

**Inventory of Parks Division lands
for threatened and endangered species habitats
and exemplary plant communities
2001**

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Introduction

The Nebraska Natural Heritage Program is responsible for environmental review of state projects that may impact state-listed threatened and endangered species, including those on Parks division properties. This survey was undertaken to improve the Nebraska Game & Parks Commission's knowledge of threatened and endangered species and their potential habitat on park properties in order to reduce time spent by Heritage staff reviewing management proposals for these sites. Nebraska Heritage is also responsible for recording occurrences of high-quality natural plant communities in Nebraska. The second objective of this survey was to locate and evaluate exemplary areas of natural vegetation, as such data are incomplete for most properties in the park system. Finally, management recommendations are made for dealing with threats to natural plant communities to enhance their quality for the native species within them, including threatened and endangered species.

Methods

Prior to the survey, all properties in the park system were prioritized based on their likelihood of containing threatened or endangered species habitat or exemplary plant communities. These judgments were based on communications with Heritage staff, personal experience on these areas, and known records of threatened and endangered species occurrences. Several sites, such as Indian Cave and Ponca State Parks were considered high priority and were extensively surveyed. Numerous areas were also eliminated from consideration, though later on it was discovered that some of these sites contained historic records of protected species. The remaining sites were given lower priority and were surveyed as time permitted. Certain extremely large areas such as Fort Robinson State Park, Lake McConaughy SRA and Merritt SRA, could not be completely surveyed and instead only selected portions were considered.

Not all threatened and endangered species listed for Nebraska were included in this survey. The American burying beetle is not included, since its habitat has not been satisfactorily quantified, making it nearly impossible to evaluate potential habitat. Whooping cranes are present in Nebraska only during a brief time in the spring and fall, and tend to utilize habitats that are highly variable and unpredictable. Black-footed ferret and Eskimo curlew were also excluded because both are presumably extirpated from the wild in Nebraska.

Surveys were conducted between May and October of 2001. Areas of exemplary communities were mapped on USGS 7.5-minute topographic quadrangles to be left with the Natural Heritage division upon completion. Descriptions of exemplary communities and species of concern were recorded on heritage field forms that will accompany the maps. Common names are used for all species mentioned in this report, with scientific names given in the appendix. The nomenclature of plant communities follows the most recent (2000) edition of the Nebraska Heritage community classification.

Results

A total of 32 Parks properties were evaluated during the course of this survey. One protected species population was observed during the surveys, that being a bald eagle nest at Indian Cave State Park. Most of the threatened and endangered species habitat observed during the survey were associated with major rivers, and the species for which suitable habitat is most frequently recorded include interior least tern, piping plover, pallid and lake sturgeon, sturgeon chub, bald eagle, and river otter. Potential habitat for all protected species surveyed were observed on Parks properties with the exception of Massasauga rattlesnake, Salt Creek tiger beetle, saltwort, and Ute lady's-tresses.

Exemplary communities were recorded at 26 of the 32 properties evaluated, with the most commonly recorded being upland forest and wetland communities. Grassland communities were not extensively surveyed at some of the larger parks.

The most frequent management issues in the parks properties surveyed involve invasion by exotic species. The two most threatening invasives observed during the survey are garlic mustard, which was observed invading woodland at Indian Cave, Platte River and Ponca State Parks, and Louisville SRA; and purple loosestrife, which was observed at Smith Falls and Ponca State Parks, and Keller Park SRA. Of these, the most serious threat appears to be spread of garlic mustard at Platte River State Park. Other exotics that pose serious problems in parks throughout the state include common buckthorn, sericea lespedeza, Canada thistle, leafy spurge and multiflora rose. Other common management issues include fire and grazing management of grassland and open upland forest, and in a few cases, wetland restoration.

Summaries of the results for each survey site are grouped alphabetically by region. For each park unit, records of all species of concern and potential habitat for threatened and endangered species is summarized, descriptions of all exemplary plant communities (and a short summary of major non-exemplary ones) is included, and prioritized management recommendations are provided whenever possible.

CENTRAL REGION

Overview

Region 2 includes southwest, south-central, and central Nebraska, including portions of the Platte, Loup and Republican River systems. Thirteen state-listed threatened and endangered species have been recorded within the boundaries of Region two within the last twenty years, including two (whooping crane and American burying beetle) not included in this survey. Of the remaining eleven species, four occupy habitats associated with large river channels, two are found in small streams, three are associated with grasslands, and the remaining two are restricted to saline wetlands near Lincoln. Piping plover and interior least tern nest along the Platte and lower portion of the Loup River system. River otters have been reintroduced in the central Platte and along the South Loup, Calamus, and Cedar Rivers. Bald eagles winter along the Platte, Loup and Republican Rivers and along several tributaries associated with reservoirs. Finescale and northern redbelly dace are found in small streams in the drainage of the Platte and South Loup Rivers. Swift fox is known from open areas south and west of North Platte. Western fringed prairie orchid is scattered in upland and lowland areas in the east half of the region, and small white lady's slipper is present in wet meadows in the Loup River drainage. The remaining two species, Salt Creek tiger beetle and saltwort are restricted to saline areas near Lincoln, the beetle being found nowhere else. Other species recorded historically within the region include blacknose shiner, Topeka shiner, eskimo curlew and sturgeon chub.

Of the 11 protected species recorded from the central region, only three bird species have been recorded on Parks properties. Interior least tern and piping plover have been observed at a number of sites along Lake McConaughy and also apparently at Sandy Channel SRA. Both birds are recorded very near to North Loup SRA, where potential habitat exists, and areas with potential habitat may be present at Bowman Lake SRA as well. Bald eagle roosts are present at Lake McConaughy, Sutherland Reservoir, Swanson Reservoir and reportedly Lake Ogallala, but no nest sites have been recorded. Finescale and northern redbelly dace have been recorded from the immediate vicinity of Arnold Lake, though not on the property, and Topeka shiner was recorded from Crystal Lake SRA, albeit over sixty years ago. Potential habitat for river otter is present at Buffalo Bill SRA and Lake McConaughy, and habitat for the protected dace species may be present in Sand Creek on the north side of McConaughy.

Apart from the Sandhills in the northern and western part of the central region, relatively little native vegetation remains in this part of the state. There are no large State Parks in this region, and the majority of the properties are small and/or consist mostly of an artificial lake or lakes surrounded by land that is largely developed. Consequently, most of the properties in the central region were excluded from this survey or assigned a low priority and were not surveyed due to time limitations. Only seven Parks units were surveyed, these being Alexandria SRA, Bowman Lake SRA, Buffalo Bill SRA, Lake McConaughy SRA, North Loup SRA, Rock Creek Station SHP, and Rockford Lake SRA. Gallagher Canyon and Victoria Springs were visited, but it was concluded there was little undeveloped land present worthy of attention. Some of the larger reservoirs were ranked low priority because much of the natural vegetation surrounding them is on

WMA land, some of which was included in a similar 1999 survey. These sites included Branched Oak, Calamus, Enders, Medicine Creek, and Red Willow. A portion of Red Willow SRA was included in the 1999 survey, and further surveys at Calamus, Enders, and Medicine Creek are particularly warranted.

Areas that were excluded because of a perceived absence of potential habitat for threatened or endangered species or exemplary communities include Arnold SRA, Blue River SRA, Buffalo Bill SHP, Champion Lake SRA, Champion Mill SHP, Cheyenne SRA, Conestoga SRA, Crystal Lake SRA, DLD SRA, Fort Hartsuff SHP, Fort Kearney SHP, Fort Kearny SRA, Johnson Lake SRA, Lake Maloney SRA, Lake Ogallala SRA, Mormon Island SRA, Pibel Lake SRA, Rock Creek Lake SRA, Rock Creek Station SRA, Sandy Channel SRA, Sherman SRA, Stagecoach SRA, Sutherland SRA, Swanson SRA, Union Pacific SRA, Victoria Springs SRA, Wagon Train SRA, War Axe SRA, and Windmill SRA. Protected species habitat has been recorded at or very near Arnold, Crystal Lake, Sandy Channel, and Sutherland, so further surveys for these species may be useful. Other areas with potential protected species habitat or exemplary communities that should be considered priority for future surveys include Arnold, Bluestem, Branched Oak, Calamus, Champion Lake, Crystal Lake, Enders, Medicine Creek, Olive Creek, Pawnee, Red Willow, and Sandy Channel. Species of concern have been recorded on 25 of the 45 properties.

Exemplary plant communities were recorded at five of the seven sites surveyed with the most examples recorded from Rock Creek Station SHP. Region 2 contains most of the region of loess mixed-grass prairie in Nebraska and portions of the Sandhills and eastern tall-grass prairie and forest. Remnants of tall-grass prairie, upland woods, and lowland forest were recorded from Rock Creek Station, but the remaining exemplary communities recognized in this survey were all wetlands. Springfed peat marshes were recorded from Alexandria and Lake McConaughy, sandflats were recorded at North Loup SRA and freshwater and saline wet meadows were recorded at Lake McConaughy and Buffalo Bill SRA, respectively. Numerous other communities of high quality (grasslands in particular) are undoubtedly present at Lake McConaughy and elsewhere at Parks properties in the central region, but time constraints prevented an adequate survey of this area.

The foremost management considerations in the Parks units surveyed in the central region appear to be invasion of native communities by eastern red cedar and by exotic woody plants, with common buckthorn being the most serious. Of the invasive herbaceous plants seen, Canada thistle appears to be the most controllable threat. Smooth brome and reed canarygrass are extensively established at many sites, but would appear to be controllable only with great difficulty and expense in most cases.

Alexandria State Recreation Area

Alexandria SRA is a small (101 acre) site of which nearly half its total area is occupied by three large, nearly contiguous sandpit lakes. Much of the area surrounding the lakes is developed, except for portions on the north and west side of the west lake. Lowland

forest is found in a draw south of the campground, and in the southwest corner of the site. Both areas contain permanently flooded seepage wetlands with soils containing peat or muck. These sites contain some unusual species typical of wetlands in the northern plains.

Species of concern

No species of concern are known from this site, and no potential habitat for threatened or endangered species is present.

Exemplary communities

Peat Marsh

Two small areas of permanently saturated wetland occur in openings in the woods along the west side of the west lake. The smaller and richer of the two occurs near the mouth of the wooded draw south of the turnaround at the east end of the campground. The south-central portion of this 1500 square meter marsh contains soils consisting of about five inches of firm sedge peat overlying muck, with soft peat in the north half, and some areas along the west side quite degraded and mucky. Dominants include common cattail, which is especially common in the soft peat in the north part, as well as hardstem bulrush, bald spikerush, rice cutgrass, riggut sedge, common arrowhead, spotted touch-me-not and northern clearweed. In slightly raised areas where the soil is a bit firmer, small trees such as American elm and green ash are scattered, along with patches of false indigobush and rough dogwood and scattered elderberry and gooseberry. In the areas of firmer peat, riggut sedge dominates and numerous other species are present including swamp agrimony, arrow-leaved tear-thumb, marsh bedstraw, common boneset, swamp milkweed, false nettle, purple willowherb, sawbeak sedge, mad dog skullcap, pale bulrush, blue vervain, panicked aster and yellow loosestrife. No exotic species were noted at this site.

A larger similar wetland about 0.5 acre large occurs on the southwest side of the lake west of the road and north of the railroad ditch. At this site the peaty soils are more degraded and mucky, and it appears this may partly be due to the fact that the adjacent ditch along the railroad drains some of the water, making it less likely to remain permanently saturated. This site also occurs in a woodland opening and contains a few tall peachleaf willow and smaller American elms and green ash, with false indigobush and rough dogwood shrub patches on the periphery. Much of the marsh is dominated by common cattail, with rice cutgrass, bald spikerush, common arrowhead and northern clearweed abundant. Other conspicuous species include bottlebrush sedge, softstem bulrush, hardstem bulrush, pale bulrush, marsh bedstraw, arrow-leaved tear-thumb, fen water parsnip, false nettle and sawbeak sedge.

Saturated marsh appears to be present on the north side of the lake. An inspection from along the road indicates that most of these are in the woods on the adjacent Wildlife Management Area, though careful inspection may reveal similar wetlands on the SRA.

