THE VEGETATION AND CONSERVATION STATUS OF UPLAND HARDWOOD FORESTS IN EASTERN MONTANA

Peter Lesica

The Nature Conservancy

Montana/Wyoming Field Office

P.O. Box 258

Helena, Montana 59624

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INTRODUCTION

The Great Plains is the largest grassland region of North America. Forest communities in the Northern Great Plains are relatively rare, occupying less than 1% of the landscape (Bjugstad 1977). Native forests occur as isolated islands or stringers along rivers, streams, and drainageways or other positions where moisture relations are improved over that of the surrounding semi-arid grasslands. In the Northern Great Plains, plant communities dominated by trees include coniferous forests of breaks and elevated areas, cottonwood forests along major watercourses, and upland hardwood forests occurring on cool slopes and along drainageways of smaller order streams. These upland hardwood forests are often referred to as hardwood draws or woody draws.

In Montana, hardwood draws are found throughout the eastern half of the state, occurring as far west as Choteau and Yellowstone counties. They become increasingly more common towards the east. At this time two hardwood draw plant associations are recognized in Montana: the green ash/chokecherry (Fraxinus pensylvanica/Prunus virginiana) association and the green ash/American elm (Fraxinus pensylvanica/Ulmus americana) association (Andy Kratz, Montana Natural Heritage Program, personal communication). The green ash/chokecherry association occurs throughout eastern Montana, while the green ash/American elm association is restricted to the eastern tier of counties from Ekalaka north to the Missouri River.

Although they comprise less than 1% of the landscape, upland hardwood forests provide critical wildlife habitat. Hardwood draws are important year-round habitat for mule deer and important winter habitat for white-tailed deer (Swenson 1981, Severson and Carter 1978). Hardwood draws are also critical winter habitat for sharp-tailed grouse (Swenson 1981). In addition to their importance to game species, hardwood draws also provide habitat for a large number of songbirds and non-game mammals including coyotes, weasels, red fox, and bobcat (Swenson 1981, Sieg et al. 1984, Hopkins 1984). Many species of plants such as American elm (Ulmus americana), river birch (Betula occidentalis) Sprengel's sedge (Carex eburnea), Torrey,s sedge (C. torreyi), ivory sedge (C. eburnea), greenbriar (Smilax herbacea), figwort (Scrophularia lanceolata), and virginia creeper (Parthenocissus vitacea) are restricted to riparian and upland forest communities in eastern Montana. Deciduous forest vegetation is also important in preventing erosion and stabilizing stream flow (Gloria Mooers, USDA-Soil Conservation Service, personal communication).

METHODS

From June 8 to 12, 1987, I surveyed hardwood draws in Carter, Fallon, Wibaux, and Dawson counties. I located areas with extensive hardwood forest vegetation from color infrared aerial photographs provided by the Bureau of Land Management, Miles City and inspected these areas on foot, recording observations on

species composition and stand condition. I estimated canopy cover of dominant species to the nearest 5% in representative 100 m^2 plots in 30 stands. Vascular plant nomenclature follows Barkley et al. (1986).

RESULTS AND DISCUSSION

Location of plots, stand descriptions, and canopy cover data are presented in Figure 1 and Tables 1 and 2. Composition of the two deciduous forest associations is similar. The green ash/chokecherry association is characterized by greater coverages for box elder (Acer negundo) and chokecherry (Prunus virginiana) and the absence of elm when compared with the green ash/American elm association. Other common shrub species in these forests are snowberry (Symphoricarpos occidentalis), serviceberry (Amelanchier alnifolia), Wood's rose (Rosa woodsii), currant (Ribes sp.), and wild plum (Prunus americana). The two most abundant graminoids are the native Sprengel's sedge and the exotic Kentucky bluegrass (Poa pratensis). Common forbs include black snake-root (Sanicula marilandica), cleavers (Galium aparine), fringed loosestrife (Lysimachia ciliata), sweet cicely (Osmorhiza chilensis), and wild bergamot (Monarda fistulosa). Dandelion (Taraxacum officinale) is abundant in many of the more disturbed stands.

A list of all species observed in upland hardwood forests in the study area are presented in Table 3. There is a tendency for the ash/elm association to have greater species diversity than

the ash/chokecherry association. Girard (1985) found the ash/elm association to have the highest species diversity among among upland deciduous forest communities in southwestern North Dakota.

