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BIOLOGICAL AND MEDICAL SCIENCES

AN ANALYSIS OF THE VEGETATION AND FLORA OF FIELD-EDGES AND ROADSIDES OF AGRICULTURAL LAND

IN EASTERN NEBRASKA

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Five hundred sixty-seven hectares of agricultural cropland in eastcentral Nebraska were sampled during a vegetative analysis and botanical survey in the summer of 1979. One hundred eighteen species of plants in 39 families were recorded. The number of species recorded in the various edge-areas sampled ranged from six to 34. The differences noted were that species composition varied and some plants were present in small numbers in some areas and absent or undetected in others. Differences could be attributed to variations in slope, soil characteristics, and management of the areas sampled.

† † †

Although cropland agriculture comprises the predominant land use in many areas of eastern Nebraska, there has been little analysis of the plants that are found on farmland. Farms have roadside and irrigation ditches, grass waterways, and fence lines as well as pastures that are areas of permanent vegetative cover.

To evaluate some of the characteristics of the flora of agricultural land, a vegetative analysis and botanical survey was conducted on three east-central Nebraska farms. Plants were examined as a part of the habitat analysis for a comparison of the biological communities of an organic and a conventional farm.

The area studied is agricultural land on the Platte River flood plain 6.4 km north and 3.2 km west of Valley, Douglas County. Soils there are of the Gibbon-Eudora-Wabash association made up primarily of silt and clay with a wide range of moisture drainage. Differences in land topography are slight as the area is nearly flat. Two sections of land were north of Nebraska Highway 36 (Sec. 3 and 4, T. 16 N., R. 9 E.) and a small part (N½ Sec. 10) south of the highway. Three farms comprising 567 ha were systematically surveyed. The greatest number of hectares was devoted to corn production while alfalfa, oats, rye, soybeans, and wheat were other crops produced (Fig. 1). In addition to cropland there was a coolseason grass pasture on the organic farm. The pasture was grazed by 80 cattle during the study period. It was also burned during the spring of 1979.





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20 J. Ducey and C. Wiederspan

There were several differences in management noted on the farms. One farmer mowed frequently during the growing season while another mowed only some areas and with less frequency. The use of herbicide was another difference. Drift from field applications was noted to have an effect on plants growing adjacent to the area of application. Also, one ditch showed signs of having been burned in 1978.

METHODS

Field work took place from May through August of 1979, with efforts limited to edge-areas that comprised only 16 ha of the total farm area. A map of the study site was prepared and each edge-area was assigned a number. Those ditches and edge-areas oriented north and south were assigned even numbers, while those going east and west were given odd numbers (Fig. 1).

A modified ten-point sampling frame was used to determine percentage of bare ground, litter, and basal cover of vegetation. The sampling device consisted of a metal frame mounted on legs. Ten holes were drilled in the horizontal members to allow steel pins to be inserted and moved vertically. When the frame was set on the ground, each of the ten pins was pushed towards the ground until contact was made with a plant, vegetative litter, or bare ground. This feature was then recorded. In order to have an even sampling intensity the length and width of each area were considered. Longer and wider areas were subject to greater sampling effort. Percent composition was then calculated from the values derived from basal cover. Frequency of occurrence, expressed as a percentage of the area sample quadrats which contained the species, was calculated by use of a 0.1 m^2 quadrat placed on the ground once per 200 m^2 and recording the presence of each species. The number of species recorded in an area served as a measure of species richness.

RESULTS AND DISCUSSION

List of Species

In addition to four crop species, *Glycine max* L. (soybean), *Secale cereale* L. (rye), *Triticum aestivum* L. (wheat), and *Zea mays* L. (corn), 114 species of 39 families were recorded as follow:

Aizoaceae

Rough pigweed
Poison ivy

Apiaceae

Cicuta maculata L.

Asclepiadaceae

Asclepias incarnata L. A. syriaca L. A. verticillata L.