Other communities

The shallow, wooded draw on the northwest side of the lake can be classified as the broadly-defined lowland mesic forest community. This site has a canopy of hackberry and honey locust with a subcanopy mostly of hackberry, a short shrub layer of coralberry and a herbaceous layer dominated by common wood sedge, Canada black snakeroot, eastern poison ivy, inflated narrowleaf sedge and white avens. A similar woods occur adjacent to the wetland in the southwest corner of the SRA, but differs in that American elm is more common in the understory and that a well-developed tall shrub layer of rough dogwood is present. Among the common understory herbs are swamp agrimony, nodding fescue, Virginia wildrye, white avens, Canada black snakeroot and stinging nettle. Multiflora rose is the most noteworthy exotic plant present in the woods.

Management Recommendations

1. Control of potentially invasive woody plants, which are not common at this time, but which could become problems in the near future. Multiflora rose is scattered in the woods on the west and perhaps the north side of the west lake. Autumn olive is established along roadsides near the west end and perhaps elsewhere.

Bowman Lake State Recreation Area

Bowman Lake SRA is a small property (43 acres) in the floodplain adjacent to the Middle Loup River which contains about one quarter mile of riverfront. No plant communities were seen in the river channel in 2001, though some aquatic habitats are present in the lake after which the site is named. Bowman Lake was very low 2001, but contained a large population of white water lily. A tract of low riparian woodland occurs on the south side of the lake. Portions of the woods are moist and species-rich, but are also heavily infested with woody invaders such as common buckthorn and multiflora rose. Most of the remaining floodplain is developed or weedy, though a few species indicative of wet meadow are present in the south part. No high-quality communities were recognized at the SRA in this survey.

Habitat suitable for interior least tern and piping plover is known from along the Middle Loup and could be present along the river certain years. Two plant species of concern have been recorded from the SRA, including the aforementioned white water lily and slender fimbry.

Species of concern

White water lily is extensive on the north and south ends of the lakebed, where it has been established since the early 1970's. Slender fimbry was collected on a sandflat along the east side of the river in 1991, but could not be relocated since no suitable sandflats were present during the 2001 survey. Interior least tern is known to nest upstream on the Middle Loup and could be present in the river channel when suitable conditions exist. Piping plover also possible, though conditions here are probably not ideal for either bird, except perhaps along less accessible portions of the river channel in the south part of the site.

Other communities

An aquatic plant community is likely present in Bowman Lake at times of higher water levels, but one did not seem to be present this year. In some areas of shallow water and exposed shore, white water lily is common, with interspersed plants of mild water pepper and, in shallow water, coontails and bladderwort. A marsh complex is present in the center of the lake and most of the wetlands within it are extensively invaded by reed canarygrass.

Immediately south of the lake is a patch of riparian woodland with a canopy of cottonwood and a subcanopy of American elm, which occurs with green ash in lower places. Shrubs are common in the woods and, in addition to the native rough dogwood, the woods are choked by the exotic common buckthorn and to a lesser extent by multiflora rose. Despite this the herbaceous understory is fairly rich and includes white avens, Canada black snakeroot, lopseed, enchanter's nightshade, rough avens, false Solomon's seal and poison ivy. Lower areas in the woods contain wild black currant, spotted touch-me-not, sweet-scented bedstraw, false nettle, and stinging nettle, though reed canarygrass is extensive in places.

The open areas in the floodplain south contain little native vegetation of significance except in a wetland channel east of the campground. Plants typical of wet meadow, such as mountain mint, have been found in the south part of the site, though they are becoming increasingly uncommon as the floodplain becomes increasingly encroached by woody vegetation. The noxious weed leafy spurge is present along the road in the south of the campground.

Management Recommendations

1. Control leafy spurge populations in the south part of the SRA by spraying in fall if possible.
2. Control common buckthorn and multiflora rose in the woods as best possible, but cutting back plants and painting the stumps. Buckthorn in particular is quite extensive.

Buffalo Bill State Recreation Area

Buffalo Bill SRA contains 233 acres of North Platte River floodplain which includes a heterogeneous mixture of grassland and wetland communities, most significantly a strip of western alkaline meadow which is probably the only representative of this uncommon community in the Parks system. The southwest third of the site is river terrace grassland that is extensively grazed by horses and was not included in this survey. Saline areas occur at the boundary of the river terrace and the floodplain just below. The southeast part of the site is mostly degraded wetland with scattered cottonwood trees and numerous shallow marshy sloughs. The northwest part, which includes the areas near the campground, is mostly degraded grassland with numerous patches of invasive trees such as eastern red cedar and common buckthorn. Extensive areas of cattail and reed marsh

occur along the river and in the vicinity of some of the sloughs, though most of the wetland at the site is extensively invaded by reed canarygrass.

Although the site contains a significant stretch of riverfront, no sandbar or similar habitats that might be suitable for interior least tern or piping plover were observed. River otter have been released downstream and it seems possible they could expand their range into areas in the vicinity of this site. Little biological survey work has been carried out at Buffalo Bill SRA and the single known species of concern was recorded during this survey.

Exemplary communities

Western alkaline meadow

At and just below the slight rise that separates the pastured terrace from the lower floodplain is a band of halophytic vegetation that extends from the west and south sides of the campground southward to about several hundred meters south of the entrance road. The full extent of the community is difficult to determine but it probably occurs as patches over a 10-30 acre area, with a much smaller area of high-quality saline meadow within it. Through most of this area, the ground is nearly level and is intersected by shallow wetland sloughs that contain freshwater wetland species such as cattails and three-square bulrush. In the most highly saline areas, saltgrass dominates, with alkali sacaton abundant in places. Species diversity is typically low in the more alkaline soils, though a few halophytes including saline sparscale and seablite may be locally common. Slightly less saline soils have much alkali muhly in addition to saltgrass, with other alkali indicator species including meadow bluegrass, clustered field sedge, alkali plantain, arrowgrass, and sea milkwort. Tall fescue is problematic in places, along with other exotics such as strawberry clover and the ubiquitous kochia. At the margin of the floodplain terrace north of the entrance road is a fairly diverse area of grassland with saline soil dominated by switchgrass and saltgrass with conspicuous alkali-tolerant prairie plants such as lance-leaved gayfeather, prairie gentian, wild licorice and meadow heath aster. Along its east boundary, this community grades into wetland and meadow dominated by three-square bulrush and switchgrass, while along its west side it passes into floodplain grassland of big bluestem, Indiangrass and switchgrass. Freshwater sloughs with cattails and three-square bulrush intersect in places.

The portion of the western alkaline meadow community that is parallel to the horse pasture on the south side of the entrance road is regularly mowed as part of a system of horse trails. The highest concentration of alkali indicator species are found here, including sea milkwort, which is known from only three other sites in Nebraska. Though sea milkwort appears to be intolerant of heavy grazing, the frequent mowing seems to allow it to compete with taller grasses. The most species rich portion of the community, which borders the fence to the north of the road, is also mowed regularly, but many of the species here do not seem to thrive under these conditions. The most extensive mowing occurs around some ill-advised ornamental tree plantings that are struggling in the saline soil. Many of the ornamental plantings in the south half of the campground are similarly inappropriate for these soils and look sickly. The regular mowing appears to be

impacting this community, which includes many rather attractive natives such as lance-leaved gayfeather and prairie gentian. It would be advisable to discontinue mowing a broad swath around the ornamental plantings along the road through the best part of this community. A mowed strip of no more than six feet wide along the road from the turnoff to the culvert north of it would help maintain the diversity of this uncommon community. These areas could, however, benefit from infrequent mowing (once a year) to remove excess thatch.

Other communities

The pastured terrace appears to contain a mesic tall-grass prairie community dominated by big bluestem, Indiangrass, and switchgrass. Most of the area is heavily grazed, and its overall species composition is difficult to estimate. To the east of the saline meadows, most of the natural vegetation is a hodgepodge of variously degraded grassland, meadow and wetland that is difficult to classify. In the north part of the site, especially near the campground, the area is mostly grassland that is heavily invaded by eastern red cedar and common buckthorn. The southeasternmost part of the site area is a very degraded open meadow community containing scattered cottonwoods with small Russian olives among them, and a herbaceous layer extensively invaded by reed canarygrass. Native wetland vegetation in this area is mostly restricted to several shallow sloughs that run through the site. Cattails and three-square bulrush are the most common species, though dotted smartweed and tall water parsnip are conspicuous in places. The introduced yellow iris is established in a slough at the south end of the property, and could eventually become problematic. Mowed horse trails occur in the wetland meadows in the southeast part of the SRA, but a dense network of impromptu trails lead off from many of these, creating a network of paths throughout this area. Where these paths cross the sloughs they often deeply rut the soil and do damage to the wetland vegetation. Perhaps a smaller network of trail that minimally cross the sloughs might help prevent damage. Regular mowing of areas infested with reed canarygrass might also prove beneficial in reducing populations of this invasive species.

Near the river, dense patches of common reed and cattail occur. Although this portion of the Platte River is within the range of piping plover and interior least tern, no areas of open sand are present that are suitable for use. Some parts of the braided channel might be useful to river otters at a future date.

Management recommendations

1. Restrict mowing in the area between the horse pasture and the road to the campground to a six foot wide swath on either side and abandon, if not eliminate, the woody plantings on the west side of the road south of the culvert. It also may be wise to replace the stunted and dying ornamental plantings in the south part of the campground with species tolerant of the dry conditions and saline soils.
2. Thin eastern red cedar and eliminate common buckthorn in the vicinity of the campground.

3. Increase mowing in the southeast part of the site, in areas infested by reed canarygrass. A better-defined set of mowed trails might discourage horse riders from cutting through more sensitive wetland communities in the sloughs.
4. Eliminate Russian olive and monitor the spread of yellow iris, so that it can be removed if it becomes invasive.

Lake McConaughy State Recreation Area

Lake McConaughy SRA is the largest property in the Parks system (37020 ac), but 85% of the total acreage is lake. Nonetheless, it has the third largest land acreage of any Parks in the system. Most of the uplands in the SRA consist of a very narrow boundary along the perimeter of the lakebed, though this band is broader in parts on the north side and a large tract of uplands is present on the south side of Lake Ogallala. Due to time limitations, the survey was limited to two drainages on the north side of the lake, though further surveys, particularly on the south and southeast side are necessary to fully determine the extent of exemplary communities at the SRA.

Most of the land on the north side of the lake contains low, rolling, degraded sandhills. Several small coldwater streams drain into the north side of the lake, the largest being Lonergan and Sand Creeks. Though the most biologically valuable areas along Lonergan Creek are north of the SRA, some wetland of good quality is present on the property along Sand Creek. A large complex of seepage wetlands is also present at the Spring Park area. The south side of the lake contains rocky bluffs covered with mixed-grass prairie dissected by canyons. The best extent of upland grassland is found in the southeast corner of the SRA, but was not included in this survey.

Species of concern

Piping plover were recorded from a number of areas along the lake in recent years and some of the areas are quite heavily utilized by people. Among the sites are Ogallala Beach, West Oglallala Beach, East Kelly Beach, the east side of Kelly Bay, O'Brien Beach, Sand Point, Omaha Beach, West Lemoyne Beach, and the east and west sides of Martin Bay. Interior least tern has been recorded at Sand Point and along the west side of Martin Bay. It is likely that numerous other nesting sites are present.

Peregrine falcon were recorded from rocky outcrops on the south side of the lake west of the headquarters building in 1985. Bald eagles are known to roost along the lake, but no nesting sites have been recorded. A survey of the perimeter of the lake could reveal potential nesting sites, most likely in fairly remote areas with large trees near the shore. River otter have been released in the North Platte River upstream from the lake, and could be present at the upper end. It is also possible that some protected fish species could be present in Sand Creek and Lonergan Creek, since they are known in streams on the north side of the river downstream from the lake.

A single plant species of concern, large-flower monkeyflower, is known from Sand Creek on the north side of the lake. It was not located at that site in 2001.