At this time I am unable to say what factors are controlling the distribution of the two associations in the study area. Girard et al. (1984) state that elm occurs in the more mesic upland forests in southwestern North Dakota, and elm reproduction in this study was greatest in the Willard-Ekalaka area which has the highest annual precipitation in the eastern tier of counties (Miller et al. 1973). The frequency of such mesic forest indicators as red-osier dogwood (Cornus stolonifera) and Canada violet (Viola canadensis) was higher in the elm forests.

All the forests that I visited have been grazed by livestock, and all have exotic weeds in the understory. Forests which appear to be lightly grazed have undergrowth dominated by shrubs, native forbs, and tree saplings, while degraded stands have understories dominated by intoduced grasses and forbs. There appears to be a negative correlation between the amounts of Sprengel's sedge (Carex sprengelii) and introduced Kentucky bluegrass. There appears to be a positive relationship between the amount of degradation in the forest understory and that of the surrounding grasslands. Forest stringers occurring on more level terrain and nearer to water are generally in worse condition than forests occurring on steeper slopes at the head of drainages. These relationships indicate that livestock grazing

is at least partially responsible for the degradation of forests in the study area.

Green ash seedlings and saplings were present in most stands. Ash saplings had been browsed severely in many stands, and many of these stands lacked trees in the large sapling and small pole size classes. In general, elm reproduction is not as vigorous and appears to be more common in the southern part of the study area. The effects of recent drought conditions on tree reproduction are not known.

Upland forest communities provide shade, forage, and sometimes water. Consequently, grazing animals tend to congregate in these communities during the summer and fall months (Severson and Boldt 1977). Since hardwood draws occupy only a small portion of the landscape, they will tend to be overgrazed by cattle even at moderate stocking rates.

Heavy browsing of seedlings and saplings by livestock and other grazing animals reduces recruitment and leads eventually to opening of the tree canopy. Rubbing and trampling also reduce the cover of tree species (Butler and Goetz 1984). A more open canopy favors sod-forming grasses and further augments the problem by inhibiting establishment of tree seedlings.

Overuse of hardwood draws by livestock can result in soil compaction and reduced infiltration rates which increase runoff and erosion (Severson and Boldt 1977). Erosion of the drainage results in gully formation and a concomitant drop in the water table (Swenson 1981). Decreased infiltration and a lowering of

the water table could result in decreased establishment of some mesic forest species such as elm.

The effects of native grazing ungulates on hardwood draw vegetation is unknown. Hardwood draws are favored wintering areas of white-tailed deer in eastern Montana (Swenson 1981). In areas with large deer populations, tree reproduction may be limited by winter browsing. In Wisconsin, wintering areas have been severely degraded as a result of unnaturally large deer populations.

Fire was a common occurrence in presettlement Great Plains grasslands (Daubenmire 1978). The effects of fire on upland hardwood forests in this region are not well known. Both green ash and American elm sprout prolifically when the main stem is damaged (Severson and Boldt 1977). Occasional severe crown fires may be an essential part of normal stand replacement.

It appears to me that the age class structure of most stands I visited is greatly skewed in favor of older trees. My observations indicate that continuous suppression of ash and elm recruitment and degradation of understory vegetation by livestock grazing results in the following successional sequence. As the shorter-lived ash trees die they are not replaced, and the canopy becomes more open. Increased light and disturbance favors exotic rhizomatous grasses over the native graminoids and forbs. As the process continues, most of the ash and understory shrubs, forbs, and saplings disappear, and the forest is converted to an open pasture woodland. Eventually the elms die, and what remains is a

meadow dominated by Eurasian grasses and some grazing resistant shrubs.

Dutch elm disease has resulted in the loss of a large portion of both planted and forest elms in North America. This disease was first reported in Montana in 1973 (Sinclair and Campana 1978). The extent of the occurrence of Dutch elm disease in forest stands in Montana is unknown, but most stands will probably be exposed to the disease eventually. It is believed that native elms will survive in naturally occurring forest stands because the disease strikes mainly trees of repoductive age. Thus, trees are usually able to produce seed and replace themselves for a number of years before succumbing to the disease (Sinclair and Campana 1978). The age stucture of stands will be altered, but resistant strains will be selected for and eventually replace the stands (Sinclair and Campana 1978). In stands where reproduction is limited or absent, elms will probably disappear shortly after introduction of the disease.