Asteraceae

Ambrosia artemisiifolia L A. psilostachya DC. A. trifida L. Artemisia ludoviciana Nu Aster praealtus Poir. A. sp. Carduus nutans L. Conyza canadensis (L.) Ci Erigeron strigosus Muhl. Helianthus annuus L. Lactuca canadensis L. L. oblongifolia Nutt. Ratibida columnifera (Nu Woot and Standl. Taraxacum officinale Web Trapogon dubius Scop. **Bignoniaceae** Catalpa speciosa Warder

Brassicaceae

Capsell bursa-pastoris (L.) Medic.
Descurainia pinnata (Walt.) Britt.
Lepidium virginicum L.
Rorippa sinuata (Nutt.) Hitchc.
Thlapsi arvense L.

Cannabaceae

Cannabis sativa L.

Cary ophyllaceae Stellaria sp. Celastraceae Euonymus atropurpureus Ja Chenopodiaceae Chenopodium album L. Kochia scoparia (L.) Schrad.

Commelinaceae

Commelina communis L. *Tradescantia bracteata* Small

	Convolvulaceae	
n ivy	Convolvulus arvensis L.	Field bindweed

Waterhemlock

Swamp milkweed Common milkweed Whorled milkweed

	Common ragweed Western ragweed
	Giant ragweed
tt.	White sage
	Willowleaf aster
	Aster
	Musk thistle
ronq.	Horseweed
	Daisy fleabane
	Common sunflower
	Wild lettuce
	Blue lettuce
.tt.)	Durinia annaflannan
	Dandelian
ber	Contaboard
	Goalsbeard
	Catalpa
) Medic.	Shepherd's purse
.) Britt.	Tansy mustard
r. 1	Virginia peppergrass
litchc.	Spreading yellow cre
	Penny cress
	Hemp
	Chickweed
т	117.1
Jacq.	Wahoo
	Lamb's quarters
ad.	Kochia
	Dayflower
nall	Spiderwort

Field edge and roadside vegetation 21

Cornaceae Cornus sp.

Cupressaceae Juniperus virginiana L.

Equisetaceae Equisetum arvense L. E. laevigatum A. Br.

Euphorbiaceae Euphorbia maculata L. E. sp.

Fabaceae

Amorpha fruticosa L. Desmanthus illinoensis (Michx.) MacM. Medicago lupulina L. M. sativa L. Melilotus alba Desr. M. officinalis (L.) Lam. Strophostyles helveola (L.) Ell. Trifolium pratense L. T. repens L. Vicia americana Muhl. V. villosa Roth

Hydrophyllaceae Ellisia nyctelea L.

Lamiaceae Nepeta cataria L.

Liliaceae Allium canadense L. Polygonatum biflorum (Walt.) Ell. Smilacina racemosa (L.) Desf.

Moraceae Morus alba L. M. rubra L.

Oleaceae Fraxinus pennsylvanica Marsh.

Oxalidaceae Oxalis stricta La

Plantaginaceae

Plantago rugelii Dcne.

Poaceae

Agropyron canimum (L.) Beauv.

Red cedar

Field horsetail Smooth horsetail

Spotted euphorbia Euphorbia

False indigo

Bundleflower Black medic Alfalfa White sweet clover Yellow sweet clover Wild bean Red clover White cover American vetch Hairy vetch

Waterpod

Catnip

Wild onion Solomon's seal False spikenard

White mulberry Red mulberry

Green ash

Yellow wood sorrel

Rugel's plantain

Slender wheatgrass

A. repens (L.) Beauv. A. smithii Rvdb. Agrostis stolonifera L. Andropogon gerardii Vitman Avena sativa L. Bromus inermis Leyss. B. japonicus Thunb. B. tectorum L. Carex sp. Cenchrus longispinus (Hack.) Fern Dicanthelium oligosanthes (Shult.) Gould D. wilcoxianum (Vasey) Gould and Clark Digitaria sanguinalis (L.) Scop. Echinochloa crusgalli (L.) Beauv. Elymus canadensis L. Eragrostis cilianensis (All.) E. Mosher Hordeum jubatum L. H. pusillum Nutt. Leersia oryzoides (L.) Sw. Panicum virgatum L. Phalaris arundinaceae L. Poa pratensis L. Setaria faberi Herrm. S. glauca (L.) Beauv. S. verticillata (L.) Beauv. S. viridus (L.) Beauv. Spartina pectinata Link. Sphenopholis obtusata (Michx.) Scribn. Sporobolus cryptandrus (Torr.) Gray S. heterolepis (Gray) Gray

Polygonaceae Polygonum arenastrum Jord. ex Bor. P. ramosossimum Michx. P. sp. Rumex sp.