Exemplary communities

Sedge-bulrush wet meadow

Wet meadow occurs in a band along the margin of Sand Creek below the railroad tracks. Cattails, rice cutgrass and Emory's sedge dominate this community, with northern reedgrass conspicuous in slightly higher areas. This site has a rather high density and diversity of hydrophytic plants, chief among them common water horehound, blue vervain, marsh skullcap, field mint, rusty flatsedge, nodding beggarticks, hardstem bulrush, nodding willow weed, straw-colored flatsedge, mad dog skullcap and dotted smartweed. Patches of willow border the meadow and a few large cottonwoods are scattered west of the stream. Large-flower monkeyflower is a western species known in Nebraska only from a few tributaries of the North Platte River between Oshkosh and Lemoyne. It was collected in Sand Creek in 1987, but was not relocated in 2001. This species typically grows in shallow coldwater streams, and the channel of Sand Creek is visibly deeper than it was in 1987, which may have eliminated this species and possibly lowered the water level and limited the extent of the adjacent wet meadow. Nonetheless this site represents a high quality wetland which lacks redtop and reed canarygrass, two species which plague wet meadows statewide. The only problematic exotic present is Canada thistle, which is locally common in the north part of the community.

Peat marsh

A two to three acre seepage marsh complex is present in a shallow draw on either side of the road west of the Spring Park turnoff. The soils at this site are composed mostly of organic matter varying from soft to firm peat and muck over sand, with peat in excess of six inches deep in places. Cattails are abundant in mucky soils, especially in shallow water at the bottom of the draw, though they also extend well up the slopes of the draws in places. Areas of peaty soils border the cattails, which are dominated by Nebraska sedge and/or three-square bulrush. Spotted touch-me-not, northern clearweed, bugleweed, nodding beggarticks, and fen water parsnip are often frequent among the cattails and in adjacent sedge-dominated areas. Areas of flowing water in the bottom of the draw additionally contain watercress. Along the periphery of the community is a band of wet meadow dominated by forbs such as Canada goldenrod and western poison ivy, along with scattered patches of willows. Patches of Canada thistle are established along the margins as well.

Other communities

No detailed observations were made of other areas around the lake, though in general the north side contains rolling dunes of degraded sandhills prairie with patches of sandsage and occasional rocky outcrops. Rock outcrops are fairly common on the south side of the lake, surrounded by mixed grass prairie and juniper wooded canyons. The most representative examples of the communities on the north side of the lake occur in the area of Spring Park, while the communities on the south side are most extensive south of Lake

Ogallala. Further surveys will undoubtedly reveal the presence of other biologically valuable areas.

Management recommendations

1. Based on this survey, control of Canada thistle in wetland areas is a priority, though further surveys are needed to develop more comprehensive recommendations for the SRA.

North Loup State Recreation Area

North Loup SRA is a very small (20-acre) tract of floodplain on the north side of the North Loup River north of St. Paul. Despite its size, its proximity to the river provides it with interesting riparian areas in the river channel that could provide habitat for interior least tern and piping plover, which have been recorded nearby the site. A fairly large (3-4 acre) stretch of sandflats occurred along the east half of the site in 2001.

Species of Concern

No threatened or endangered species have been recorded at North Loup SRA, though interior least tern and piping plover have been observed at sandpits nearby. Potential habitat for least tern and piping plover was observed at the SRA during this survey. The only species of concern recorded from this site is lowland toothcup, which was found in 2001.

Exemplary communities

Sandbar/mudflat

A narrow sandflat 3-4 acres large west of the U.S. 281 bridge. The site was fairly densely vegetated, the dominants being mostly cottonwood seedlings and flatsedges such as rusty flatsedge, umbrella flatsedge and awned flatsedge, accompanied by relatively few, scattered hydrophytic plants. Among the associated species were scattered grasses such as teal lovegrass, barnyard grass, Carolina lovegrass, and sprangletop, with nodding beggarticks and false pimpernel the principal forbs. Some seedlings of the weedy tree Siberian elm were observed near the riverbank.

Other communities

Patches of riparian woodland are present, but are generally fairly degraded and weedy.

Management Recommendations

No recommendations at this time other than control of noxious weeds.

Rock Creek Station State Historical Park

Rock Creek Station is the largest State Historical Park in the central region (353 acres) and the second largest in the State, and contains a higher proportion of natural vegetation than most Parks properties in this region. The uplands through much of the Park are covered with native remnant and restored tall-grass prairie in average to good condition, with both upland oak woodland and riparian forest represented along Rock Creek and its tributaries. Invasion of upland woods by eastern red cedar appears to be the biggest threat to natural communities in the Park.

No state threatened or endangered species have been recorded from vicinity of Rock Creek Station, though two non-protected fish and three plant species of concern have been recorded within Park boundaries. Several other are known from the adjacent WMA to the south.

Species of concern

Bluntnose minnow was collected in Rock Creek in 1983 and orangethroat darter from a tributary (possibly on the SRA) in 1985. The historical range of the state endangered Topeka shiner includes the Park, though its presence there is unlikely.

Three plant species of concern have been recorded, namely Bush's sedge, which is common in upland prairie, frostweed and sessile-leaved tickclover, which are uncommon in rocky open woods and prairie along the south side.

Exemplary communities

Tall-grass Prairie

Tall-grass prairie covers most of the uplands south of the railroad tracks, and a large portion of the area to the north. Parts of the site, especially in the east and south part have a species composition somewhat different from most native prairie in the region and appears to have been at least partly reseeded. The highest quality site is south of the railroad tracks on the north part of the interfluvium west of the horse trail. A 15-acre portion of this area is dominated by big bluestem with much Indiangrass and little bluestem, with many-flower scurfpea and ironweed the principal forbs. Narrowleaf milkweed and downy gentian, both indicators of high quality tall-grass prairie, are present on this tract, but not in the apparently reseeded tracts nearby. Canada bluegrass is the most conspicuous exotic species.

A larger prairie that also appears to be a native remnant surrounds the visitors center. Big and little bluestem and Indiangrass are the dominant grasses, and a short shrub layer of leadplant is conspicuous. Common forbs include many-flower scurfpea, white prairie clover, purple prairie clover and round headed bushclover. Some Kentucky bluegrass and smooth brome is common along the margins, where the prairie intergrades with the degraded grassland surrounding it.

A large portion of the uplands in the east part of the Park contain unusual prairie dominated by little bluestem and Indiangrass with abundant Bush's sedge, and with big

base at the margin of the wetlands. The upper slopes, however, are fairly disturbed and weedy, probably due to erosion. Eastern red cedars are problematic on parts of these wooded slopes, and some parts are nearly impenetrable. Removing some cedars could help native understory to become established in places.

Management Priorities

1. Limiting the spread of reed canarygrass. This species threatens many of the wetlands in the vicinity of the large oxbow. Mowing of some of these areas may limit its spread, but control measures need to be considered carefully.
2. Restoring the wetlands between the oxbow lake and the river. This should be conducted by surveying the area for existing communities and looking at historical photos of the area, if possible, to determine what native wetland communities would occur here.
3. Thinning cedars from the uplands by cutting out large female trees, though this appears to be a low priority at present.

Fremont State Recreation Area

Fremont Lakes consists of two tracts totaling 670 acres of Platte River floodplain containing numerous artificial sandpit lakes surrounded by narrow strips of floodplain that are almost entirely developed. Some interesting ephemeral plant species have been collected on the shores of some of the lakes, but no extensive or exemplary areas of undisturbed shoreline are present. The largest undeveloped area on the site is a strip on the south side of the SRA south of Lake 20. Here a band of cottonwood dominated riparian woodland is present which contains some interesting wetland depressions, but is heavily infested by eastern red cedars, white mulberry and common buckthorn. Some sandy grassland is present in this area as well, but it has been heavily disturbed.

Species of concern

No threatened or endangered plant or animal species have been recorded on the SRA, and no habitat suitable for these species is currently present. Interior least tern and piping plover have been known to nest near sandpits upstream on the Platte River, but because of the extensive development at the SRA few or no suitable nesting areas are present. Despite the fact that the area has received attention from botanists since the late 1940's, the only species of concern recorded from the site are white water lily, which was last documented in 1970 and sand croton, which is still present but very unlikely to be considered for protection in the near future.

Other communities

No exemplary communities were observed at Fremont Lakes. The largest intact area of natural vegetation is a strip of degraded eastern floodplain woodland on the south side of

a few bur oak and patches of honey locust. Hackberry, scattered slippery elm and Kentucky coffeetree are found in the subcanopy. Shrubs are scarce and the herbaceous layer is lush and dominated by graminoids such as hairy wildrye, nodding muhly, nodding fescue, Davis' sedge and common wood sedge, with yellow ironweed and Virginia creeper the common forbs. Aside from a few openings with white mulberries and a patch of poison hemlock, few exotics are present.

Other communities

A north-south tributary ravine in the northeast part of the Park contains a narrow band of bur oak woodland with a denser canopy than the woods in the southwest part that can be classified as bur oak forest. Bur oaks dominate the canopy with green ash, American elm and black walnut in the subcanopy. Rough dogwood occurs with hackberry saplings in a tall shrub layer, and a short shrub layer contains coralberry and gooseberry. Among the herbaceous species in the best preserved areas on the west side of the draw are pointed tickclover, Virginia wildrye, nodding fescue, Virginia creeper, woods bedstraw, lopseed and common wood sedge. Portions of the slopes, especially on the east side are rather eroded and weedy. The draw immediately west of this one is similar, but of poorer quality.

Management recommendations

1. Thin cedars in the woods on the south side of the Park, at the very least removing the large female trees. Portions of the nearby SRA could be thinned to lessen the possibility of a destructive fire occurring there.
2. Continue a program of burning and grazing upland prairie tracts every 3-4 years (with at least one burn and one mowing during that period).

Rockford Lake State Recreation Area

Rockford Lake SRA is a moderate-sized area (436 acres) containing a small artificial lake that is mostly developed along the periphery with the exception of the south end. Along the inlet channel are some small areas of upland oak woods and some degraded tall-grass prairie, both extensively invaded by eastern red cedar.

Species of concern

No threatened or endangered species are recorded near Rockford Lake and no potential habitat for threatened or endangered species is present at Rockford Lake.

Frank's sedge and greenfruit burreed, two non-protected aquatic plant species of concern, were recorded from Rockford Lake in the early 1970's. Frank's sedge could still be present along the inlet on the south end of the lake, but the current degraded condition of the wetlands there perhaps precludes it. The burreed is a northern species that is significantly disjunct from its main range and probably represents an accidental,

EAST REGION

Overview

Region 3 includes much of northeast and extreme eastern Nebraska, including portions of the lower Niobrara, Elkhorn and Platte Rivers and nearly the entire east border formed by the Missouri River. Fourteen state-listed threatened and endangered species have been recorded within the boundaries of region, three within the last twenty years. Several of these occupy habitats within major river channels. Pallid sturgeon, lake sturgeon, and sturgeon chub are found in the Missouri and lower Platte Rivers, while river otter has been reintroduced in the Elkhorn River in Antelope County and has expanded its range downstream. Scaleshell mussel is known in Nebraska only from a single collection made below Gavins Point Dam, but is likely in areas inhabited by sturgeon. Southern flying squirrel and American ginseng are found in upland oak forest on bluffs bordering the Missouri and possibly the lower Platte Rivers. Other species more widely distributed include interior least tern, piping plover and bald eagle, which nest along larger rivers throughout. Topeka shiner is generally distributed in small, clear streams, while western fringed prairie orchid may occur in upland or lowland prairie through much of the region. Massasauga rattlesnake and small white lady's-slipper have a more limited distribution within region three and are unlikely to occur on any Parks properties in the region. Seven threatened and endangered species have been recorded on Parks properties, and eleven Parks units either contain or border potential threatened and endangered species habitat.

Five of the 22 properties in the east region were not surveyed because they were considered unlikely to contain habitat for any state-protected species or exemplary plant communities. These were Arbor Lodge SHP, Ashfall SHP, Fort Atkinson SHP, Memphis SRA, and Pioneer SRA. Two other sites, Verdon Lake SRA and Willow Creek SRA, that have a slight possibility of containing threatened or endangered species habitat or high quality communities were considered low priority and were not surveyed due to time limitations. Several species of concern that are indicative of high quality tall-grass prairie have been recorded over the years from Verdon Lake SRA. All these records are at least fifteen years old, and it does not appear that this site currently contains any quality native plant communities. Willow Creek SRA was also not surveyed, though the state endangered Topeka shiner was collected in Willow Creek in 1939. Construction of the reservoir appears to have eliminated habitat for this fish from the site. Finally, Niobrara State Park was initially determined as unlikely to contain exemplary communities or protected species habitat and was considered low priority. State-protected species are known from the mouth of the Niobrara River, and a survey of the floodplain in the south part of the Park might reveal areas containing high quality communities and habitat. Of the areas not surveyed, the sites which should be considered priority for future surveys include Niobrara SP, Ashfall SHP (for Topeka shiner habitat) and Fort Atkinson SHP (for exemplary communities).

