

Proceedings of the Iowa Academy of Science

Volume 36 | Annual Issue

Article 32

1929

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Robert P. Adams

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Recommended Citation

Adams, Robert P. (1929) "Weed Succession on an Abandoned Roadway," *Proceedings of the Iowa Academy of Science*, 36(1), 213-219.

Available at: <https://scholarworks.uni.edu/pias/vol36/iss1/32>

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WEED SUCCESSION ON AN ABANDONED ROADWAY

ROBERT P. ADAMS

In 1912, Dr. B. Shimek of the State University of Iowa, presented a paper, "An Artificial Prairie," before the Botanical Society of America. In this article, he described and explained a strip of "man-made prairie" bordering the roadway leading north from Homestead to Amana, Iowa. This road was cut in 1856 through the dense upland woods lying between the two villages and bordering the valley of the Iowa River. Its inception and maintenance provided conditions of such a xerophytic character that a typical prairie strip was produced. By means of comparison between a comprehensive list of the xerophytic plants growing on this prairie and a similar list compiled from collections of plants growing in the deep woods habitat just a few feet back of the clearing, he was able to prove the existence of a prairie "in the heart of the forest." This xeric condition was brought about by the cutting of the forest and the continuous clearing of trees and brush from the roadway afterward, allowing full exposure to the sun and wind from the southwest. Evaporation was so raised and relative humidity so lowered that conditions favoring the establishment of a prairie resulted.

In more recent years, the management of the Amana Society seems to have devoted less painstaking care than formerly to the removal of encroaching brush, so that gradually, up to the year 1925, the width and the cleancut character of the prairie borders diminished. In that year, a new bridge was constructed across the Iowa River, a new road cut through the forest at a different angle to meet the bridge and the old roadway abandoned.

A collection of prairie plants made by the writer during August of both 1925 and 1926 checked very closely with the list given by Dr. Shimek in 1912, except that some early season species, not conspicuous or even visible in late summer, were not recorded in the later record. The striking difference lay in the extreme narrowness of the prairie strip, in most places hugging the very edge of the bank between woods and roadway, and as a corollary, the small number of individuals of many species was very evident.

The roadway was abandoned in midyear, 1925. In August, 1926, the first census of plants growing in the old driveway was taken. A section about one quarter of a mile long, lying to the south of the bisection of the old road by the new, was selected for the purpose. The elevation of the south end of this road section is considerably higher than the north end, where it dips down into a small upland bog before meeting the new road. The soil is quite sandy, especially toward the south. It is to be remembered that this road-bed was practically bare of vegetation at the time it was abandoned, as it had been graded and scraped systematically up to this time.

The included list of twenty-four species found on the roadbed proper, from ditch to ditch, was entirely of weedy plants. The possible exception, *Panicum Scribnerianum*, is not usually a weed, but is included as it was a pioneer invader. According to habitat groupings, the list follows:

A. Introduced, cosmopolitan as to habitat but preferring open places.

- Amaranthus retroflexus* L.
- Anthemis Cotula* L.
- Digitaria sanguinalis* (L.) Scop.
- Echinochloa crusgalli* (L.) Beauv.
- Phleum pratense* L.
- Setaria glauca* (L.) Beauv.
- Trifolium repens* L.

Trifolium repens is included here as an introduced weed, although many authors consider it a native plant of wide distribution.

B. Native.

1. Prairie weeds.

- Amaranthus blitoides* Wats.
- Ambrosia artemisiifolia* L.
- Cassia Chamaecrista* L.
- Erigeron ramosus* (Walt) BSP.
- Erigeron canadensis* L.
- Euphorbia corollata* L.
- Lepidium apetalum* Willd.
- Oxalis corniculata* L.
- Panicum Scribnerianum* Nash.
- Polygonum aviculare* L.

2. Wet ground forms.

- Acnida tuberculata* Moq.
- Agrostis alba* L.
- Ambrosia trifida* L.
- Panicum dichotomiflorum* Michx.

3. Cosmopolitan species.

- Eragrostis Frankii* (Fisch. Mey. and Lall.) Steud.
- Eragrostis pilosa* (L.) Beauv.
- Polygonum pennsylvanicum* L.

We can see from the above groupings that ten of the native weeds are from prairie origins. Of the remaining seven, four belong to low or wet places, and were originally prairie in origin, while the remaining three are of wide and mixed origin, and distribution.