CONCLUSIONS

The threats to hardwood draw communities in eastern Montana include overgrazing by livestock and possibly deer, coal mining, and Dutch elm disease. Virtually all the forests that I visited have been degraded to some extent by man's activity. A significant portion of these communities will probably be lost in the not-too-distant future. In Montana, the more mesic green ash/American elm association is restricted to a small portion of

the state and may be more vulnerable to livestock induced alterations. Immediate protection and proper management of these communities is essential if this element of the state's natural diversity is to be preserved.

Figure 1. Location of upland hardwood forest stands visited in June, 1987

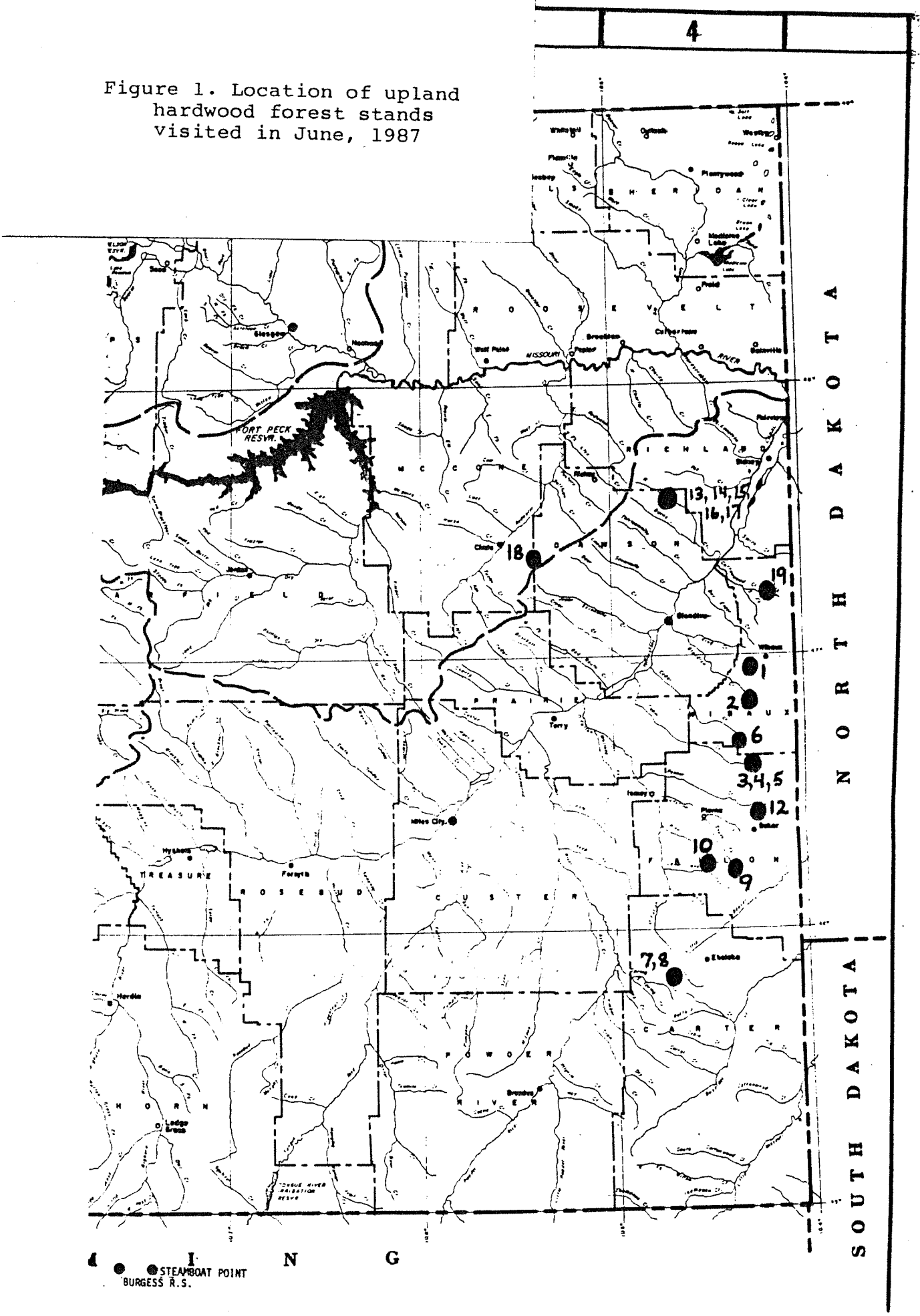

Table 1. Location and description of hardwood draw stands visited June 8-12, 1987.

1. Wibaux Co. T14N R59E S19 SW1/4. Narrow stringer. Overstory is entirely ash. The understory is almost entirely Eurasian grass. Surrounding grasslands in good condition.