Surveyed areas which contained potential habitat for legally protected species include Dead Timber SRA, Indian Cave SP, Lewis & Clark SRA, Louisville SRA, Platte River SP, Ponca SP, Schramm Park SRA and Two Rivers SRA. Areas that provide access to

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non-persisting introduction. The closest populations to this site are in the eastern Sandhills.

Other communities

A small oak woodland remnant is found along the west side of the inlet on the south side of the lake. The canopy consists of bur oak, hackberry and black walnut with green ash and red mulberry in the subcanopy and a short shrub layer of coralberry. Common herbaceous understory includes Virginia creeper, eastern poison ivy, woods bedstraw, pointed tickclover, and rattlesnake fern. Invasive smooth brome is common on upper slopes near the edge where eastern red cedar is encroaching. The uplands on the east side of the draw contained small patches of tall-grass prairie in 1990, but now are completely overgrown with a nearly impenetrable stand of cedar that poses a potential fire hazard.

Management Recommendations

Thinning out the cedars on the west side of the inlet at the south end, starting with female trees. Eventually, periodic controlled burns may be initiated to limit their spread.

Brownville State Recreation Area

Brownville SRA is a small (23 acre) site in the narrow floodplain bordering the Missouri River just east of Brownville. Though the site is mostly developed, some degraded riparian woodland and wetlands are present on the west side of the campground. The natural communities at the SRA are probably too degraded to restore effectively, but control of the potentially invasive Amur honeysuckle should be a priority.

Very little biological survey work has been conducted at Brownville SRA and only a single non-protected plant species of concern has been recorded. Nonetheless, the endangered pallid sturgeon has been recorded from the river channel nearby.

Species of concern

Sporadic, informal botanical collecting has been conducted at Brownville SRA in last ten to fifteen years, and the only species of concern recorded at the site is sand croton, which is very unlikely to be considered for protection in the near future. Pallid sturgeon was collected in the Missouri River channel not far downstream from this site in 1978, and lake sturgeon and scaleshell mussel are also possible. Signs alerting boaters to the presence of sturgeon should be posted near the boat ramp.

Other communities

No exemplary communities were found at the SRA, but a small patch of sandy woods classifiable as degraded eastern floodplain woodland occurs on the west side of the campground. It is dominated by cottonwoods but has a subcanopy consisting almost entirely of exotic white mulberry. Few native shrubs or herbs are present in the woods, except for some sedges that occur in low places at the margins. Invasive plants including ground ivy and Amur honeysuckle are found in the woods. Removing white mulberry from the woods could help the native understory compete, but could also open up habitat for other exotics such as the Amur honeysuckle.

A shrubby wetland dominated by sandbar willow and the invasive reed canarygrass is present in the drainage channel along the road on the south side of the woods. Shoreline sedge is the only significant herbaceous native plant in the wetland, and it has nearly been overtaken by reed canarygrass. Neither the woodland nor the wetland appears to have much biological value.

Management Priorities

The primary concern is controlling Amur honeysuckle, which is found along the west side of the woods. It has proven to be a serious invasive in adjacent states and should be cut and stump-painted before it reaches reproductive size.

Dead Timber State Recreation Area

Dead Timber SRA is a moderately small (200 ac) area that contains two old oxbow channels and surrounding floodplain along the Elkhorn River. A narrow strip of upland is found along the north and east sides of the site, but it contains little native vegetation. Naturally occurring wetland is extensive in the floodplain, but the majority of the wetlands are severely infested by reed canarygrass. Nonetheless a small area of high-quality peat marsh is located along the large oxbow lake and contains several native plant species unusual to northeast Nebraska. Although much of the site is wooded, including much of the wetland, no high quality woodland communities are present on the SRA. An interesting expanse of sandflats is present on the west side of the river at the west end of the SRA and represents the only other high quality community recognized at this site. The feasibility of restoring some of the wetlands at the site should be studied.

Species of Concern

Although the SRA has received occasional attention from biologists since the early 1970's, no legally protected species have been recorded at Dead Timber SRA. However, the portion of the site bordering the Elkhorn River contains potential habitat for several threatened and endangered animals. Large cottonwoods in the riparian woods along the river provide potential nesting and roost sites for bald eagle, especially in the southwest part of the site. The relatively inaccessible sandflats on the west side of the river could provide potential nesting sites for interior least tern and piping plover. River otter has been released in the Elkhorn River upstream from Dead Timber and could eventually occur in the adjacent river channel. Restoring the old side channel adjacent to the river could provide higher quality otter habitat. Since access to the Elkhorn River is impractical from most parts of the SRA, it seems likely that the aforementioned species could thrive along the river in relative isolation from human activity.

Three non-protected plants of concern were found on the sandflats along the river in 2001, including lowland toothcup, slender fimbry, and narrowleaf paleseed. A sedge species that has not yet been identified is common in the peat marsh bordering the oxbow lake on the east side of the river. It has not been collected previously in Nebraska.

Exemplary communities

Peat marsh

This community is provisional and is not included in the NNHP community classification. It includes permanently saturated wetlands with a peat layer less than 12 inches deep, which, at least in northeast Nebraska, are not always easily distinguishable from fens. Such a marsh occurs in a band along the east side of the "peninsula" formed by the bend of the large oxbow lake. It is permanently saturated and has a layer of relatively firm, fibrous peat 6-8 inches deep over mucky sand, except in the middle, where the peat is fairly soft and mucky. Cattails occupy the central part of the wetland, while the peripheral marsh is dominated by common arrowhead, bald spikerush, Emory's sedge, sawbeak sedge and rice cutgrass, with bottlebrush sedge, bearded sedge, and pale

bulrush conspicuous. Common forbs include spotted touch-me-not, marsh bedstraw, fen willowherb, northern clearweed and nodding beggarticks. A large colony of an unidentified sedge that resembles the Northwest Territory sedge (which is very rare in Nebraska) occurs on the east side of the cat-tail patch. It is not particularly similar to this species and could be a relict hybrid of one or more species no longer found at this site. Patches of green ash saplings and false indigobush are scattered on slightly higher places along the periphery or in small inclusions within the marsh, where they occur with bald spikerush, Emory's sedge, sawbeak sedge and scattered marsh forbs such as swamp milkweed. Apart from the unusual sedge, the marsh has a species composition similar to other saturated wetlands in northeast Nebraska. The invasive reed canarygrass is scattered here and there along the periphery of the marsh, but seems unable to compete in the saturated soil. It is not nearly as problematic here as it is elsewhere in the SRA, but could continue to spread along the periphery.

Sandbar/mudflat

A fairly high quality wetland complex is present on sandflats on the west side of the Elkhorn River at the west end of the SRA. As one travels farther from the river, the vegetation on the sandflats grades from moist and fairly well-vegetated to dry and sparsely vegetated, to densely vegetated perennial sandbar wetland, to willow shrubland, and eventually riparian woodland. The lowest areas along the river are fairly densely covered with annual hydrophytes including barnyardgrass, teal lovegrass, Carolina lovegrass, nodding beggarticks, yerba-de-tajo, rusty flatsedge, awned flatsedge, and smallflower half-chaff sedge. Three species of concern were found at this site in 2001 including lowland toothcup, slender fimbry, and narrowleaf paleseed. No more than four individuals of any of these species were found. The wetland vegetation on the west side of the sandflats consists mostly of sandbar willow and rice cutgrass. This community grades into the degraded cottonwood woodland on its west side.

Other communities

Extensive wetlands are present in the floodplain west of the big oxbow lake. Most of these wetlands are heavily vegetated by reed canarygrass to the near exclusion of native species, apart from scattered cottonwoods and willows and occasional shrubs such as buttonbush. These areas are difficult to access, and further surveys could reveal high-quality wetland inclusions. This area may benefit from restoration efforts including removing some of the hardwoods and possibly dredging or scraping the old wetland channel to encourage growth of native wetland plants. It was not possible to assess the quality of these areas and further surveys of the wet areas west of the road are recommended.

Riparian woods of cottonwood and silver maple are present along the east side of the river directly south of these wetlands. They are fairly open and heavily invaded by exotic white mulberry and reed canarygrass. A mature, but severely eroded and degraded wooded area is present on the steep slope along the north and east sides of the SRA. Portions of this slope appear to have been wooded for some time, especially along the

Rock Creek Station State Historical Park

Rock Creek Station is the largest State Historical Park in the central region (353 acres) and the second largest in the State, and contains a higher proportion of natural vegetation than most Parks properties in this region. The uplands through much of the Park are covered with native remnant and restored tall-grass prairie in average to good condition, with both upland oak woodland and riparian forest represented along Rock Creek and its tributaries. Invasion of upland woods by eastern red cedar appears to be the biggest threat to natural communities in the Park.

No state threatened or endangered species have been recorded from vicinity of Rock Creek Station, though two non-protected fish and three plant species of concern have been recorded within Park boundaries. Several other are known from the adjacent WMA to the south.

Species of concern

Bluntnose minnow was collected in Rock Creek in 1983 and orangethroat darter from a tributary (possibly on the SRA) in 1985. The historical range of the state endangered Topeka shiner includes the Park, though its presence there is unlikely.

Three plant species of concern have been recorded, namely Bush's sedge, which is common in upland prairie, frostweed and sessile-leaved tickclover, which are uncommon in rocky open woods and prairie along the south side.

Exemplary communities

Tall-grass Prairie

Tall-grass prairie covers most of the uplands south of the railroad tracks, and a large portion of the area to the north. Parts of the site, especially in the east and south part have a species composition somewhat different from most native prairie in the region and appears to have been at least partly reseeded. The highest quality site is south of the railroad tracks on the north part of the interfluvium west of the horse trail. A 15-acre portion of this area is dominated by big bluestem with much Indiangrass and little bluestem, with many-flower scurfpea and ironweed the principal forbs. Narrowleaf milkweed and downy gentian, both indicators of high quality tall-grass prairie, are present on this tract, but not in the apparently reseeded tracts nearby. Canada bluegrass is the most conspicuous exotic species.

A larger prairie that also appears to be a native remnant surrounds the visitors center. Big and little bluestem and Indiangrass are the dominant grasses, and a short shrub layer of leadplant is conspicuous. Common forbs include many-flower scurfpea, white prairie clover, purple prairie clover and round headed bushclover. Some Kentucky bluegrass and smooth brome is common along the margins, where the prairie intergrades with the degraded grassland surrounding it.

A large portion of the uplands in the east part of the Park contain unusual prairie dominated by little bluestem and Indiangrass with abundant Bush's sedge, and with big

Lake 20. This area is dominated by cottonwoods and is extensively invaded by exotic woody species such as white mulberry, northern catalpa, and common buckthorn. Eastern red cedars are also abundant in places. A few small wet depressions occur on the east side of the woodland, and these contain an assortment native hydrophytes. Conspicuous plants of shaded depressions include Emory's sedge, woodreed, false nettle, whitegrass and dotted smartweed, while crested sedge, fog fruit, false nettle, field mint, common boneset, and fall sneezeweed occur where the tree canopy is more open. Reed canary grass is problematic in parts of these wetland areas.

An area of floodplain grassland occurs in an opening on the west side of the woods, and although it is heavily disturbed, it includes some native grasses and forbs typical of sandy prairie. Among the common grasses here are switchgrass, Canada wildrye sand lovegrass and purple lovegrass.

Much of the botanical work that has occurred at Fremont Lakes in the last 50 years has concentrated on the moist, sandy shores that border some of the lakes. No species of concern have been collected, but some uncommon ephemeral annual plants such as dense-tuft hair sedge and western umbrella sedge have been collected numerous times. The shore communities observed in 2001 are mostly small, patchy and degraded. The largest area of intact shoreline vegetation was observed in the vicinity of Brick's Bay on the north side of Lake 10. This site was moderately diverse and of average quality.