Primulaceae Lysimachia ciliata L.

Ranunculaceae Anemone canadensis L.

Rosaceae Potentilla recta L. Rosa sp. Quackgrass Western wheatgrass Redtop Big bluestem Oats Smooth brome Japanese brome Downy brome Sedge Field sandbur Small panicgrass Wilcox panicum Crabgrass Barnyard grass Canada wild rye Stink grass Foxtail barley Little barley Rice cutgrass Switchgrass Reed canarygrass Kentucky bluegrass Chinese foxtail

Chinese foxtail Yellow foxtail Bristly foxtail Green foxtail Prairie cordgrass

Prairie wedgegrass

Sand dropseed Prairie dropseed

Common knotweed Bushy knotweed Knotweed Dock

Fringed loosestrife

Meadow anemone

Sulphur cinquefoil Rose

22 J. Ducey and C. Wiederspan

Rubiaceae		Vegetative Analysis
Galium aparine L.	Catchweed bedstraw	
		The most common species were three grasses, smooth
Salicaceae		brome, Kentucky bluegrass, and big bluestem (Tables I and II).
Salix interior (Rowlee) Cronq.	Long-leaf willow	Smooth brome was the only species recorded in every area. It was also the most frequent species in the pasture (Table III).
Solanaceae		Analysis of the pasture showed it had 7.2% vegetative cover,
Solanum carolinense L.	Horse nettle	litter was 92.4% of the cover, and bare ground was 0.4% .
Typhaceae		Differences were noted between the species composition
Typha latifolia L.	Common cattail	within the edge-areas with some plants present in small num.
		bers in some locations and absent or undetected in others.
Ulmaceae		These differences could be attributed to slope, soil type and
Ulmus americana L.	American elm	texture, water holding capacity, available moisture, etc., and management that could influence plant distribution and occur-
Urticaceae		rence. Physical barriers such as a ditch with steep side slopes
Parietaria pensylvanica Muhl.		or standing water all or part of the year also would influence
ex Willd.	Pennsylvania pellitory	the presence of a species. These barriers meant an area was
Urtica dioica L.	Stinging nettle	inaccessible to farm machinery and could not be mowed. Also, fence lines would prevent an area directly under the fence
Verbenaceae		strands from being mowed. The tall forbs, shrubs, and tree
Phyla lanceolata (Michx.) Greene	Fog fruit	saplings in such areas provided habitat suitable for wildlife
Verbena bipinnatifida Nutt.	Vervain	and many birds had nest sites in this upright vegetation (Ducey)
V. bracteata Lag. and Rodr.	Bracted vervain	and Miller, 1980).
V. stricta Vent.	Hoary vervain	
		Although sampling intensity differed with the size of an
Violaceae		area, several ditches were of similar size and thus equally
Viola sp.	Wild violet	sampled. Comparisons were made between three groups of †

TABLE I. Number of species and frequency of occurrence (in percentage) in area sample quadrats which contained the species. Species are listed in order from most to least abundant.

