.

Table Showing Weed Occurrence in Percentage, for Seventeen Oat-fields in Central Iowa

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	Story Co., Huxley	Polk Co., North Part	Polk Co., 1	Boone Co., Jordan	Story Co., Ames 1	Polk Co., 2	Hamilton Co., 1	Hamilton Co., 2	Hardin Co.	Black Hawk Co., Waterloo	Story Co., Ames 2	Story Co., Ames, 3	Story Co., 4	Black Hawk Co., Waterloo	Black Hawk Co., Waterloo	Black Hawk Co., Cedar Falls	Marshall Co.
1. Artichoke *-----					4.8				1.							3.2	
2. Aster, willow-leaved-----																	
3. Black bindweed-----			0.5				1.65	4.8				10.5	8.1	3.2	1.7		4.1
4. Carpet weed-----										15.8							
5. Cheeses-----																.15	
6. Curled dock-----	0.6					1.2	10.89	3.9			0.2	0.25	1.				1.5
7. Cocklebur-----	0.15			2.25	0.3				10.								
8. Dandelion-----		1.		0.9			0.33	0.6			2.3						1.8
9. Daisy fleabane-----							0.33	0.6									7.5
10. Evening primrose-----							1.32					0.05					
11. Five finger-----		0.3				1.2	3.63					2.	3.5	1.2			
12. Foxtail, green-----	80.	79.	80.	73.5	73.	77.	57.7	53.7	54.	31.5	68.5	79.	73.	44.1	49.5	82.8	73.3
13. Foxtail, yellow-----														6.	24.2		
14. Germander-----														19.5	3.5		
15. Ground cherry-----			0.5														
16. Horsetail-----		0.1			2.2												
17. Horseweed-----	1.8		10.	0.3		0.6					0.1			1.2	1.5	0.13	2.2
18. Hog peanut-----														1.2			
19. Indian hemp-----								0.97									
20. Lamb's quarters-----	1.8	1.			1.5		2.97	1.5				0.5	0.6			0.93	
21. Marsh cress-----		8.		12.9	0.1	4.1	2.97	12.9	0.5		11.	0.1	0.15	1.	1.5	0.13	1.8
22. Mayweed-----																0.13	
23. Milkweed, common-----	0.7		2.	0.2	2.2		1.32	0.3			0.1	0.15	0.15			1.73	1.1

* The technical names of weeds corresponding to numbers used above are given in the list following this table.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
24. Mustard, black-----	0.2			0.15				2.1	1.			0.1	1.1	0.7			
25. Mustard, common wild--		0.5			0.5												
26. Mustard, hedge-----						3.5		2.1	1.1								
27. Mustard, Indian-----	2.7																
28. Nettle-----					1.7									3.1			
29. Northern nutgrass-----						0.6	8.58	7.5			0.6					1.2	
30. Oxalis, yellow-----				0.75			0.99	5.4				2.4	1.6	2.5	3.1		3.7
31. Peppergrass, small flow'd		1.8	0.5									4.1					
32. Pigweeds-----				3.75								0.1					
33. Plantain, Rugel's-----								0.3									
34. Prickly lettuce-----		1.5	0.5	0.15													
35. Ragweed, large-----	2.1	3.				1.2	2.97		4.5			0.15	0.4				
36. Ragweed, small-----	2.8	1.		0.3					12.5	26.2	0.6	1.7	7.1	4.		34.3	5.6
37. Sandbur-----										5.2							
38. Shepherd's purse-----		2.															
39. Shoofly-----																0.27	
40. Smartweed, lady's thumb	5.			0.15		7.1	3.3	3.	8.			0.05	1.2			1.3	1.3
41. Smartweed, nodding-----					9.4											1.7	
42. Smartweed, Pennsylvania		0.1									6.	1.8		9.	12.4		3.7
43. Sorrel-----																2.4	
44. Spanish needle-----								6.6								0.27	
45. Speedwell-----														3.1			
46. Spurge, flowering-----										5.3							
47. Spurge, prostrate-----											3.		1.2				
48. Spurge, sp.-----				3.45		1.8				2.1		0.1					2.7
49. Squirrel-tail-----	0.7							1.5							1.4		
50. Sunflower-----				2.5							4.1						
51. Tanweed-----			6.									0.5	0.33				
52. Three-seeded mercury---									8.								
53. Wild bean-----										6.3							
54. Wild morning-glory-----			0.5		2.6	1.8						0.25	0.33	2.2	2.1	0.65	
55. Wild rose-----					0.4					7.3							

In all the above fields, corn was the crop in the previous year. In several cases (3, 6, 11, 12) the rotation seems to have been corn and oats for several years. Several of the fields (1, 6, 9) showed poor preparation for the oats — the old corn stalks yet standing in the soil.