Management concerns

Controlling common buckthorn. Of all the exotic species at the SRA, buckthorn probably represents the biggest threat. It is scattered in the woods south of Lake 20, but could readily spread to treelines and thickets elsewhere on the site. Purple loosestrife, which is thoroughly established upstream on the Platte, could eventually appear here and should be looked for periodically.

Indian Cave State Park

Indian Cave State Park is the largest Parks unit in the east region (3397 acres) and is situated along the Missouri River on the Nemaha-Richardson county line in the southeast part of the state. The majority of the Park consists of upland loess bluffs clothed with average to fairly high quality southeastern upland forest, with scattered small patches of tall-grass prairie on the highest ridgetops. Some of the larger, level upland areas are developed or appear to have been farmed or heavily grazed in the past and are in poor condition. The floodplain along the river is very narrow through most of the Park, but several strips of degraded eastern floodplain woodland are present. Much of the remaining floodplain has been farmed or developed, and what remains is often infested with reed canarygrass. Small wetland areas are present at the mouth of some ravines and at the bases of the loess bluffs. The only high quality wetland site found is a patch of eastern sedge wet meadow along a stream in the southeast part of the Park.

community and are dominated by prairie sandreed, little bluestem and sideoats grama, with Kentucky bluegrass and cheat among the common exotic invaders. Herbaceous species typical of coniferous woodland are tucked in protected sites here and there and include northern pussytoes, harebell, smooth blue aster, wild licorice, Oregon woodsia, mouse-ear chickweed and occasionally the low shrubs Oregon grape and creeping juniper.

Pines are widely scattered on the lower slopes of the bluffs, where Pine Ridge sandy slope grassland dominates. Prairie sandreed and little bluestem are the usual dominants, though sand bluestem, needle-and-thread and the exotic Kentucky bluegrass are also common, with conspicuous yuccas and patches of wolfberry.

Other communities

The majority of the uplands at the Park consist of variously degraded upland prairie with inclusions of disturbed areas that represent areas of pine woodland that burned in 1989. The blufftops contain rocky outcrops, usually occurring as a patchy mosaic with western mixed-grass prairie. The slopes below the blufftops are occupied by Pine Ridge sandy slope prairie, which on the lower slopes of the bluffs grades in to low hills of prairie sandreed, little bluestem and needle-and-thread, often heavily infested with Kentucky bluegrass. Patches of sandsage are characteristic in these sites, which form a series of low, rolling hills to the east of the buttes that continues to the edge of the White River floodplain.

Riparian habitats occur in the bottoms of some upland ravines within the Park, particularly along Soldier Creek and Spring Creek. Young riparian woods appear to be forming along Soldier Creek following the 1989 fire. South of the road crossing the creek near the west boundary of the Park, very open areas of small cottonwoods to 15 ft. tall and young box elder and green ash to 10 ft. tall occur with patches of shrubs such as buffalo currant, chokecherry and wolfberry. The herbaceous plants in the openings are typical of disturbed lowlands, and include natives such as showy milkweed and Canada goldenrod, along with exotic invaders such as smooth brome and Canada thistle. In places downstream, low wet woods are forming along the edge of the creek, consisting of dense patches of sandbar willow with scattered peachleaf willows and young cottonwoods along the periphery, and an occasional box elder. Herbaceous cover associated with these sites is likewise weedy and includes smooth brome, stinging nettle, Canada thistle, and in shadier spots, catnip.

The upper portion of Spring Creek in the northeast part of the Park winds through deeper ravines than the lower portion of Soldier Creek and appears not to have been as impacted by the fire. Steep banks along the creek are frequently dotted by scattered pines and green ash along with patches of chokecherry and wild plum with western poison ivy, woodbine and Canada wildrye in the understory. On the lower parts of some north-facing banks, red osier and common scouringrush form a band several meters wide just above the stream. In the narrow ravine bottoms along the creek, young woods of scattered cottonwoods, box elder and peachleaf willow are present with an occasional American elm or even a small black walnut. Better-drained areas in slightly higher

Ten additional animal species of concern have been recorded from the Park, including three snakes: worm snake, timber rattlesnake, and smooth green snake; six birds: ruffed grouse, whip-poor-will, peregrine falcon, blue-gray gnatcatcher, Louisiana waterthrush, and Carolina wren; and a lamprey: chestnut lamprey.

No threatened or endangered plant species have been recorded in the Park, though the state threatened American ginseng has been recorded in upland bluff forest downstream near Rulo. Suitable habitat for American ginseng is present in high-quality forested ravines throughout the Park, and future surveys may reveal its presence. Yellow lady's slipper orchid has been recorded anecdotally within the Park, and may be considered for protection in the near future. It is not known whether these populations are still extant. Twenty-six plant species of concern have been documented from the Park including: spikenard, pale Indian plantain, purple milkweed, long-awned wood grass, cutleaf toothwort, Frank's sedge, eastern star sedge, nodding chickweed, late coral-root, Wister coral-root, bulblet fern, mullein foxglove, showy orchis, great St. John's wort, violet bush clover, wild crabapple, Indian pipe, purple cliff brake, sycamore, may apple, whorled mountain mint, white oak, hooked buttercup, smooth ruellia, winter grape, and fox grape.

Exemplary communities

Upland tall-grass prairie

Small tall-grass prairie remnants less than one acre in size are scattered atop high, steep, narrow bluff ridges through the Park. The best-preserved examples are found atop interfluvies along the south side of the hiking trail east of trailhead 10. Five small prairie "islands" of fairly high quality were recorded in 2001. These patches contain very few exotic species, but are being encroached by shrubs typical of forest margins, namely rough dogwood and smooth sumac. The dominant grasses are big bluestem, little bluestem, sideoats grama, and Indiangrass. The most common forbs include purple prairie clover, narrowleaf bluets, showy-wand goldenrod, stiff sunflower, roundhead bush clover, and prairie ragwort. Less common are heath aster, azure aster, aromatic aster, silky aster, skeletonplant, gray goldenrod, stiff goldenrod, dotted gayfeather, blue-eyed grass, flowering spurge, hoary puccoon, purple coneflower, wild petunia, false boneset, and daisy fleabane. Two native prairie shrubs, namely leadplant and prairie willow, are present in places. The westernmost patch (marked "A" on the map) is the smallest and steepest site. Of all the sites recorded, it has the least invading forest vegetation, but also has the biggest problem with exotics. Black medick and yellow sweet clover are scattered through the prairie especially along the trail at the summit of the slope (in fact the exotics seem to have entered the site along the hiking trail). The other sites have very few, if any exotics. Site B is larger and not as steep, and is more extensively invaded by woody plants. Site C is a narrow linear strip of prairie below the west Adirondack shelter on the trail. It is not as extensively encroached by shrubs as B. Site D is not readily visible from the hiking trail, but is larger and not as steep as C (at least in the lower part). Site E is below the east Adirondack shelter and is similar to D, but has more sumac.

These prairies, along with others in the Park, could benefit immediately from periodic controlled burns to improve species diversity and control woodland shrub invasion.

Management Priorities

1. Thinning small pines in upland woodland stands to help the grassy understory recover.
2. Control of intermediate wheatgrass and crested wheatgrass on slopes in the Deadhorse burn area. Spring burns in areas with particularly bad infestations might help, but more work is needed to determine whether this is feasible.
3. Periodic surveys for leafy spurge, which has proven problematic elsewhere in the Pine Ridge, especially in ravine bottoms. Plumeless thistle was observed near the ravine south of the Dead Horse burn area in 2001, but does not seem to be a threat here.

Fort Robinson State Park

Fort Robinson is the second largest property in the Parks system (22673 acres) and has a terrestrial land area twice as large as that for all the Parks properties in the east region combined. The majority of the land in the Park consists of rolling uplands covered by Pine Ridge sandy slope prairie with lesser amounts of western mixed-grass prairie, rock outcrops, and various groupings of disturbance vegetation in place of pine woodland removed by the 1989 fire. Due to time constraints, the uplands in the area of the 1989 fire were not included in this survey, which focused on remaining upland woods, riparian areas and the floodplain of the White River.

The only large area of the Park not impacted by the 1989 fire was the northeast portion of the Park including the Red Cloud Buttes and Spring Creek drainage. Pine woodlands are intact in these areas, but not particularly extensive and few areas of high quality woodland are present. Open uplands contain grassland communities similar to those found in the areas excluded from this survey. Though no high quality grasslands were recorded in this survey, a number of well-developed rock outcrops that occur along the shoulders of the Red Cloud buttes are among the most diverse in the Pine Ridge.

The areas in the valley of Soldier Creek and the White River are level to rolling and often highly disturbed due to many years of extensive human activity. Degraded prairie and western floodplain woodland are present along the White River, but these communities are usually heavily invaded by exotics including Russian olive. An unusual wet woodland community not previously described in Nebraska was found to the east of the Fort complex, but it too is highly degraded and invaded by exotics such as reed canarygrass. Wetland vegetation in the Park is mostly restricted to the margins of small permanent streams such as Spring Creek and Soldier Creek.

Because of its long history, Fort Robinson and its environs have received attention from biologists since the late 19th century, but unfortunately no comprehensive list of species in the Park or descriptions of vegetation in the Park has ever been compiled.

enchanter's nightshade, may apple, yellow wood violet and yellow ironweed. Common graminoids include common wood sedge, Davis' sedge, James' sedge and burreed sedge. Ravine bottoms often are dominated by wood nettle with stinging nettle, clustered black snakeroot, honewort and numerous sedges. Two high quality lowland forest areas recorded in the north half of the Park are in Spring Hollow and in the large ravine west of the north ridge trail. Both have few exotic species and are in very good condition.

Four ravines were surveyed on the north-facing bluff on the south side of the road to the cave. The ravine along the trail southeast from Trailhead 9 has fairly high diversity and very few exotics. The ravine along the Hardwood trail south of the water pump is somewhat less diverse than the preceding one and contains more exotics including multiflora rose and blackberry lily. The ravine directly to the east of this is fairly diverse and nearly free of exotics, except for a small patch of ground ivy, and is fairly high quality. The ravine south of Trailhead 5 along the trail south of the camping area is similarly diverse and free of exotics except for a few plants of multiflora rose. Most of the deep north-facing ravines in this part of the park are quite similar, except for differences in composition of exotic species.

The bulk of the forest communities are in fairly good condition with only localized infestations of exotics. The lower slope forest sites require little attention beyond control of weedy species. Blackberry lily is locally abundant in places in the southeast part of the Park, but does not seem to be spreading rapidly. The more invasive multiflora rose is scattered in openings in the south part of the Park, particularly along trails. The spread of this shrub should be monitored and controlled.

Some of the upland forest communities in the north part of the Park could benefit from spring or fall controlled burns to reduce the extent of shrub thickets and create more prairie islands and openings for regeneration of oak trees in the upland woods. It is likely that savanna-like conditions may have existed along the upper forest margins prior to the fire suppression that followed European settlement. Six of the plant species of concern found in the Park (pale Indian plantain, purple milkweed, mullein foxglove, great St. John's-wort, violet bush clover, and whorled mountain mint) are indicative of upland savanna habitats and are currently restricted to narrow strips of grassland along trails. Most of these species are found in the north part of the Park.

Eastern sedge wet meadow

A wet meadow community is found at the mouth of the ravine near trailhead 9, bordering the spring-fed stream just south of the road. Here a saturated open meadow of about 1000 square meters occurs which is dominated by hydrophytes including dark-green bulrush, bald spikerush, fowl mannagrass and shoreline sedge. A few trees of black and peachleaf willow are scattered along the south side. Though the meadow is in fairly good condition, large colonies of reed canarygrass border it on the south and west sides. Few intact wet meadow communities remain in southeast Nebraska and this was the only intact wetland community seen in the Park. It is mostly in fairly good condition, but is

prairie on ridgetops, where it is sometimes associated with rock outcrops. Pine Ridge sandy slope prairie occupies moderate upland slopes and may be dotted with pines (as in Morgan's "savanna" community). This community grades into open canopy pine woodland on many upper and middle slopes and a more densely shaded (though not truly close-canopied) forest on lower slopes and bottoms of ravines. In the broadest ravine bottoms, northwestern canyon bottom woodland, meadow, and riparian habitats are present (all included in the riverine floodplain woodland community by Morgan), though the best developed areas along Chadron Creek are also the most heavily developed.