	Area																							
Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	25
Total Present	12	17	17	28	15	20	10	21	15	19	19	6	14	21	29	22	30	11	22	34	30	11	25	23
Frequency																								
Bromus inermis	20	50	25	50	100	60	100	55	65	45	30	95	10	85	96	85	78	20	68	20	75	90	95	100
Poa pratensis	*	40	65	35	35	35	35	35	50	5		5	80	5	63	65	44	50	29	13	27	15	55	57
Carex sp.	_	15	40	38	10	35	10	30	3	55	15		20	20	23	35	40		28	58	37	25	23	10
Viola sp.	_	15	_	8	10	10		5		5	30	_	10	5	10	15	10	_	3	18	10	5	2	10
Polygonum sp.		_	5	33	_	3	3	25	3	20	30	25	15	35	4	5	-	30	12	23	15	15	_	10
Oxalis stricta	8	50	20	15	10	15	_		_	65	_	15	_	15	10	25	3	_	2	20		_	2	3
Spartina pectinata	15	10	5	3		_		10	_		20	10		5	4	5	5		3	23	2	-	2	
Rumex sp.				18		5	_	30	3	5	40	5	15		-	10	1	40		58	7	15	_	
Ambrosia artemisiifolia					30	5	40	3	28	_	25		_	5	1	_		_	8	18	10	5	10	20
Amaranthus retroflexus	5	_	_	_	_	5	_	20	_	_	25	_	15	10	4	5	_ '	20	7	_	7	_	8	7
Hordeum jabatum	_		_	5	_	_			15	15	_	_	60	_	3	5	8	6 0	3	_	3	_	2	
Cenchrus longispinus	_	30	_	5	15	30	5	_	_	30		_	_	5	_	10	_	30		3	5	-	_	
Taraxacum longispinus	_		_	8	5	15	_	3	30	5		_	20	-	_	30	1	30		3		_		-
Kochia scoparia	3	5	15			_	_	15	3	_	3	_	_		_	10	5	10	_	5	_	_	2	_
Trifolium pratense	_			5	_	_	_			_	5		_		15	35	4	_	3	5	3	_	2	7

TABLE I. Continued.

