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Conservation Efforts and Natural History of a Prairie Habitat at Jennings Environmental Education Center, Pennsylvania

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Abstract

The habitat considered in this study is a 19.8-acre (8.0-hectare) prairie relict, which is part of the 296-acre (120-hectare) park (Jennings Environmental Education Center), and it is located in northwest Pennsylvania (Butler County). This prairie remnant is one of the easternmost existing relicts of the once widespread post-glacial prairies. The focus of this paper is to present an overview of the natural history of the Jennings Prairie with emphasis on preservation practices that have occurred since its discovery, in 1905, and management approaches aimed at the conservation of this habitat. The maintenance of its 225 native plant species requires human intervention in order to avoid its succession into a forest ecosystem, which is typical for this bioregion. Pedologic data are presented briefly as a framework used to justify decision-making in common land management practices. The conservation of the Jennings Prairie (the only one remaining of a few prairies dislocated through the landscape of western Pennsylvania) remains a unique habitat unit to demonstrate ecosystem diversity in the region.

Keywords: prairie, adaptive management, conservation, Jennings Environmental Education Center, relict prairie, western Pennsylvania

Although deciduous forests cover almost entirely the state of Pennsylvania, prairie habitats have been described in the western part of the state for decades (Aaron 1974a, 1974b). A consistent establishment of early European settlements in the second half of the eighteenth century initiated major physical changes on the landscape. Smith (2001) argued that prairie extirpation from the Midwestern landscape occurred primarily because of agricultural expansion and urban development. A similar fate affected prairie habitats in western Pennsylvania and has been attributed to both deforestation and aggressive mining operations (Taylor and others 2003). In addition to this, the great oil boom of the 1800s led to the establishment and development of towns all over northern Butler County, although no oil was found in the Jennings area (M. Dunn, personal communication 2002). Perhaps, it was to save this rare testimony of its ancient natural history that the Western Pennsylvania Conservancy purchased Jennings Prairie from private landowners in 1951.

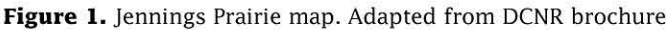
Today this relict habitat is part of Jennings Environmental Education Center, which is located in Butler County (northwest Pennsylvania) and comprises 296 acres (120 ha) managed by the Pennsylvania Department of Conservation and Natural Resources (DCNR), Bureau of State Parks. The nature reserve includes a relict prairie of the once Slippery Rock cluster (Aaron 1974a), which is adjacent

to U.S. Route 8, 19.3 km north of Butler, Pennsylvania. Here, in 1905, a 19.8-acre (8-ha) prairie ecosystem was discovered by Dr. Otto Emery Jennings, a botanist with the Pittsburgh Carnegie Museum (DCNR brochure). According to Aaron (1974a, 1974b) prairie habitats evolved in western Pennsylvania at the end of the glacial era (about 14,000 years ago). Eleven of them were discovered in the 1960s in Butler County.

The Jennings Prairie is valued for its dominant growth of forbs, and among these the dense blazingstar (*Liatris spicata*) is particularly appreciated. The purpose of this paper is to describe this rare, wet-mesic prairie habitat in a typically forested region and to present its natural history. Additionally, our paper focuses on discussing conservation strategies and challenges in prairie maintenance by managers and researchers at Jennings Environmental Education Center with the aim of achieving adaptive and sustainable management practices for the long-term prosperity of this, unique prairie habitat.

Physical Features of the Land

Jennings Environmental Education Center and its relict prairie are part of the Appalachian Plateau Province and stand at altitudes ranging between 1,247 and 1378 ft



Continental glaciers advanced toward the Jennings area three times between 120,000 and 23,000 years ago, and geologic history relevant to present day conditions of Jennings Prairie occurred at similar times, during a concurrent establishment of prairie habitats in southern Ohio (Braun 1928b). At earlier times however (from 360 to 330 million years before present), all of western Pennsylvania was part of a shallow, inland sea, bordered on the west by deep waters, and on the east by a then newly formed ridge which lasted about 30 million years (Transeau 1935, Mehrhoff 1997). Erosion and sedimentation contributed to the establishment of rock strata between the late Paleozoic and early Mesozoic eras and shaped the characteristics of its soils, which derived primarily from sediments of glacial lakes (Transeau 1935, Deevey 1949). The moderate permeability of most soils in western Pennsylvania supports a high, seasonal water table and makes them unfeasible for cashcrop farming, or development. They are mostly gently sloping and acidic (Soil Survey of Butler Co. 1989), favoring an agricultural production of corn, soy bean and fodder crops that are grown in rotation, to suffice the needs of the local dairy industry. Pedogenesis at Jennings goes back to 14,000 years, when the glaciers that until then covered the landscape, began to recede. An additional 7,000 years determined favorable climatic changes, which enhanced prairie establishment, as the environment evolved through a xerothermic phase (Braun 1928a, Braun 1955, Mehrhoff 1997). However, according to Cowles (1928) this time frame, although consistent, was not sufficient to develop prairie soils