A vascular plant species list was begun by students at Chadron State under the direction of Dr. Ronald Weedon at about the time of Morgan's survey, but it was never completed.

Species of concern

Despite a history of biological survey work in the Park since the 1930's, relatively few species of concern have been recorded. Lewis' woodpecker was observed in the Dead Horse burn area in the north part of the Park in 1986. Common poorwill was recorded from either within or very near the Park boundaries in 1992. Four of the five plant species of concern recorded from the Park were collected by the late William Tolstead in 1939-1940 and included prostrate juniper, Great Plains bladderpod, veiny meadow rue and tower mustard. Tower mustard was recollected in 2001, but the other species were not found. The only other plant species of concern collected in the Park between 1940 and 2001 was the saprophytic orchid Wister's coral-root, which was collected in the late 1960's, representing the first known record of this species in the state.

A total of 171 plant species were recorded in the Chadron State College survey of the Park, but none were species of concern. A specimen of iron skyrocket was recently identified among these collections. This plant is not previously recorded as occurring in Nebraska and probably came in as an introduction along the road. In addition to the tower mustard, two new element species were recorded in 2001, namely rattlesnake plantain and fireweed, which represent only the second and third known Nebraska collections of these species, respectively. No threatened or endangered species have been recorded from within or near the Park boundaries and suitable habitat for protected species is unknown in the Park.

Exemplary communities

Western Coniferous Forest

Most of the pine woodland in the Park is fairly open and not particularly diverse. Some of the deepest and narrowest canyons, along the south side of the Park, are rather rocky and contain little vegetation. The best-developed coniferous forest in the Park was observed in the upper portion of the ravine that runs northeastward on the west side of the cabin area. Much of the upper portion of the ravine is fairly open and the lower slopes contain a rather open canopy of tall, slender Ponderosa pines with a short subcanopy of widely scattered green ash and American elm. The woods are rather brushy, with a well-developed shrub layer of abundant chokecherry and vines such as bittersweet and riverbank grape. Creeping juniper and Oregon grape form a conspicuous short shrub

marsh. Though much of the herbaceous understory is invaded by reed canarygrass, many native smartweeds and sedges remain.

A third riparian woodland site occurs in a narrow band along the margin of the river in the northeast part of the new floodplain addition. It contains large cottonwoods and scattered sycamore and is heavily invaded by white mulberry. The understory is extremely degraded and contains few native plants, but much garlic mustard, poison hemlock, and reed canarygrass. This site also contained the aforementioned active bald eagle nest.

All the floodplain woodland tracts seen in the Park are heavily degraded and may be difficult to restore. Removal of invasive white mulberries might promote growth of native subcanopy trees, but might also increase the spread of reed canarygrass and garlic mustard in these habitats. Garlic mustard is particularly threatening, since it has become an aggressive invader elsewhere along the Missouri River in Nebraska, overtaking riparian woods and often spreading into upland bluffs and suppressing the native understory. The spread of garlic mustard should be monitored and controlled in the woods west of the boat ramp, where it is still localized and controllable. The far north woodland (near the eagle nest) is heavily infested, but is fairly isolated from the other riparian woodlands. Populations are difficult to eliminate, but limiting traffic through this area would help to slow its spread further.

Management priorities

1. Controlling garlic mustard in the riparian woodland sites mentioned above. It is extensively established in the northeast part of the floodplain addition, which is connected by a long, narrow strip of reed canarygrass-infested willow shrubland to the riparian woodland area near St. Deroin. A single patch of rosettes was observed near the center of the woodland area west of the boat ramp, very near the base of the upland forest bluffs. The latter population should be located and destroyed as soon as possible, and the woods along the river should be periodically monitored for garlic mustard thereafter. Garlic mustard may eventually invade the upland bluff forest, especially along trails.
2. *Sericea lespedeza*, an aggressively invasive legume that may be designated noxious in Nebraska is extensively established in the large, open grassland area in the southwest part of the Park (along trail 5A). This weed, like garlic mustard, requires immediate control and periodic monitoring
3. Control of reed canarygrass in the areas surrounding the wet meadow in the southeast part of the Park. This may be fairly difficult. Other extensive infestations (along the riverfront in the northeast part, and immediately west of the boat ramp) may be difficult or impossible to eradicate and will provide a source for future invasions.

medick conspicuous. A few uncommon native wetland plants are present, but their density is fairly low. Small degraded sedge wet meadows are found nearby on the north side of the river, but by and large these are very weedy and often infested with Canada thistle.

Management Recommendations

1. Controlling Canada thistle in meadows along the west end of the SRA appears to be the highest priority at this time.

Bowring Ranch State Historical Park

Bowring Ranch SHP is a 325-acre portion of a much larger working cattle ranch in the western Sandhills north of Merriman. Sandhills dune prairie makes up most of the Park, but a large portion of the east half of the Park is an interdunal valley that contains a large wetland complex of marsh and wet meadow that includes a small patch of sandhills fen. Little or no biological work appears to have been carried out at this site in the past.

Species of Concern

Bowring Ranch is within the geographic range of blowout penstemon, but no large blowout complexes that could support a population were observed at the Park or on aerial photos. Habitat that could support western fringed prairie orchid is present in the hay meadows surrounding the wetlands in the east part, but the site occurs west of that species' known geographic range and the meadows mostly appear too wet and invaded by exotics to support the quality habitat necessary for it to thrive. No species of concern have previously been recorded from the SRA, though trumpeter swan was observed at a lake to the east of the site in 1985. Several historical records of plant species of concern are known from the Merriman area and although none of these were found during this survey, three of them (dwarf raspberry, clammy hedge hyssop, and smooth goosefoot) are possible at the SRA. The only species of concern recorded from the site in 2001 is bog aster, which occurs in a small fen area near the west end of the valley.

Exemplary communities

Sandhills fen

The valley to the east of the ranch buildings contains a large and very heterogeneous complex of wetlands of mostly average to poor quality. A small area in the west part of the valley qualifies as sandhills fen in that it contains a layer of saturated fibrous peat at least 12 inches thick and at least one species (bog aster) diagnostic of this fairly rare community. The fen at Bowring Ranch is only about 10 acres large at most and has a lower species diversity than most fens found farther to the south and east in the Sandhills. The dominant species at this site include Nebraska sedge, bald spikerush, Baltic rush, and Sartwell's sedge, with northern reedgrass in common in slightly higher areas and prairie sedge, lesser panicled sedge, bluejoint and scattered cattails common in lower areas with very soft peat. Typical forbs include bugleweed, field mint, tufted loosestrife, northern water dock, fen willowherb, and small bedstraw. Woody vegetation is mostly absent

sturgeon may inhabit parts of the lake adjacent to Game & Parks property. Signs should be in place to alert boaters and fishermen to the presence of these species. Scaleshell, a state endangered mussel, has been recorded from the river channel below Gavins Point Dam, and occupies habitats similar to those favored by sturgeon. Future surveys for this mussel in the lake and other points below the dam may be useful.

Prior to this survey, only one fish and one plant species of concern had been recorded within the boundaries of the SRA. Johnny darter was collected in 1987 at the Weigand-Burbach area and spatterdock, a relative of water lily, was collected at Weigand in 1893. The spatterdock is no longer present and was doubtlessly extirpated by flooding following the construction of the dam, if not sooner. Blue sucker is the only other non-protected species of concern that has been recorded in the lake outside of the SRA boundary. In 2001, two additional plant species of concern, rock elm and wild sarsaparilla were found in a deep, forested ravine at the Deep Water area. Wild sarsaparilla had not been recorded in Nebraska outside of the Niobrara River valley since 1893.

Exemplary Communities

Northeastern Upland Forest

Northeastern upland forest is, by and large, poorly developed in the SRA, due in part to the fact that the deep ravines in which the best examples of this community tend to occur are now mostly underwater. Most of the upland forest at Lewis & Clark SRA represents upper slope forest that has fairly low species diversity and is heavily invaded by eastern red cedar. This is especially true at the South Shore area, where the woods south of the highway are dominated by bur oaks with a nearly impenetrable subcanopy of large eastern red cedars and little or no herbaceous understory. In many places, the slopes of ravines are nearly unvegetated and severely eroded. The few areas that have only scattered cedars generally have much more herbaceous understory. One small, shallow, forested draw on the east side of the lake inlet represents moderately high quality upper slope forest. This area, which was first sampled in 1999, is located along the road south of the parking area. It has a canopy of bur oaks and scattered green ash 40 to 50 feet tall, and a subcanopy of slippery elm that at times is nearly as tall as the canopy trees. Patches of chokecherry form a sparse tall shrub layer, and the herbaceous understory contains Virginia creeper, hairy wildrye, American germander, and white snakeroot. Lower slopes of the ravine are sparsely wooded and in many places extensively invaded by common buckthorn.

A high quality low slope forest community is located on the west side of the entrance road to Deep Water area. Here a deep, forked draw contains forest of bur oak and basswood with a subcanopy of hop hornbeam and rock elm. Chokecherry is the conspicuous shrub here as well and the understory of the lower slopes is rich with Virginia creeper, moonseed, white-tinge sedge, hairy wildrye, and longbeak sedge. The upper slopes are dominated primarily by bur oak with some hop hornbeam scattered in the subcanopy in spots where eastern red cedar is not too abundant. Sedges and littleseed ricegrass dominate the herbaceous layer of the upper slopes. A moderately large colony

(or aboveground briefly following heavy rains). These areas have soils mostly of coarse sand and gravel and are very well drained. The plants that occupy sand draws include many found in the ill-defined "riverine gravel flats" community of the Nebraska Natural Heritage classification and the two may need to be combined. Sand draw vegetation is present for much of the length of Ash Hollow, but is best developed near the south end of the Park. The gravelly soil is sparsely to densely vegetated with perennial grasses such as prairie sandreed, sand dropseed, blue grama and scattered patches of sand bluestem. Annual and perennial forbs are common and conspicuous, the most frequent being blazing star, silky wormwood, slender knotweed, lemon pectis, goldenaster, common ragweed, clammyweed and numerous weedy annuals including exotics such as slender Russian thistle and cheatgrass. This community is fairly distinctive near the south end of the Park, but elsewhere grades into the surrounding grassland. Some gravelly hills on the east side of the valley have similar species and merit further study.

Other communities

Rock outcrops occur as a mosaic with western mixed-grass prairie throughout the uplands at the Park. The most diverse outcrops seen during the survey were located along the crests of the north facing bluffs that border the Platte River floodplain at the north end of the Park. Among the rock outcrop plants that approach the east edge of their range here are silky milkvetch, mountain cat's-eye, alpine golden wild buckwheat, and calcareous cat's-eye, which were seen atop the bluffs on the east side of the hollow. The bluffs on the west side, where summer milkvetch was collected, were not surveyed. The vegetation of these outcrops is richer than most outcrops seen east of the Wildcat Hills, but are not as high quality as most rock outcrops communities in the west half of the Panhandle.

Canyon bottom grassland communities are poorly studied in the Nebraska and are not accommodated by the Nebraska Heritage community classification. The grassland that occupies the bottom of Ash Hollow is fairly disturbed and variable. The grassland near the sand draw is dominated by the same species as the sand draw, namely sand dropseed, prairie sandreed, sand bluestem and blue grama. Among the conspicuous forbs are blazing star, plains prickly pear, silky wormwood, clammyweed and lemon pectis. The ubiquitous cheatgrass is the most common exotic invader. Level grassland in higher portions of the canyon bottom, such as at the base of the slopes, appears to be similar to the western sandy slope prairie community, which is commonly associated with escarpments in the Panhandle. The highest quality example observed was at the base of the bluffs on the west side of the hollow and this site was dominated by needle-and-thread and prairie sandreed, with little bluestem and sideoats grama often common, along with blazing star and yuccas. Parts of this area appear to be regularly mowed, and these sites appear completely different, being dominated by sand dropseed and blue grama, with little bluestem common in places. Dwarf milkweed, round-leaved groundcherry, and shaggy evolvulus are among the common forbs seen in these mowed prairies.