												A	rea											
Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	25
Echinochloa crusgalli	_	5	_		10	5	15	23	_	20	_	_	10	_		6	_	_	_	13	_	_	_	
Anemone canadensis	_	5	15	10	5	_		3	_	_	_		_		1	5	_	_		18		_	_	13
Medicago lupulina	_	_		_	5			_		_		_			20	30	14		18	_	3	_	22	43
Elymus canadensis	30	-	25	_		_	_	3	_	10	20		10	_		_	_	_		8	2	-	_	_
Equisetum laevigatum				8	_	20	_	3	_	_	_	_		_	1	15	19	_	_	_	25	_	5	_
Chenopodium album		5		_		_	_	3	_	10		_		5	1	15	_	-	_	13	_			3
Andropogon gerardii	35	_	5		20	_	_	5	_	_	_	_		5	3	_	6		_		_	_	_	_
Anaropogon geralan		_	_		_		_			_	_		35	5	1	10		~~		3		_	7	3
Trifolium pratense	_	_	_	_	5	_	5	_		_	_	_		_	28	10	1		2	_	2	_	_	
Convolvulus arvensis	_		_	_	5	5	5	_	_		_	_		_	20	_	3	_	8	18	_	_	_	
Convolvatas a ventes	_	_	_	_	_	5	_	-	-			-		5	4	_	16	_	3	_	2	_	_	7
Amorosu psilosiacnya	_	_	_	3	_	_		3		_	_		_	5	_		4	_	_	3	2	_	_	7
			_	3		_	5	5		5	15	_	_	5			7	_		10	2	_	2	/
	_		10	2		_	5	_		5	15		_			_	_	_		10	_	_	2	_
Conyza canadensis	_	_	10	10					-	5			_	5			5		_	10		-		-
Verbena bracteata	-	_		10	3		3	_			3			3	_		-	-		_	_			/
Asclepias syriaca	3		-	10		3	_	δ	_	_					_	_	14	_	2	_	_			
Bromus tectorum	-	5	~	10			_	-	_	-		_	_		3	_	1	_	_	_	/	-	_	/
Setaria verticillata	35	5	_	_		_	_	13	-	35	-					_	_	-	~	3	-	-	-	-
Hordeum pusillum	_	5		_	_	5	_	_	3	35	20			-		-	-	-	_	-	-	_	_	-
Phyla lanceolata		-	-		-	-	-			-	_		5	-	-		9	10	5	-	2	-	-	-
Lactuca oblongifolia	—	-		_		_		-	—	-	-	_	5		1		_	-	2	3	_	5		-
Plantago rugellii	-	-		20		5	-	-	5	_		_	_			-	-	-	-	-	2		-	-
Setaria viridus		5	—	3	-			20	—		-				-	-		-	-	3	2	_		-
Aster sp.	-		—	—	-		_	-	—		_	_	_			-	19	_		_	2		3	3
Erigeron strigosus	—	-	-	5		_	-	_		_	_	-	—	_	1		1	_	_	_	-	10		-
Rosa sp.	3	-	5	3	_	_	—			_		_			-	-	-	-	_		5			
Cannabis sativa		-	45		-		-		-	-	45			_	-				-	3	_		—	
Digitaria sanguinalis	_	10		5		_	-			25				_	_		_	-	-	_	-		_	
Ambrosia trifida		_	15	_	-		_	_	_	_	5		_	5	_		_		_	_	_		_	-
Panicum virgatum	20	_	_	_	_	_		_	3								_	-		_	2	-	-	_
Leersia oryzoides	_		-		_	_			_	_	5		_	_	_			_	8			_	2	
Potentilla recta	_	-	-	_	_	5	_			_	_		_	5	_		_				_	5	_	_
Agrostis stolonifera	_			_			_		_	_	*			_	_		_	_	2	-	2	10		
Thlapsi arvense	_	_	_					_		_	_			_	1		1	_	_	10	_	_		_
Sphenopholis obtusata	_	_				_	_			_			_	_	1	_	9		_	_	2	_	_	_
Desmanthus illinoensis			_	_	_	_	_	_	_	_	_			_	_		20	_			_	_	12	_
Setaria glauca			_	_			_	-	_	5	20	-		_	_				_		_		_	_
Equisetum arvense		_	15	8		_	_	_		_		_	_	_		_	_				_		_	
Verbena bipinnatifida	_	5	_		_	_	_	_	18		_		_	_	_								_	_
Eragrostis cilianensis	_	_	_	_		_	_		_	_		_	_	5		15			_	_	_	_	_	
Parietaria pensylvanica				_	_		_	_			5	_		_	_		_			10	-		_	
Nepeta cataria	_	_	_	_	_	5	_	_	_	_			_	_						8				
Helianthus annus						5		_		_			_	_			_	-	_	0	_	_		10
Descurainia ninnata	_						_			_	_	_	_			_		_		€0		_	2	10
Polygonum ramoniai	_		_	_			_			_	_						_	-	_	ŏ	_	_	-	3
Strophostyles helest	-	-	2.5	-	-	-	_		55		-	_				-	-	-	-	-	-	-	_	
Secale coreal.			35	-		-	-		-	_			-	-		-	_					-		-
Agronument	-	-	-		_	-	-	-	23	-	-		-	-	-	-	_		-		-	-	-	
Vicia will	-	-		_	-	-	-		-	_		-				-		20			-		-	-
villosa		-	-	10	-				-	-		-			-	-	-	-	-			-	_	

*Indicates no value.

TABLE II. Percent basal vegetative cover for species with a cumulative value greater than 10%. Species are listed in order from, most to least abundant.