Jennings Prairie and its Flora

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Conservation Strategies and Approaches at the Jennings Prairie

Three trails are maintained through the prairie (Blazing Star, Massassauga, and Prairie Loop) in order to facilitate access to the site by visitors and also for obvious managerial reasons (Figure 1). The holistic goal of prairie ecosystem management at Jennings focuses on protecting, maintaining and enhancing a unique ecosystem, in an effort of preserving also rare species, in a biologically diverse community (State Park Management Manual 1993). However, a pursuit toward this primary and broad goal entails interaction with a variety of other goals supporting specific areas. Inevitable conflicts may arise occasionally, when certain goals conflict with one another, or detract from the primary goal.

At Jennings Prairie these conflicts are common and they are resolved with an approach that often demands flexibility in routine decision-making, as simplistic solutions applied to complex systems normally fail to fulfill expected outcomes (Pilione 1998). Maintaining a safe and durable system that will not irreversibly damage the prairie through visitors' impact constitutes an extremely important secondary goal for the Jennings Prairie. More goals include the protection of the prairie from alien vegetation, maintain species composition, control soil water saturation and water based hibernaculum area, manage aggressive tree growth invasion. Maintaining current research programs about management prescription effects is another legitimate goal (State Park Management Manual 1993), as often decisions about land management and use are made without considering implications for ecological disturbances and impacts created by a linear *modus operandi* (Dale and others 2000). We remain convinced that land management unavoidably demands a decision-making solidly grounded in ecological and ethical principles and theory. A viable framework to prepare land managers to operate in a more sustainable manner is presented by the Land Ethic (Leopold 1949), and we advocate an application of its principles in conservation efforts at Jennings and elsewhere.

Prescribed Fires as a Management Tool at Jennings Prairie

Controlled burning is an effective technique in prairie restoration and conservation (Pauly 1997), but in order to effectively fulfill the managerial goals of a specific environment, it may be integrated with other methods to maximize its beneficial effects. At Jennings, vegetation control with prescribed fires takes place usually in the spring, between mid-March and early May and these are coordinated with the Bureau of Forestry and County Control. Copeland and colleagues (2002) discussed how prescribed prairie fires during the late growing season enhance species richness of both forbs and warm-season tallgrasses. A spring burn contemplated by the fire schedule in place at Jennings is conceived to generate

minimum disturbance to the massassauga rattlesnake, which is still hibernating at this time of the year. A 10-foot fire line surrounds the prairie on its western side whereas existing trails serve as a fire line for the eastern boundary (Figure 1). The respective fire lines are mowed semi-annually and when soils are deeply frozen, depending upon which quadrants will be burned on a yearly basis. Therefore, these operations can be conducted during the winter months if heavy, mechanical equipment is used.

The prairie has never been burnt all at once in order to avoid excessive disturbance to the hibernating rattlesnake and, more importantly, to minimize the risk for the surrounding forest to catch on fire. Rosburg (2001) pointed out that late spring fires can be used effectively to control non-native species in prairies without negatively affecting forb communities. Winter (end of January at Jennings) is also conducive to accomplishing manual operations on the prairie, aimed primarily at controlling the propagation of tree seedling community (*Aspen* spp.), which pose great challenges to prairie preservation at Jennings. Manual operations such as this one could be postponed into late winter, especially if geared also toward seed dispersal, as Jackson (1999) demonstrated the beneficial effects of trampling during seeding with prairie perennials to establish permanent pastures in northern Iowa. Immediate and long-term effects of fire on complex, vegetative, assemblages depends on fire severity, extent and timing as well as on the characteristics of the area (Reichman 1987, Vickery and Dunwiddie 1997). Although forb assemblage fires differ from tallgrass prairies and even more from woodland fires, burns constitute standard maintenance procedures to fit eastern grasslands (Winne 1997). However, frequent burning has been proven to reduce species heterogeneity at the advantage of grasses, if mowing, and/or grazing do not complement vegetation management (Collins and others 1998). Finally, Vickery (2002) demonstrated that the effect of prescribed fires enhances seed viability and protection from insect predators on the northern blazingstar (*Liatris scariosa* var. *novae-angliae*). Therefore, it is plausible to surmise that besides positively affecting the plant phenology and propagation, prescribed fires may exert a beneficial control of various pathogens and parasites. The challenge remains to verify with more research that a combination of practices (including burning and mowing), properly alternated, can best fulfill the managerial needs of the site.