Riparian woodland is also developed in the bottom of Ash Hollow in the vicinity of the springs, but is highly disturbed. Cottonwoods dominate the canopy, and green ash, after which the hollow is named, are frequent in the subcanopy. Junipers and Russian olive

3. Thinning eastern red cedars in upland woods in areas where they are abundant, such as at in some of the oak woodland south of the highway at South Shore. This should allow herbaceous species a chance to become re-established and help control erosion.
4. Initiating controlled burns in prairie uplands from which eastern red cedars have been removed.
5. Removing Amur maple plantings from the Weigand-Burbach area and monitoring their spread.

Louisville State Recreation Area

Louisville Lakes is a moderately small (192 acre) area which contains several sandpit lakes and also a fairly long extent of riverfront on the south side of the Platte River. Most of the site is developed, except for a strip of riparian woods that occurs along the south side of the river that is fairly extensive but mostly in fair to poor condition. A smaller extent of very degraded woods occurs on the east end of the site in the vicinity of the sewage plant.

Species of Concern

The Platte River in the vicinity of Louisville has received much attention from biologists going back to at least the 1930's. Interior least tern and piping plover have been recorded from the Platte River channel at the SRA since the early 1990's. Suitable habitat is present on sandbars and islands in the river adjacent to the SRA. Pallid sturgeon was also recorded nearby in 1995 and the state threatened lake sturgeon, sturgeon chub, and scaleshell mussel may also be present. Signs alerting people to the presence of these species should be in place. Because of the extensive development, it seems unlikely that nesting bald eagle would be present along the river channel, though potential habitat exists.

The non-riverine portion of the SRA has not been studied as well, but has received attention from botanists since at least the 1970's. Non-protected plant species of concern include slender fimbry, which was collected in 1973. Sand croton has been collected on numerous occasions but is not likely to be considered for protection.

Other communities

No exemplary plant communities have been recorded within the SRA. The most conspicuous natural community at the site is the band of riparian woods that borders the river. The woods are classifiable as eastern floodplain woodland and are dominated by a tall canopy of cottonwoods with a subcanopy mostly of American elm and the invasive white mulberry. Occasional native trees including silver maple, red mulberry and hackberry are also present. The woods are very brushy, with dense stands of rough dogwood and chokecherry in places and a short shrub layer of coralberry and scattered gooseberry. The understory is varied and contains many native species, the most

potential threat include common buckthorn at Long Pine SRA, Russian olive at Ash Hollow and Fort Robinson, and Scotch thistle at Fort Robinson.

Though native, eastern red cedar has invaded and seriously degraded upland pine woods at some sites, especially along the Niobrara River. It is particularly problematic at Keller Park. Cheatgrass and reed canarygrass are exotic species that invade grassland and wetlands respectively and are difficult to control. Carefully controlled burns could help reduce cheat populations at Ash Hollow and Wildcat Hills. Reed canarygrass is not as serious a problem in the northwest region as it is elsewhere in the state, but at Oliver Reservoir it is an even greater threat to Colorado butterfly plant habitat than Canada thistle.

Ash Hollow State Historical Park

Ash Hollow State Historical Park is a moderately large (1001 ac) site located in the rocky bluffs on the south side of the North Platte River. The north parcel of the Park occupies the lowest 1.5 miles of the hollow and a portion of the uplands extend about half a mile on either side. The south parcel, known as Windlass Hill is a 64-acre upland tract on the south side of the canyon about 1.5 miles south of the north tract. The uplands at both sites are mostly covered by western mixed-grass prairie with rock outcrops scattered on hilltops and eroded slopes of the canyon and draws. Fairly high quality prairie and rock outcrop are present, the outcrops being best developed on the north end of the Park. A couple of small woodland areas are present in hollow on the north tract, including a juniper woodland found at the base of a side-draw, and a fairly degraded riparian deciduous woodland in the bottom of the canyon itself. Though freshwater springs are present, no natural wetland communities occur, though some small patches of wet ground occur in the woods. Much of the bottom of Ash Hollow consists of a gravelly "sand draw" surrounded by degraded grassland. Though some interesting plants occur in these sand and gravel flats, few high quality areas are present in the canyon bottom overall.

Ash Hollow has received far more attention from geologists than biologists, though botanical records that can be placed near the Park with certainty are known back to at least the 1950's.

Species of concern

No threatened or endangered species have been recorded from Ash Hollow, nor does there appear to be suitable habitat for such species. Although the site is within the geographic range of swift fox, the rocky, rugged nature of the uplands at the Park probably preclude the presence of soils suitable for den digging away from the highway.

Several non-protected species of concern have been recorded at or near the Park. A golden eagle nest was observed along the west edge of the Park in 1976, a single American bittern was observed in or near the Park in 1983, and a single male Bell's vireo was recorded in the Park in 1990, where it apparently had been present for several years. The only plant species of concern recorded from Ash Hollow are curved-pod fumewort, which was collected in or near the Park in 1951 and 1966, and summer milkvetch, which

Exemplary communities

Tall-grass prairie

A small half acre strip of prairie occupies a narrow interfluvium north of the County Cork cabin area. The prairie is mostly surrounded by upland forest dominated by bur oak, eastern red cedar and dogwood, and the cedars are invading the site, especially near the north end. Little bluestem is the dominant species, with some big bluestem, spring panicum and sedges. Forb density and diversity is fairly high and conspicuous species include western ironweed, yarrow, prairie birdsfoot violet, frostweed, prairie ragwort and field pussytoes. Portions of the prairie are infested with Kentucky bluegrass and smooth brome. The quality of this site would improve if the large cedars were removed and periodic springtime controlled burns initiated. A strip of mowed lawn separates the prairie from the cabin area and could be used as a firebreak. The proximity of this prairie to a developed site would both make it fairly easy to manage and open the possibility of future use of the prairie for environmental education.

Very narrow patches of tall grass prairie are also present near the north end of the interfluvium north of the Running Deer cabin area as well, but these are heavily shrub-invaded. Nonetheless frostweed is also scattered in this area. These sites could also benefit from similar management practices.

Southeastern upland forest

The oak forest along the bluffs in the east half of the Park are not as rich or diverse as similar areas downstream at Schramm SRA or Platte River State Park. The uppermost slopes in this area are frequently dominated by bur oak with scattered red oak, green ash, hackberry or bitternut hickory in the canopy and eastern red cedar common in the subcanopy. Cedars, rough dogwood and prickly ash often form a thicket along the margin of the woods and the latter two may form a tall shrub layer under the canopy nearby. Coralberry is also prominent as a short shrub and Virginia creeper makes up the bulk of a relatively sparse herbaceous understory.

The upper slopes of the ravine north of the Kiewit lodge contain species typical of upper slope forest in the Park. The lower slopes are similar, except that slippery elm becomes the most abundant subcanopy tree below. The bottom of the ravine (and many of the side draws) are severely downcut by runoff from the paved road above the ravine. Occasional basswood are found on some of the slopes at the edge of the ravine bottom, and in some places that are not severely eroded, a rich herbaceous understory of bluntleaf woodsia, hog peanut, white snakeroot, and white-tinge sedge is apparent. Farther down the ravine the canopy becomes mostly composed of red oaks with occasional hackberry and black walnut in the subcanopy.

The ravine west of the County Cork cabin area is longer and somewhat richer than the preceding. It has red oak in addition to bur oak and black walnut in the upper slope canopy, and red oak and basswood dominant on the middle and lower slopes. Slippery elm is common in the subcanopy throughout, and Virginia creeper and sedges dominate

NORTHWEST REGION

Overview

Region 1 includes the Nebraska Panhandle, north-central Nebraska and the western Sandhills region. Fifteen state-listed threatened and endangered species have been recorded within the boundaries of Region 1 within the last twenty years. Four of these are small fishes that are restricted to small, clear streams, mostly in the Sandhills and Niobrara River drainage, including finescale dace, northern redbelly dace, blacknose shiner, and Topeka shiner. Other larger animals, such as river otter, interior least tern, piping plover and bald eagle are often associated with areas along large rivers and lakes. Swift fox and mountain plover are typically found in prairie in the Panhandle. White lady's slipper and western prairie fringed orchid are rare in wet meadows in the Sandhills. Two species of very limited distribution, which just enter the state from the west, are Ute lady's tresses, known from a single site along the Niobrara River in Sioux County and Colorado Butterfly Plant, known from a very few scattered locations in Kimball County. Including Oliver Reservoir SRA.

Habitats suitable for the above species, except the Ute Ladys' tresses, are found within Parks properties in the region. Surveyed areas that were recognized as having high potential to contain habitat for legally protected species include Fort Robinson State Park (swift fox), Long Pine SRA (finescale and northern redbelly dace), Merritt Reservoir SRA (finescale and redbelly dace, and blacknose and Topeka shiner), and Oliver Reservoir SRA (Colorado butterfly plant, swift fox and mountain plover). Areas with a slight chance of containing threatened and endangered habitat include Bowring Ranch SHP (blowout penstemon and western prairie fringed orchid) and Smith Falls State Park (small white lady's slipper orchid).

Seven of the eighteen Parks units in the northwest region were considered lower priority and were not surveyed because they were considered unlikely to contain habitat for any state protected species or exemplary plant communities. These were Bluewater Overlook Historical Site, Box Butte SRA, Bridgeport SRA, Cottonwood Lake SRA, Lake Minatare SRA, Long Lake SRA and Walgren Lake SRA. Of these, two have reports of state protected species. Finescale dace was collected in the Niobrara River in the vicinity of Box Butte Reservoir prior to construction of the dam. It is possible that it could be present at the upper end of the property. Bald eagle roosts were reported from Lake Minatare, and though nesting pairs have not been observed there, they are recorded nearby at the much less heavily utilized Lake Alice. Non-protected species of concern have been recorded from all the unsurveyed Parks properties with the exception of Bluewater Battlefield, and though it is possible that further surveys may reveal small examples of good quality plant communities, the possibility of the presence of threatened and endangered species habitat is fairly low. Among these sites, the ones that should be considered as priorities for future surveys are Box Butte Reservoir and Lake Minatare for possible protected species habitat, and Bluewater Battlefield, Cottonwood Lake, Long Lake and Walgren Lake for exemplary communities.

2. Slowing rate of runoff from paved roads into forested ravines. This is especially problematic in the ravine north of the Kiewit lodge, where some of these narrow, deep washes extend nearly to the road.
3. Thinning cedars at the margin of upland forest, especially in the vicinity of the prairies. Controlled burns conducted on the prairies can also include adjacent upper forest slopes.
4. Conducting surveys for southern flying squirrel in the deep ravine in the northwest part of the Park.

Pelican Point State Recreation Area

Pelican Point is a 36-acre strip of floodplain bordering the Missouri River. Most of the site is developed for camping, though some intact cottonwood-dogwood woodland occurs as a narrow band along the west and south sides. A few parts of the woods along the south side of the site are of moderately high quality, but most of the woodland is fairly degraded.

Species of Concern

No habitat for threatened or endangered species is present on the terrestrial portion of the SRA, but habitat for pallid and lake sturgeon and scaleshell mussel is present in the adjacent river channel. A pallid sturgeon (state and federally listed as endangered) was caught in the river near the boat ramp in 1996. A sign alerting fishermen to the presence of sturgeon is posted nearby. Lake sturgeon and scaleshell mussel occupy similar habitats and could also be present. No other plant or animal species of concern are known from the site, and previous biological survey has been limited to informal vegetation survey of the woods.

Exemplary communities

Cottonwood Dogwood Floodplain Woodland

A narrow strip of riparian woodland along the southwest side of the SRA seems to be the highest quality natural area on the site. It is between 1 and 2 acres in size and has a tall canopy of cottonwoods (about 60 ft. high) with a subcanopy of scattered American elms between 20 and 25 ft. high, and a tall shrub layer of scattered dogwoods 10-15 ft. tall. The herbaceous understory is fairly dense, but not highly diverse, with Virginia creeper, poison ivy and American germander the most common species. Climbing vines (including Virginia creeper and poison ivy) are conspicuous. A single shrub of Amur honeysuckle was observed in the south part of the site. This species, which has been found at scattered sites along the Missouri River, is reportedly very invasive in states to our east and could become problematic here. The shrub seen here was not large enough to flower yet, and should be eliminated before it reaches reproductive size.

mulberry and the native red mulberry. Rough dogwood is widely scattered and a short shrub layer of coralberry is conspicuous. Dominant herbs include wood nettle, nodding fescue, white snakeroot, jumpseed, sweet-scented bedstraw, woodreed, jack-in-the-pulpit, enchanter's nightshade and pale touch-me-not. Lower, wetter forest southward near the WMA contains a canopy of silver maple with a tall subcanopy of green ash and few other trees. Dogwood is moderately dense in these areas and the understory is primarily dominated by sedges and eastern poison ivy. The wet woods may represent the mature phase of the previously described cottonwood-silver maple phase of the eastern floodplain woodland. The presence of a single large cottonwood in this area seems to suggest it was formerly a cottonwood woodland.