* The technical names of weeds corresponding to numbers used above are as follows:

- | | |
|-------------------------------------|-------------------------------------|
| 1. <i>Helianthus tuberosus</i> | 29. <i>Cyperus esculentus</i> |
| 2. <i>Aster salicifolius</i> | 30. <i>Oxalis stricta</i> |
| 3. <i>Polygonum Convolvulus</i> | 31. <i>Lepidium apetalum</i> |
| 4. <i>Mollugo verticillata</i> | 32. <i>Amaranthus</i> sp. |
| 5. <i>Malva rotundifolia</i> | 33. <i>Plantago Rugelii</i> |
| 6. <i>Rumex crispus</i> | 34. <i>Lactuca scariola</i> |
| 7. <i>Xanthium commune</i> | 35. <i>Ambrosia trifida</i> |
| 8. <i>Taraxacum officinale</i> | 36. <i>Ambrosia artemisiifolia</i> |
| 9. <i>Erigeron annuus</i> | 37. <i>Cenchrus caroliniana</i> |
| 10. <i>Oenothera biennis</i> | 38. <i>Capsella Bursa-pastoris</i> |
| 11. <i>Potentilla monspeliensis</i> | 39. <i>Hibiscus Trionum</i> |
| 12. <i>Setaria viridis</i> | 40. <i>Polygonum Persicaria</i> |
| 13. <i>Setaria glauca</i> | 41. <i>Polygonum lapathifolium</i> |
| 14. <i>Teucrium canadense</i> | 42. <i>Polygonum pennsylvanicum</i> |
| 15. <i>Physalis lanceolata</i> | 43. <i>Rumex Acetosella</i> |
| 16. <i>Equisetum arvense</i> | 44. <i>Bidens frondosa</i> |
| 17. <i>Erigeron canadense</i> | 45. <i>Veronica peregrina</i> |
| 18. <i>Apios tuberosa</i> | 46. <i>Euphorbia corollata</i> |
| 19. <i>Apocynum cannabinum</i> | 47. <i>Euphorbia annuus</i> |
| 20. <i>Chenopodium album</i> | 48. <i>Euphorbia</i> sp |
| 21. <i>Radicula palustris</i> | 49. <i>Hordeum jubatum</i> |
| 22. <i>Anthemis Cotula</i> | 50. <i>Helianthus annuus</i> |
| 23. <i>Asclepias syriaca</i> | 51. <i>Polygonum Muhlenbergii</i> |
| 24. <i>Brassica nigra</i> | 52. <i>Acalypha virginica</i> |
| 25. <i>Brassica arvensis</i> | 53. <i>Strophostyles helvola</i> |
| 26. <i>Sisymbrium officinale</i> | 54. <i>Convolvulus sepium</i> |
| 27. <i>Brassica juncea</i> | 55. <i>Rosa pratincola</i> |
| 28. <i>Urtica gracilis</i> | |

DISTRIBUTION OF MARSH CRESS IN NORTHERN IOWA, 1927

(A. Hayden)

Cerro Gordo County—Of about three hundred fields observed in Cerro Gordo county, about 40 per cent contained marsh cress in such quantities as to be conspicuous. In fields where cress was not manifest from the road, a few plants were always to be discovered, usually below average size and not so tall as the oats. The area occupied by cress in the fields in which it was present varied in amount from 1 to 10 per cent. Occasionally fields appeared to have about 20 per cent of their area occupied by cress.

The soils of the eastern four-fifths of the county are derived from the Iowan drift, the remainder being contributed by the Wisconsin drift. The Wisconsin drift areas which are knobby and rolling appeared to have little cress on the portions cultivated, which were the higher, well drained tracts.

The Iowan drift area is in topography table-like, and while it is traversed by more streams than is the Wisconsin drift area, there were shallow depressions connected by low areas which during the spring rains held water, and the fields were not well drained. These

depressed areas were marked by rank growths of marsh cress, which in some instances occupied the high flat land as well.

Worth County—The Wisconsin drift occupies the western half of Worth county and the Iowan the eastern half. The same conditions seemed to exist here as in Cerro Gordo county as to the occurrence of cress. The territory inspected lay in Kensett and Lincoln townships from Northwood to the southern boundary, within the Iowan drift district. About 40 per cent of the hundred and fifty fields observed were infested with cress. Some fields showed a population as high as 80 per cent of this weed. One such notable field of mixed oats and barley was reported by its owner, Mr. Bakken, never to have borne cress during a period of twelve years, the time of his ownership. Other weeds, particularly tanweed, were abundant when the farm was bought, but this had been eliminated and with effort the farm, including this field, had been brought to a state of comparative freedom from weeds. In this field, rotation of oats and corn had been practiced for about eleven years. It had been fall plowed for corn the previous year and had been double disked this spring in preparation for the oats, which were seeded with a drill. An adjoining oat and barley field which was seeded in part to alfalfa and to sweet clover this year bore no cress.

Mr. Ellingston, who had noticed cress in his field in the spring, when the oats were ready to come up, double disked the field with a tractor, setting the disk at half the usual depth. This field at harvest time was clean.

Mr. H. D. Backhaus had very little cress in his oatfields, less than 3 per cent, and the plants were mostly small in stature. For some years he had noticed none, but recalled that beginning about twelve years ago cress was prevalent for several years during a wet period.

In a number of instances clean fields were found to be correlated with fall plowing before the previous year's planting of corn. Not only low, wet areas but also unplowed fields frequently produce a good growth of cress this year.

The period of viability of its seed would also shed light upon its probable re-appearance when the seeds were brought to the surface by cultivation. One seed pod contains an average of 45 to 50 seeds. One average sized plant bears from 700 to 6,000 pods, so that an average sized mature plant may shed more than 300,000 seeds in a season.

It is probable that the few plants which have been present for

some time had contributed enough seed so that when favorable conditions appeared — a prolonged wet autumn followed by a cool wet spring, the fields for a time becoming temporarily marshlike — this plant, which is known to be a resident of the marshes, ditches, sloughs and meadows the world over, made use of these conditions favorable for its optimum growth.

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