Conclusion

It remains challenging to verify the environmental features of Butler County, Pennsylvania and its relict prairie at Jennings prior to European settlement. Thus, preserving a habitat that accurately reflects those earlier botanical attributes becomes quite an arduous venture. Allison (2002) argued that even surveys of old tallgrass prairies in the Midwest aimed at pursuing the most precise restoration plans are difficult to achieve in full. Inevitable environmental changes, succession and various anthropogenic factors (including interactions among plants and soil communities) are consistent with the

dynamism occurring in natural systems. A reliable body of literature remains available to learn about prairie habitats in various regions of continental United States (Whitford 1958, Reichman 1987, Van Bruggen 1992, Vickery and Dunwiddie 1997) and assess conservation efforts over time (Bever 1994, Vidrine and others 2001). Concurrently, a growing interest by the general public of adopting a prairie habitat as a model to convert lawns into more sustainable landscapes, inhabited primarily by perennial plant species over annual cultivars is becoming more popular and better accepted through educational initiatives as those programmed by Jennings Environmental Education Center. Recent efforts in Louisiana demonstrate the enthusiastic momentum of the restoration movement in the southern United States, where, until a few years ago, such a paradigm was often unconceivable (M.F. Vidrine, public communication 2001). Since 1995, similar efforts have been occurring at the Robert A. Macoskey Center of Slippery Rock University, an institution for higher education that is located a few miles north of the Jennings Prairie (Doherty and others 2001, Chesto and others 2002). This site has provided for several years outstanding educational opportunities for its students in restoration ecology, while strengthening collaboration in education and research efforts with Jennings Environmental Education Center and other conservation parties in western Pennsylvania. Manuals and other materials have become available recently to learn more about the botanical heritage of our region and thus, enhance concerns among local citizens for preserving rare and endangered plant species (Haywood and Monk 2001, Rushing 2003).

Several implications to guide future research have emerged from this initial study beside a need to continue with education efforts in our area in order to instill among the general public sound principles of ecosystem conservation, as natural habitats become scarcer and more fragmented. An adaptation in the use of fire while attempting to preserve the endangered massasauga rattlesnake constitutes a clear challenge at the Jennings Prairie. Therefore, a better understanding of the biology of this reptile will allow for a more efficient use of fire in the management of the prairie flora. Alternative methods to fire use studies (mechanical, chemical, manual) to control arboreal population encroachment is another open field for future investigations, which requires great attention at Jennings. Finally, soil and hydrological investigations will broaden the knowledge of the ecology of plant communities at Jennings and of its associated entomofauna. Vickery and Dunwiddie (1997) pointed out for example, how limited is the knowledge about invertebrates (particularly insects), and their ecological interactions with prairie plants. Thus, a better understanding about prairie insects and flora could expand and improve opportunities in achieving also sustainability in modern farming systems (Vidrine and Borsari 1998, Vidrine and Borsari 1999) feasible for this part of the country. We refer primarily to pollination services and biological control strategies by beneficial insect species, which studied at the Jennings Prairie could eventually, become employable in local agroecosystems, as

Pennsylvania remains primarily a vast agrarian region. Also, we remain convinced that a better understanding of the evolutionary consequences of management practices about the plant species being managed at the Jennings Prairie is of paramount importance. The achievement of this objective will require more in-depth knowledge about the ecological processes that shaped the Jennings Prairie and its taxa. Therefore, we advocate a need for more quantitative research framed around current management practices that will generate opportunities to learn more about this unique environment and, ultimately, help us to include new research findings into more improved management practices.

Acknowledgments

We are grateful to Philip Tramdack and his staff at the Bailey Library of Slippery Rock University for their help with the retrieval of most of the references that were consulted to write this manuscript. We also thank anonymous reviewers and attendees of the 19th North American Prairie Conference. Dr. Malcolm F. Vidrine was very supportive and encouraged us enthusiastically throughout this work. Giovanni B. Borsari was helpful with the transcription and organization of the plants list.