Cassia Chamaecrista was perhaps the dominant invader, especially on the sandier portions of the tract. The grasses, *Setaria glauca*, *Eragrostis pilosa* and *Eragrostis Frankii* were quite widely and evenly distributed. It was strikingly noticeable, however, that the invading plants had, as yet, only thinly covered the bare soil.

At the close of the 1927 season, the flora had much more completely possessed the soil. *Melilotus alba* appeared new in considerable quantity, as did *Poa pratensis*. *Trifolium repens* was much more common and wide spread than the previous year. Seedling plants of *Solidago*, *Liatris*, *Rudbeckia*, *Helianthus*, *Cirsium*, and *Aster* were to be found but not referable to species in their juvenile condition. *Cassia Chamaecrista* was still the most abundant and conspicuous species. A sprinkling of *Potentilla canadensis* had established itself also.

In 1928 beginnings of a more pronounced change became evident. The roadbed began to lose some of its former weedy character. Some weed species had disappeared. Of these, *Echinochloa crusgalli*, *Polygonum pennsylvanicum*, *Amaranthus retroflexus*, *Amaranthus blitoides* and *Ambrosia trifida* might be mentioned. *Melilotus alba*, *Trifolium repens* and *Cassia Chamaecrista* were the most conspicuous species as to number of individuals and space occupied.

A. Monocotyledones.

1. Lower damper soil habitat.

Agrostis alba L.

Panicum dichotomiflorum Michx.

Phleum pratense L.

Poa pratensis L.

2. High dry habitat.

Agrostis perennans (Walt) Tuckerm.

Juncus tenuis Willd.

Poa compressa L.

Panicum Scribnerianum Nash.

3. Woods.

Bromus ciliatus L.

Cinna arundinacea L.

Carex rosea Schkur.

4. General habitat.

Eragrostis Frankii (Fisch. Mey. and Lall.) Steud.

Eragrostis pilosa (L.) Beauv.
Setaria glauca (L.) Beauv.

In this grouping are found three new species from the adjacent woods, *Bromus ciliatus*, *Cinna arundinacea*, and *Carex rosea*. One, *Poa compressa*, comes from the nearby prairie strip, while *Juncus tenuis* and *Agrostis perennans* are new and weedy, but not strict as to habitat choice, preferring, however, a dry sterile situation.

B. Dicotyledones :

1. Weeds.

a. Low ground species.

Acnida tuberculata Moq.
Polygonum acre HBK.
Radicula palustris (L.) Moench.
Trifolium hybridum L.

b. Dry or sandy soil species.

Ambrosia artemisiifolia L.
Cassia Chamaecrista L.
Erigeron canadensis L.
Euphorbia corollata L.
Lepidium apetalum Willd.
Polygonum aviculare L.

c. Species of more general habitat choice.

Erigeron ramosus (Walt) BSP.
Melilotus alba Desr.
Oxalis corniculata L.
Potentilla canadensis L.
Trifolium pratense L.
Trifolium repens L.

In this list, again, nine of the sixteen species are pure prairie weeds, four are introduced, while three are from general sources.

The low ground species are to be found for most part in or near the bog at the north end of the road. This spot provides for several species not to be found in other parts of the area.

2. The prairie list of invaders includes plants that were present the year before as juveniles, and were this season in flower and fruit. It includes :

a. Dry ground species.

Antennaria neglecta Greene.
Aster multiflorus Ait.
Rudbeckia hirta L.
Solidago rigida L.

b. Moist ground species.

Cirsium discolor (Muhl) Spreng.
Helianthus grosseserratus Martens.
Liatris pycnostachya Michx.

Rudbeckia subtomentosa Pursh.
Solidago canadensis L.
Veronica virginica L.

3. From the woods are to be traced another group of invaders. These are in most part, woody plants and are yet one year seedlings. This list is divided into two portions, the one, of plants which are naturally found along borders, often extending far out into pure prairie formations. Of these species, the most outstanding are *Corylus americana*, *Rhus glabra*, *Rhus Toxicodendron* and *Vitis vulpina*. The greater portion of these first invaders are, naturally, these very border plants. However, a few deep forest plants are also represented among them, *Populus tremuloides*, and *Populus grandidentata*. These two species could well be termed forest weeds, since they are usually the first trees to occupy a clearing.

- a. Plants of borders.
 - Ciriu maltissimum* (L.) Spreng.
 - Corylus americana* Walt.
 - Rhus glabra* L.
 - Rubus allegheniensis* Porter.
 - Rubus occidentalis* L.
- b. Forest plants.
 - Aster Drummondii* Lindl.
 - Ribes gracile* Michx.
 - Populus tremuloides* Michx.
 - Populus grandidentata* Michx.
 - Prunus serotina* Ehrh.
 - Quercus alba* L.
 - Quercus velutina* Lam.