2. Wibaux Co. T13N R59E S3Ø SE1/4. Head of draw. Overstory is ash with a few box-elder. Chokecherry has been browsed. Understory is mainly Eurasian grass; some C. sprengelii. Stand surrounded by agricultural fields.

3. Fallon Co. T1ØN R59E S24 NW1/4. Dominated by ash; some box-elder. Understory dominated by Poa; many native forbs present. Adequate ash reproduction.

4. Fallon Co. T1ØN R59E S26 NW1/4. Wide stringer. Dominated by ash with some box-elder. Understory is mainly Poa; many native forbs present. Ash reproduction is good. Surrounding grasslands are in fair condition.

5. Fallon Co. T1ØN R59E S9 SW1/4. Head of draw. Overstory is ash with some box-elder. Understory is Poa and C. sprengelii; many native forbs. Adequate ash reproduction. Surrounding grasslands in fair condition.

6. Wibaux Co. T11N R59E S19 SE1/4. Head of draw. Dominated by ash and box-elder. Understory is dominated by C. sprengelii; many native forbs. Good ash reproduction. Surrounding grasslands are in good condition.

7. Carter Co. T1S R57E S4 NW1/4. Wide stringer. Dominated by ash and elm. Understory mainly bare ground? and forbs. Many native forbs present. Reproduction of ash and elm is good on steep slopes. Surrounding grasslands in poor condition.

8. Carter Co. T1S R57E S5 NW1/4. Wide stringer. Dominated by ash, elm, and cottonwood. Understory is Poa. Ash and elm reproduction is good. Surrounding grasslands in poor condition.

9. Fallon Co. T6N R59E S32 SE1/4. Head of draw. Dominated by ash and elm. Understory is Poa and native forbs. Many native forbs present. Adequate ash and elm reproduction. Surrounding grasslands in good condition.

1Ø. Fallon Co. T6N R58E S29 NW1/4. Narrow stringer. Dominated by ash. Understory dominated by Poa; few native forbs. No ash reproduction. Surrounding grassland in fair condititon.

11. Fallon Co. T6N R57E S14 NW1/4. Narrow stringer. Dominated by ash. Species depauperate.

12. Fallon Co. T8N R6ØE S1Ø Nw1/4. Head of draw. Dominated by ash; some elm. Understory of Poa and C. sprengelii. Good nativr forb component. Reproduction is poor. Adjacent grasslands in fair condition.

13. Dawson Co. T21N R54E S15 SE1/4. Head of draw. Dominated by ash and elm. Understory of Eurasian grass. Some ash reproduction; elms are decrepit and not resprouting. Adjacent grasslands are in poor condition.

14. Dawson Co. T21N R54E S14 NE1/4. Broad stringer. Dominated by ash and elm. Understory of exotic species; poor forb component. Poor reproduction. Adjacent grasslands in poor condition.

15. Dawson Co. T21N R54E S12 NW1/4. Narrow stringer. Dominated by ash; some elm. Understory of Eruasian grass. Poor reproduction. Adjacent grasslands in poor condition.

16. Dawson Co. T21N R55E S19 SW1/4. Head of draw. Dominated by ash and elm. Understory of native forbs and some Poa. Good ash reproduction; little elm reproduction. Adjacent grasslands in fair-good condition; part of adjacent land is agricultural.

17. Dawson Co. T21N R55E S34 NW1/4. Head of draw. Dominated by ash, aspen and birch; some elm. Understory dominated by native forbs; some Poa. Good ash and aspen reproduction; some elm reproduction. Adjacent grasslands in fair condition.

18. McCone Co.(?) T18N R5ØE S31 NE1/4. Head of draw. Dominated by ash. Understory dominated by C. sprengelii; some Poa; poor forb component. Good ash reproduction. Adjacent grasslands in fair condition.

19. Wibaux Co. T17N R59E S3 NE1/4. Narrow stringer. Dominated by ash. Understory of cheatgrass. Poor forb component. Adequate ash reproduction. One decrepit elm present. Adjacent grasslands in poor-fair condition.

Table 2. Canopy cover of dominant plant species in upland hardwood forests in eastern Montana. See Table 1. for locations and descriptions of stands.