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Appendix 1. Herbaceous, angiosperm list of taxa by major plant group, and then by family from Jennings Prairie in western Pennsylvania.

(Adapted from: State Park Management Manual 1993). The symbol (*) after the plant scientific name stands for: Introduced (non-native).

	Common Name	Scientific Name
MONOCOTYLEDONS		
ARACEAE	Northern jack-in-the-pulpit	<i>Arisaema stewardsonii</i>
	Small jack-in-the-pulpit (L.) Schott	<i>Arisaema triphyllum</i>
DIOSCOREACEAE	Wild yamroot	<i>Dioscorea villosa</i>
IRIDACEAE	Blue-eyed grass	<i>Sisyrinchium angustifolium</i> P. Mill
LILIACEAE	White clintonia	<i>Clintonia umbellulata</i> Michx.
	Day lily	<i>Hemerocallis fulva</i> L.
	Canada lily	<i>Lilium canadense</i> L. ssp. <i>canadense</i>
	Large-flowered trillium	<i>Trillium grandiflorum</i> (Michx.) Salisb.
	Wild oats	<i>Uvularia sessilifolia</i> L.
	Indian poke	<i>Veratrum viride</i> Ait.
ORCHIDACEAE	Nodding ladies'-tresses	<i>Spiranthes cernua</i> (L.) L. C. Rich.
POACEAE	Slender wheat grass	<i>Agropyron trachycaulum</i>
	Hairgrass	<i>Agrostis hiemalis</i> (Walt.) B.S.P.
	Redtop	<i>Agrostis stolonifera</i>
	Big bluestem	<i>Andropogon gerardii</i> Vitman
	Broom sedge	<i>Andropogon virginicus</i> (L.)
	Sweet vernal grass	<i>Anthoxanthum odoratum</i>
	Bearded short husk	<i>Brachyelytrum erectum</i>
	Common hairy chess	<i>Bromus commutatus</i>
	Smooth brome grass	<i>Bromus inermis</i> (Leyss.)
	Wild chess	<i>Bromus kalmii</i> Gray
	Wood reed grass	<i>Cinna arundinacea</i>
	Poverty oats	<i>Danthonia spicata</i>
	Wide-leaved panicum	<i>Dichanthelium laterifolium</i>
	Crabgrass	<i>Digitaria sanguinalis</i>
	Canada ryegrass	<i>Elymus canadensis</i>
	Bottlebrush grass	<i>Elymus hystrix</i>
	Riverbank ryegrass	<i>Elymus riparius</i> (Wieg.)
	Virginia wild rye	<i>Elymus virginicum</i>
	Nodding fescue	<i>Festuca obtusa</i> Biehler
	Fowl manna grass	<i>Glyceria striata</i>
	Velvet grass	<i>Holcus lanatus</i>
	Bottlebrush grass	<i>Hystrix patula</i> Moench
	Whitegrass	<i>Leersia virginica</i> (Willd.)
	Tall millet grass	<i>Milium effusum</i>
	Nimblewill	<i>Muhlenbergia schreberii</i>
	Witch grass	<i>Panicum capillare</i>
	Wide low panicum	<i>Panicum latifolium</i>
	Linear leaved panicum	<i>Panicum linearifolium</i>
	Switchgrass	<i>Panicum virgatum</i> L.
	Canada bluegrass	<i>Poa compressa</i>
	Foul bluegrass	<i>Poa palustris</i>
	Yellow foxtail	<i>Setaria lutescens</i>
	Green foxtail	<i>Setaria viridis</i>
	Little bluestem	<i>Schizachyrium scoparium</i> (Michx.) Nash
	Indiangrass	<i>Sorghastrum nutans</i> (L.) Nash
	Prairie wedge grass	<i>Sphenopholis obtusata</i>
SMILACACEAE	Carrion flower	<i>Smilax herbacea</i>
	Common greenbrier	<i>Smilax rotundifolia</i>
TYPHACEAE	Narrow-leaved cattail	<i>Typha angustifolia</i> L.