We have seen at the close of three years the following changes in the flora of this area :

1. Suppression and elimination of many introduced weedy species, which first took possession.
2. Extension in individuals of a few strong species as *Cassia Chamaecrista*, *Poa pratensis* and *Trifolium repens*.
3. Retention of most of the native prairie weeds.
4. Invasion by other prairie species.
5. Invasion by wood species.

We can trace through this three year study a definite tendency among plants of this area. First, the dominance of the weed, many of them introduced weeds. Quickly, however, the prairie attempts to dominate this bare area, first by its prairie weeds, then by non weedy prairie species.

It is evident, however, judging from the origin of this bit of

roadside prairie in the "heart of the forest" and from its subsequent behavior, both when man aided in preserving conditions permitting its perpetuation and since he has retired from any active agency in the matter, that this prairie is not a climax flora. Hence, any attempt by prairie plants to establish a climax on this roadway is doomed to failure. The start of a forest flora begun in the third year, should mark the beginnings of a flora which will, if allowed to pursue its own course, in time establish a climax.

In the subjoined table, the plants of this roadway are listed. The year of their first appearance, their duration during one, two or three seasons is checked. This graphically illustrates the tendency set forth above. It will be observed that the plants appearing in 1926 are almost entirely weedy, that those appearing first in 1927 are mostly prairie species, and those first listed in 1928 are in most part woods forms.

	1926	1927	1928
<i>Acnida tuberculata</i>	x	x	x
<i>Agrostis alba</i>	x	x	x
<i>Amaranthus blitoides</i>	x	x	
<i>Amaranthus retroflexus</i>	x	x	
<i>Ambrosia artemisiifolia</i>	x	x	x
<i>Ambrosia trifida</i>	x	x	
<i>Anthemis Cotula</i>	x		
<i>Cassia Chamaecrista</i>	x	x	x
<i>Digitaria sanguinalis</i>	x		
<i>Echinochloa crusgalli</i>	x	x	
<i>Erigeron canadensis</i>	x	x	x
<i>Erigeron ramosus</i>	x	x	x
<i>Eragrostis Frankii</i>	x	x	x
<i>Eragrostis pilosa</i>	x	x	x
<i>Euphorbia corollata</i>	x	x	x
<i>Lepidium apetalum</i>	x	x	x
<i>Oxalis corniculata</i>	x	x	x
<i>Panicum Scribnerianum</i>	x	x	x
<i>Panicum dichotomiflorum</i>	x	x	x
<i>Phleum pratense</i>	x	x	x
<i>Polygonum aviculare</i>	x	x	x
<i>Polygonum pennsylvanicum</i>	x	x	
<i>Setaria glauca</i>	x	x	x
<i>Trifolium repens</i>	x	x	x
	1926	1927	1928
<i>Aster multiflorus</i>		x	x
<i>Aster Drummondii</i>		x	x
<i>Cirsium altissimum</i>		x	x
<i>Cirsium discolor</i>		x	x
<i>Helianthus grosseserratus</i>		x	x
<i>Liatris pycnostachya</i>		x	x
<i>Melilotus alba</i>		x	x
<i>Poa pratensis</i>		x	x
<i>Potentilla canadensis</i>		x	x
<i>Rudbeckia hirta</i>		x	x
<i>Rudbeckia subtomentosa</i>		x	x
<i>Solidago canadensis</i>		x	x
<i>Solidago rigida</i>		x	x

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	1926	1927	1928
Agrostis perennans.....			x
Antennaria neglecta.....			x
Bromus ciliatus.....			x
Carex rosea.....			x
Cinna arundinacea.....			x
Cornus asperifolia.....			x
Corylus americana.....			x
Juncus tenuis.....			x
Polygonum acre.....			x
Populus grandidentata.....			x
Populus tremuloides.....			x
Poa compressa.....			x
Prunus serotina.....			x
Quercus alba.....			x
Quercus velutina.....			x
Radicula palustris.....			x
Rhus glabra.....			x
Rhus Toxicodendron.....			x
Ribes gracile.....			x
Rubus allegheniensis.....			x
Rubus occidentalis.....			x
Trifolium hybridum.....			x
Trifolium pratense.....			x

IOWA CITY, IOWA.