Species	Stands													
	4	5	6	10	18	7	8	9	12	13	14	15	16	17	19
Fra pen	50	70	40	60	60	30	50	40	60	50	45	30	60	40	40
Ulm ame	-	-	-	-	-	40	15	25	5	20	35	5	30	5	P
Ace neg	5	5	30	-	30	-	-	-	-	-	-	-	P	-	-
Jun sco	-	P	P	-	-	P	5	-	-	P	-	-	P	-	-
Bet occ	-	-	-	-	P	-	-	-	-	-	-	-	P	P	-
Pop tre	-	-	-	-	-	-	-	-	-	-	-	-	P	20	-
Pop del	-	-	-	-	-	-	15	-	-	-	-	-	-	-	-
Pru vir	30	40	40	40	-	10	10	30	P	30	P	5	30	5	35
Sym occ	15	20	P	20	-	P	10	P	-	5	10	20		30	-
Ame aln	P	P	5	P	P	P	P	-	P	5	P	P	P	5	-
Pru ame	-	5	5	-	P	P	-	P	10	P	-	-	-	-	-
Ribes sp	P	-	P	-	5	P	5	P	-	-	-	-	P	P	-
Ros woo	P	P	P	-	-	P	-	P	-	P	P	P	-	P	-
Cor sto	-	-	-	-	P	P	5	P	-	-	-	-	P	P	-
Tox ryd	-	P	P	-	-	5	-	30	-	-	-	-	P	-	-
Ber rep	-	-	-	-	-	P	-	5	-	-	-	-	-	-	-
Poa pra	70	50	P	90	5	P	70	50	80	70	80	80	25	10	?
Car spr	5	50	60	-	50	P	-	5	55	-	-	-	5	-	-
Bro ine	5	-	-	-	-	-	-	P	-	10	5	10	-	-	-
Bro tec	5	-	-	-	-	P	-	-	-	-	-	40	-	-	80
San mar	P	-	P	-	-	10	-	-	5	P	-	-	P	P	-
Lys cil	P	P	P	-	P	-	-	5	-	-	P	-	-	P	-
Gal apa	P	P	P	-	5	P	-	P	P	P	P	P	-	-	-
Osm chi	P	P	P	-	-	P	-	P	-	-	-	-	P	-	-
Tar off	P	P	P	-	-	P	-	-	P	20	50	-	P	P	-
Mon fis	P	-	P	-	-	P	-	-	-	5	P	-	-	P	-
Vio can	-	-	-	-	-	P	-	P	-	P	-	-	-	5	-

Table 3. Vascular plants observed in upland hardwood forests in Carter, Fallon, Wibaux, and Dawson counties, June 8-12, 1987. Nomenclature follows Barkley et al. (1986). An asterisk (*) indicates introduced species.

Trees

Acer negundo
Betula occidentalis
Fraxinus pensylvanica
Juniperus scopulorum
Populus deltoides
Populus tremuloides
Prunus pensylvanica
Ulmus americana

Shrubs

Amelanchier alnifolia
Berberis repens
Cornus stolonifera
Juniperus communis
Prunus americana
Prunus virginiana
Ribes aureum
Ribes sp.
Rosa woodsii
Rhus trilobata
Salix sp.
Shepherdia argentea
Symphoricarpos occidentalis
Toxicodendron rydbergii

Graminoids

Bromus inermis*
Bromus tectorum*
Carex eburnea
Carex geyeri
Carex petasata
Carex sprengelii
Carex stipata
Elymus glaucus
Oryzopsis micrantha
Phleum pratense*
Poa pratensis*

Forbs

Achillea millefolium
Anemone cylindrica
Antennaria neglecta
Arctium minus*
Arenaria lateriflora
Aster laevis
Astragalus agrestis
Campanula rotundifolia
Cerastium arvense
Cirsium arvense*
Clematis ligusticifolia
Corallorhiza striata
Cystopteris fragilis
Disporum trachycarpum
Erigeron glabellus
Fragaria virginiana
Galium aparine
Galium boreale
Geun allepicum
Geum macrophyllum
Habenaria viridis
Hackelia floribunda
Heracleum sphondylium
Heuchera richardsonii
Hesperis matronalis*
Lychnis alba*
Lysimachia ciliata
Melilotus officinalis*
Monarda fistulosa
Nepeta cataria*
Osmorhiza chilensis
Parietaria pensylvanica
Parthenocissus vitacea
Ranunculus abortivus
Rumex crispus
Sanicula marilandica
Smilacina stellata
Smilax herbacea
Solidago gigantea
Taraxacum officinale*
Thalictrum occidentale
Urtica dioica
Vicia americana
Viola canadensis
Zigadenus venenosus

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