DICOTYLEDONS

ANACARDIACEAE

APIACEAE

APOCYNACEAE

ARACEAE

ASCLEPIADACEAE

ASTERACEAE

BALSAMINACEAE

BERBERIDACEAE

Poison ivy	<i>Toxicodendron radicans</i> (L.) Kuntze
Water hemlock	<i>Cicuta maculata</i> L.
Honewort	<i>Cryptotaenia canadensis</i> (L.) DC
Sweet cicely	<i>Osmorhiza claytonii</i>
Anise-root	<i>Osmorhiza longistylis</i>
Sanicle	<i>Sanicula gregaria</i>
Spreading dogbane	<i>Apocynum androsaemifolium</i> L.
Indian hemp	<i>Apocynum cannabinum</i> L.
Skunk cabbage	<i>Symplocarpus foetidus</i> L.
Poke milkweed	<i>Asclepias exaltata</i> L.
Swamp milkweed	<i>Asclepias incarnata</i> L.
Common milkweed	<i>Asclepias syriaca</i> L.
Butterflyweed	<i>Asclepias tuberosa</i> L.
Yarrow	<i>Achillea millefolium</i> L. (*)
Lesser ragweed	<i>Ambrosia artemisiifolia</i> L.
Field pussytoes	<i>Antennaria neglecta</i>
Calico aster	<i>Aster lateriflorus</i> (L.) Britt.
New England aster	<i>Aster novae-angliae</i> L.
Downy aster	<i>Aster sagittifolius</i>
Flat-topped white aster	<i>Aster umbellatus</i> P. Mill
Ox-eye daisy	<i>Chrysanthemum leucanthemum</i> L. (*)
Tall thistle	<i>Cirsium altissimum</i>
Canada thistle	<i>Cirsium arvense</i> (L.) Scop.
Swamp thistle	<i>Cirsium muticum</i> Michx.
Bull thistle	<i>Cirsium vulgare</i> (Savi) Tenore
Tall coreopsis	<i>Coreopsis tripteris</i>
Daisy fleabane	<i>Erigeron annuus</i> (L.) Pers.
Philadelphia fleabane	<i>Erigeron philadelphicus</i> L.
Robin plantain	<i>Erigeron pulchellus</i>
Boneset	<i>Eupatorium perfoliatum</i> L.
Hollow Joe-pye-weed	<i>Eupatorium fistulosum</i>
White snakeroot	<i>Eupatorium rugosum</i>
Flat-topped goldenrod	<i>Euthamia galetorum</i>
Thin-leaved sunflower	<i>Helianthus decapetalus</i>
Giant sunflower	<i>Helianthus giganteus</i>
Ox-eye	<i>Heliopsis helianthoides</i> (L.) Sweet
Sneezeweed	<i>Helenium autumnale</i> L.
Orange hawkweed	<i>Hieracium aurantiacum</i> L. (*)
Yellow hawkweed	<i>Hieracium floribundum</i>
Rough hawkweed	<i>Hieracium scabrum</i> Michx.
Two-flowered Cynthia	<i>Krigia biflora</i> (Walt.) S. F. Blake
Wild lettuce	<i>Lactuca canadensis</i> L. var. <i>canadensis</i>
Dense blazingstar	<i>Liatris spicata</i> (L.) Willd.
Black-eyed Susan	<i>Rudbeckia hirta</i> L. var. <i>hirta</i>
Green-headed coneflower	<i>Rudbeckia laciniata</i> L.
Golden ragwort	<i>Senecio aureus</i> L.
Whorled rosinweed	<i>Silphium trifoliatum</i> L. var. <i>trifoliatum</i>
Blue-stemmed goldenrod	<i>Solidago caesia</i> L. var. <i>caesia</i>
Canada goldenrod	<i>Solidago canadensis</i> var. <i>canadensis</i> L.
Late goldenrod	<i>Solidago gigantea</i> L.
Early goldenrod	<i>Solidago juncea</i> Ait.
Spreading goldenrod	<i>Solidago patula</i>
Rough-stemmed goldenrod	<i>Solidago rugosa</i> Ait. Var. <i>rugosa</i>
Showy goldenrod	<i>Solidago speciosa</i>
Common dandelion	<i>Taraxacum officinale</i> L.
Coltsfoot	<i>Tussilago farfara</i> L. (*)
New York ironweed	<i>Vernonia noveboracensis</i> (L.) Michx.
Spotted touch-me-not	<i>Impatiens capensis</i> Meerb.
May-apple	<i>Podophyllum peltatum</i> L.