												A	rea											
Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	25
Bromus inermis	21	20	26	17	72	41	93	46	30	44	12	75	3	59	29	44	30	19	44	12	46	79	50	51
Carex sp.	9	8	7	7	*	12		4		6	25	2	4	6	3	12	26	2	23	26	36	17	3	4
Poa pratensis		30	62	20	-	20	4	2	46	4	-	-	50	Т	26	16	16	39	16	11	6		25	26
Andropogon gerardii	44	10	Т	1	9		3	4	—	_		-	—	6	Т		2		—	11		4	_	
Polygonum sp.	—	-	2	3	_			19	_	-	13	2	3	19	_	_	_	2	Т	—		-	_	
Cenchrus longispinus		2	_	5				5	-	2	11		_	_	1	Т	_	3		1	-			
Rumex sp.			-	1		3	_		-	4	6		6		_	Т	-	2	1	3	_	-		
Viola sp.	Т			Т	_	_		_	_	2		-		Т	_	-		_	1	1	Т	_	1	
Hordeum jubatum	Т	-	_	1			_		2	4	-		8			_	Т	5	_	_		_		
Taraxacum officinale			_	2	-	2	_	8				-	13	_	_	4		21	_	_	_	-	-	-
Kochia scoparia		_	Т	_	_	_	_	5	_	_	11		_	_		Т	1			11		_		
Oxalis stricta	_	6	Т	_	_		_	_	-	4			_	2	Т	Т	—	_	_	_			_	-
Agropyron smithii		-		_	_	_	_	1	_		-	2		_	_		2	_	1	1		_	3	
Bromus tectorum	_		Т	30					_	_	_	15	_		Т	4		_			—	—	_	-
Medicago lupulina	_			_			_		_	_		_	_	_	Т	Т	5		6			_	-	15
Echinochloa crusgalli	-	_	_	_	_	_	_	_	_	2	_	5	1	3	1	_	_			_	_	_	_	_
Hordeum pusillum	_	22	_		_		_		2	13	_	_	_			_		_	-	1	_	_	_	-
Trifolium repens	_	_	_	_	2	_	_	_		_	_	_	_	_	13	7	_	_	_	_	4		_	-
Equisetum arvense			Т	_	_	8			_	_		_	_				3	_	1		_	_	_	
Anemone canadensis		_	_	3				_	_	_	_	_			_	Т			_	6	_	_	_	1
Setaria verticillata	7	_	_		_	_	_	3		_	_	_	_			_		— 1		9		_	_	_
Chenopodium album	11			Т		_	_	_	_	_	_	_	_	_	Т	_			_		_	_	_	-
Polygonum ramosissimum	_		_	_	15	_		_	_	_		_	_		_	4	_	_			_	_		
Spartina pectinata		_	_	3		_	_			_	_	14				_		_	_		_	-		
Trifolium pratense	_			-	_	_	_	-	-		_	_	_		19	-	-	-				-		

*Indicates no value.

T=Trace value of less than 1%.

edge-areas: (1) 1, 3, 19, and 21; (2) 15, 17, and 23; (3) 4, 5, 6, 7, 8, 9, 11, 14, 16, 20, and 22. The number of species present ranged from 6 to 34 (Table I). Area 6 was a roadside ditch with the low value; area 20, a roadside irrigation ditch, had the most species recorded. A comparison of the three groups showed that site 21 of group 1 had the high value of 31 species. This was a wide roadside ditch adjacent to Nebraska Highway 36. It was subject to only a single pass with a mower next to the shoulder of the road.

Species richness values for group 2 ranged from 27 to 32.

Site 17 had the highest number of species and was a wide roadside ditch. Area 20 of the group had 34 species and was a ditch with very steep sides and standing water in the bottom. Mowing was limited to a portion of the ditch that a sickle-bar mower operating from the road could reach. It was interesting that area 8, north of and continuous with area 20, was similar in size and configuration, but only 21 species were recorded. The only apparent difference between the two was that area 20 was adjacent to the organic farm while area 8 was adjacent to conventionally farmed fields. Herbicide drift from the adjacent corn field could have influenced plant species occurrence. TABLE III. Basal species cover and frequency of plants in a pasture of eastern Nebraska agricultural land. Values given as percentage.

Species	Basal Cover	Frequency
Ambrosia artemisiifolia	_	4
1 nsilostachya	_	3
promus inermis	71	99
p tectorum	1	_
Carex SD.	_	2
Chenopodium album	1	1
Funhorbia maculata	-	11
Hordeum jubatum	1	1
Kochia scoparia	1	3
tenidium virginicum	-	1
Medicago lupulina	1	7
M. sativa	-	5
Melilotus officinalis	_	3
Oxalis stricta	10	_
Poa pratensis	8	9
Taraxacum officinale	6	14

Field edge and roadside vegetation 25

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