BRASSICACEAE	Winter cress Pennsylvania bitter cress Cow-cress Field pennycress	<i>Barbarea vulgaris</i> R. Br. <i>Cardamine pennsylvanica</i> <i>Lepidium campestre</i> (L.) R. Br. <i>Thlaspi arvense</i> L.
CAMPANULACEAE	Indian tobacco Great lobelia Pale-spike lobelia	<i>Lobelia inflata</i> L. <i>Lobelia siphilitica</i> L. <i>Lobelia spicata</i> Lam.
CAPRIFOLIACEAE	Glaucous honeysuckle Tinker's weed	<i>Lonicera dioica</i> var. <i>glauscens</i> <i>Triosteum perfoliatum</i>
CARYOPHYLLACEAE	Mouse-ear chickweed Deptford pink Grassleaf chickweed Common chickweed	<i>Cerastium fontanum</i> Baump. <i>Dianthus armeria</i> L. <i>Stellaria graminea</i> L. <i>Stellaria media</i> (L.) Vill.
CLUSIACEAE	Dwarf St. Johnswort Spotted St. Johnswort	<i>Hypericum muticum</i> <i>Hypericum punctatum</i>
CONVOLVULACEAE	Hedge bindweed Upright bindweed	<i>Convolvulus sepium</i> <i>Convolvulus spithamala</i>
CUSCUTACEAE	Dodder	<i>Cuscuta gronovii</i> Willd ex. Schultz
ERICACEAE	Deerberry	<i>Vaccinium stamineum</i> L.
EUPHORBIACEAE	Flowering spurge	<i>Euphorbia corollata</i>
FABACEAE	Ground nut Black medic Low hop clover Alsike clover Red clover White clover Showy tick trefoil Dillen's tick trefoil Panicked tick trefoil	<i>Apios americana</i> Medic. <i>Medicago lupulina</i> <i>Trifolium campestre</i> <i>Trifolium hybridum</i> <i>Trifolium pratense</i> <i>Trifolium repens</i> L. <i>Desmodium canadense</i> (L.) DC. <i>Desmodium glabellum</i> <i>Desmodium paniculatum</i>
GENTIANACEAE	Closed gentian American columbo	<i>Gentiana andrewsii</i> <i>Frasera caroliniensis</i> Walt.
GERANIACEAE	Wild geranium	<i>Geranium maculatum</i>
LAMIACEAE	Downy wood mint Wild basil Bee-balm Wild bergamot Purple bergamot Downy scullcap Mad-dog scullcap Horse balm Ground ivy Henbit Cut-leaved water-horehound Bugle weed Heal-all Mountain mint Virginia mountain mint	<i>Blephelia ciliata</i> (L.) Benth. <i>Clinopodium vulgare</i> L. <i>Monarda didyma</i> <i>Monarda fistulosa</i> <i>Monarda media</i> <i>Scutellaria incana</i> <i>Scutellaria laterifolia</i> <i>Collinsonia canadensis</i> L. <i>Glechoma hederacea</i> L. (*) <i>Lamium amplexicaule</i> L. (*) <i>Lycopus americanus</i> L. <i>Lycopus virginicus</i> L. <i>Prunella vulgaris</i> L. (*) <i>Pycnanthemum flexuosum</i> <i>Pycnanthemum virginianum</i>
MONOTROPACEAE	Indian pipe Basil	<i>Monotropa uniflora</i> L. <i>Satureja vulgaris</i> (L.) Fritsch. (*)
ONAGRACEAE	Enchanter's nightshade Purple-leaved willow herb Seed box Sundrops	<i>Circaea lutetiana</i> L. <i>Epilobium coloratum</i> Biehler <i>Ludwigia alternifolia</i> L. <i>Oenothera fruticosa</i> L.
OXALIDACEAE	Yellow wood-sorrel Yellow wood-sorrel Violet wood-sorrel	<i>Oxalis europaea</i> L. <i>Oxalis stricta</i> L. <i>Oxalis violacea</i> L.
PLANTAGINACEAE	Common plantain Plantain	<i>Plantago major</i> <i>Plantago rugelii</i>
PORTULACACEAE	Spring beauty	<i>Claytonia virginica</i> L.
POLEMONIACEAE	Blue phlox Wild sweet william Greek valerian	<i>Phlox divaricata</i> L. <i>Phlox maculata</i> L. <i>Polemonium reptans</i> L.



POLYGALACEAE	Field milkwort	<i>Polygala sanguinea</i>
	Whorled milkwort	<i>Polygala verticillata</i>
POLYGONACEAE	Hairy Solomon's seal	<i>Polygonatum pubescens</i>
	Long bristled smartweed	<i>Polygonum caespitosum</i>
	Mild water pepper	<i>Polygonum hydropiperoides</i>
	Arrow-leaved tearthumb	<i>Polygonum sagittatum</i> L.
	Climbing false buckwheat	<i>Polygonum scandens</i> L.
	Jump seed	<i>Polygonum virginianum</i>
	Sheep sorrel	<i>Rumex acetosella</i> L.
	Bitter dock	<i>Rumex obtusifolius</i>
PRIMULACEAE	Fringed loosestrife	<i>Lysimachia ciliata</i> L.
	Whorled loosestrife	<i>Lysimachia quadrifolia</i> L.
RANUNCULACEAE	Wood anemone	<i>Anemone quinquefolia</i>
	Thimble anemone	<i>Anemone virginiana</i>
	Marsh marigold	<i>Caltha palustris</i>
	Black cohosh	<i>Cimicifuga racemosa</i>
	Virgin's bower	<i>Clematis virginiana</i> L.
	Kidney leaf buttercup	<i>Ranunculus abortivus</i> L. var. <i>abortivus</i>
	Yellow water crowfoot	<i>Ranunculus fascicularis</i>
	Hairy crowfoot	<i>Ranunculus recurvatus</i>
	Creeping buttercup	<i>Ranunculus repens</i>
	Swamp buttercup	<i>Ranunculus septentrionalis</i>
	Tall meadow-rue	<i>Thalictrum pubescens</i> Pursh.
	Rue anemone	<i>Thalictrum thalictroides</i> L.
ROSACEAE	Agrimony	<i>Agrimonia gryposepala</i>
	Swamp agrimony	<i>Agrimonia parviflora</i> Ait.
	Common strawberry	<i>Fragaria virginiana</i> P. Mill ssp. <i>virginiana</i>
	White avens	<i>Geum canadense</i>
	Dwarf cinquefoil	<i>Potentilla canadensis</i>
	Common cinquefoil	<i>Potentilla simplex</i> Michx.
	Pasture rose	<i>Rosa carolina</i> L.
RUBIACEAE	Cleavers	<i>Galium aparine</i>
	Rough bedstraw	<i>Galium asprellum</i>
	Shining bedstraw	<i>Galium concinuum</i>
	Wild licorice	<i>Galium kamtschaticum</i>
	Stiff bedstraw	<i>Galium obtusum</i>
	Sweet-scented bedstraw	<i>Galium triflorum</i>
	Bluets	<i>Houstonia caerulea</i>
	Partridgeberry	<i>Mitchella repens</i>
SAXIFRAGACEAE	Alumroot	<i>Heuchera americana</i> L.
SCROPHULARIACEAE	Turtle head	<i>Chelone glabra</i> L.
	Square-stemmed monkey-flower	<i>Mimulus ringens</i> L.
	Foxglove beardtongue	<i>Penstemon digitalis</i> Nutt ex. Sims
	Common speedwell	<i>Veronica officinalis</i> L.
	Thyme-leaved speedwell	<i>Veronica serpyllifolia</i> L.
	Culver's root	<i>Veronicastrum virginicum</i> (L.) Farw.
UMBELLIFERAE	Queen Anne's lace	<i>Daucus carota</i> L.
URTICACEAE	Stinging nettle	<i>Urtica dioica</i> L.
VERBENACEAE	Blue vervain	<i>Verbena hastata</i> L.
	White vervain	<i>Verbena urticifolia</i> L.
VIOLACEAE	American dog violet	<i>Viola conspersa</i> Reichenb.
	Wooly blue violet	<i>Viola hirsutula</i> Brainerd
	Northern white violet	<i>Viola macloskeyi</i> spp. <i>Pallens</i>
	Common blue violet	<i>Viola papilionacea</i>
	Smooth yellow violet	<i>Viola pennsylvanica</i> Michx.
	Downy yellow violet	<i>Viola pubescens</i> Ait.
	Arrow-leaved violet	<i>Viola sagittata</i> Ait.
	Wooly blue violet	<i>Viola sororia</i> Willd.
VITACEAE	Virginia creeper	<i>Parthenocissus quinquefolia</i> L.
	Fox grape	<i>Vitis labrusca</i>
	New England grape	<i>Vitis novae-angliae</i>
	Frost grape	<i>Vitis riparia</i>