A younger phase of the mature mesic forest is found northward. The canopy contains a few tall cottonwoods, a subcanopy of silver maple, green ash, elms and peach-leaved willow. Dogwood is moderate and coralberry present in the shrub layer. The herbaceous understory is dominated by mesic vegetation including hop sedge, needle spikerush, field horsetail, quill sedge, false nettle, clustered black snakeroot, selfheal, white snakeroot and jumpseed. There are also open, wet areas that contain wetland and woodland species such as hop sedge, reed canarygrass, goldenglow, Ontario aster, dotted smartweed and false nettle.

Both riparian forest communities described at Two Rivers are relatively free of invasive exotics, save for the reed canarygrass in the wet bottoms. Yellow iris is established in wetland on the WMA and could potentially invade wet areas in the woods. However, a much more serious threat is posed by garlic mustard, which is extremely well established in Omaha and could always come in with traffic.

Other communities

A degraded riparian woodland/wetland complex is found at the north end of the SRA north of the road between the Cottonwood and Oak Grove campgrounds. The south part of this area contains an unusual wetland pool that has a 3-4 inch layer of peat along its periphery. Most of the area surrounding the pool is occupied with peachleaf and diamond willow, and is heavily infested with the exotic narrowleaf cattail and reed canarygrass. Nonetheless some species associated with peaty soils of the Nebraska Sandhills are present, including mild water pepper, bearded sedge, and marsh bedstraw. Wet woodland dominated by green ash and diamond willow with a shrub layer of rough dogwood is found to the north of the wetland. This area is also heavily infested with reed canarygrass, but contains native wetland species including winged loosestrife, riggut sedge and common horsetail. Farther north strips of cottonwood-dogwood and eastern cottonwood woodland are present, though much of it is densely overgrown and nearly impenetrable. Further surveys might reveal patches of high quality native vegetation in the future.

Management priorities

1. Try to limit further development along the river to protect habitat for threatened and endangered species that utilize the river.

of the Oto teepee village. This site is dominated by big and little bluestem with a number of other native grasses and sedges, and has fairly high forb diversity including western ragweed, purple prairie clover, shell-leaf penstemon, prairie larkspur, frostweed, and prairie ragwort. Kentucky bluegrass is scattered in this prairie, but otherwise there are few exotics. The site is well drained and the soils fairly sandy, which is unusual for blufftop tall-grass prairie in this part of the state. This site could benefit from occasional spring burns to control bluegrass.

Larger prairie openings are found to the east of Stone Creek, on areas on west-facing slopes west of the Fox Hollow picnic area and the Walter Scott lodge. These sites contain much big bluestem, but also have much thatch and are invaded by eastern red cedars, so that the overall species diversity is fairly low. Removing cedars from the sites and instituting periodic spring burns should improve the quality of these sites as well as remove fuel that might promote accidental fires. The proximity of these remnants to developed areas offers an opportunity to use them to educate the public about natural processes in the grassland ecosystem.

Some unusual sandy upland prairie fragments are scattered on the southwest side of the Sjogren Wilderness tract. Indiangrass and sun sedge are among the dominants, though Kentucky bluegrass has invaded extensively. Shell-leaf penstemon and frostweed are common locally. These sites would also greatly benefit from removal of eastern red cedars and conducting prescribed burns in the spring.

Southeastern upland forest

Upland oak forest is extensive in the Park. In general, the upper slopes are dominated by large bur oaks, often with red oak and basswood. On lower slopes, basswood and red oak often dominate, and black walnuts are frequent in ravine bottoms. Four high quality forest sites were recognized in this survey.

The upper slopes of the most northwestern draw in the Park (northwest of the Pawnee teepee village) is dominated by bur oak and basswood with a sparse subcanopy of eastern red cedar, a few scattered gooseberries and a fairly sparse herbaceous layer dominated by Virginia creeper and white snakeroot. The middle slopes are richer and contain more basswood and have a richer subcanopy that includes hackberry, red mulberry and slippery elm, along with a distinct shrub layer of rough dogwood and coralberry. The herbaceous understory is more diverse and contains jack-in-the pulpit and enchanter's nightshade in addition to Virginia creeper. On the lower slopes, bur oaks are less prominent in the canopy, and black walnut and Kentucky coffeetree take their place in ravine bottoms. Hop hornbeam appears in the subcanopy of the lower slopes, and wood nettle and stinging nettle are more common in the herbaceous layer. Near the mouth of the draw, a few red oaks occur in the canopy, and additional species of shrubs and herbs appear, including chokecherry, elderberry, bladdernut, Virginia waterleaf, and pale touch-me-not. Much of the upper portion of this draw is infested by the highly invasive garlic mustard, and ground ivy is locally common on the slopes below. Despite these

these areas with native species would improve the wildlife value of these sites in the long term.

Management Priorities

1. Experiment with controlled burns in the primitive camping area. Other management efforts might be considered in the future.
2. Thin out large female cedars from the upper slopes of the forest tract on the west end.
3. Consider seeding native species in some of the lowland areas on the west end of the reservoir.

Two Rivers State Recreation Area

Two Rivers State Recreation Area is a fairly large (622 acre) tract of floodplain that borders the Platte River. Much of the west and north sides of the area contain fair to good quality riparian woodland and forest which probably represent some of the best examples of this community in eastern Nebraska. The woodlands on the south side of the SRA are the highest quality, and these continue southward onto the WMA portion of the area, which was surveyed in detail by Robert Steinauer in 1999. Small wetland areas are scattered among the woods at the SRA, but most are fairly degraded.

Species of Concern

The portion of the Two Rivers SRA that borders the Platte River contains some fairly high quality sandbar habitats that also provide habitat for threatened and endangered species. Interior least tern is the only legally protected species recorded within the SRA. Terns were observed in the channel of the Platte River between 1994 and 1997. Habitat for the protected piping plover is also likely on sandflats in the river channel, and pallid and lake sturgeon, sturgeon chub and scaleshell mussel are possible in the river channel. The cottonwoods on the island in the Platte River channel provide possible nesting habitat for bald eagle. Leaving much of the south part of the riverfront undeveloped should assure protection for the shorebirds and eagles. No habitat for threatened or endangered plant species was found on the SRA.

Two Rivers has been reasonably well studied by biologists, particularly from the University of Nebraska at Omaha, and is surprisingly species-rich. Several non-protected species of concern have been recorded within the SRA in the last 30 years. American toad was recorded in 1982 and five plant species have been verified including hop sedge, first collected in 1972, green dragon and eastern star sedge, recorded in 1998, and mullein foxglove and narrowleaf paleseed, which were found in 2001. Additionally, lousewort was recorded in the WMA land adjacent to the south in 1999.

Management Priorities

1. Controlling the spread of garlic mustard. The infestation in the northwest part of the Park is the most serious threat to the Park, and perhaps the biggest threat in any Parks property in the state. It is already abundant on the upper slopes of the north facing bluffs from the west boundary to the draw west of the Wild Strawberry cabin area. In many places it forms dense stands and is beginning to spread downslope in draw bottoms. Left unchecked it will displace desirable understory herbs and ruin the aesthetic and wildlife value of the forest within a relative few years. It will require much effort to eliminate the infestation, so highest immediate priority must be directed into limiting its spread. The extensive series of unmarked trails in the forest along Stone Creek and in the Sjogren tract make them particularly vulnerable to eventual invasion by this species.
2. Removing large female eastern red cedars from the uplands in the southwest part of the Sjogren Wilderness tract.
3. Monitoring and controlling multiflora rose along Stone Creek, where it could become problematic.
4. Initiating controlled burns in the prairie tracts west of Fox Hollow and the Walter Scott lodge. Occasional spring burns in the tract south of the Oto teepee village, and eventually in the Sjogren Wilderness tract should be considered.
5. Thinning out eastern red cedars on the upper forest slopes of the Sjogren Wilderness tract.
6. Limiting or closing off unnecessary trails along Stone Creek and in the Sjogren Wilderness tract, which can serve as pathways for invasive species.
7. Conducting surveys for southern flying squirrel, especially on the Sjogren tract, where the best potential habitat is located.

Ponca State Park

Ponca State Park is one of the more exemplary areas in the State Park system. The recent addition of the Schram tract makes it both one of the largest and one of the most diverse Parks in the eastern region as well. Most of the uplands are covered with moderate to fairly high quality northeastern upland forest. The draws in the central part of the Park appear to be richer than those in the north or southeast ends. Garlic mustard, which appears to have shown up recently in the Park, represents the greatest potential threat to this community. Small patches of prairie are scattered atop the bluffs above the forest, though many are fairly degraded and could benefit from fire management. Several floodplain communities were recognized in the Schram tract, including pondweed open water marsh, freshwater marsh, sedge wet meadow, shoreline, perennial sandbar,

floodplain terrace grassland, dune grassland, and young cottonwood-dogwood woodland. Though few of the communities are of extremely high quality, the ecosystem is sufficiently intact to be of high biological value. The communities there are by and large of higher quality than most of what remains along the Missouri River. However purple loosestrife, which is established through much of the northeast portion of the tract, could change that if it is not eliminated.

Species of concern

Ponca State Park has been the focus of several biological studies through the years, but records of the plants and animals found in the Park are incomplete. An annotated list of the vascular plant species occurring outside of cultivation in the Park was compiled by Steve Rolfsmeier in 2001. The unchannelized Missouri River, which forms the east boundary, is home to several threatened and endangered species. Interior least tern and piping plover have been recorded in the Missouri River channel near the Park since the 1980's and pallid sturgeon was recorded from the channel in 1996. In addition lake sturgeon, sturgeon chub and scaleshell mussel could be present in the river channel. Habitat for bald eagle could eventually be present along the river once the cottonwoods mature. No other animal species of concern have been recorded in the Park, though the false map turtle, which has not previously been verified in Nebraska, has been observed on the Schram Tract.

In 1989, two individuals of the state threatened American ginseng were seen along the east part trail 4 in the southwest part of the Park. Ginseng could not be relocated along this trail in 2001. Habitat suitable for ginseng is widespread in the Park. The plants are probably somewhat protected by the resemblance of ginseng leaves to the leaves of the very abundant Virginia creeper, which makes them difficult to see. Spring surveys for ginseng in Ponca State Park could be carried out to determine its status there. The Park lacks suitable habitat for any other state threatened plants, but contains several non-protected plant species of concern. The most noteworthy is wild leek, which is known from several populations in the Park. In Nebraska it is restricted to scattered populations between Ponca and Omaha, along the Missouri River bluffs. Other species of concern include Short's rockcress, wooly bugseed, blackseed ricegrass, and rock elm.

Exemplary Communities

Tall-grass prairie

Tall-grass prairie at Ponca State Park is generally restricted to steep upper slopes and ridgetops of bluffs within forest. Most of these areas are heavily infested by cool-season grasses such as Kentucky bluegrass and smooth brome, and many have additionally been invaded by the noxious leafy spurge. Native prairie plants are often present, but the overall species diversity of most of the open uplands is fairly low. The largest intact prairie tracts occur near picnic areas on the loess bluff loop road. These sites were sampled in 1998, shortly after a prescribed burn, and at that time big bluestem and Indiangrass were the dominant species, with scattered forbs and fairly low overall species diversity, probably due to years of regular mowing. A small but fairly high quality site is

Exemplary Communities

Tall-grass prairie

Several small prairie openings are present along a trail atop the forested bluff on the south side of the inlet stream. The area is rather small (0.5 ac) and consists of three connected prairie "islands" surrounded by oak forest. The prairie is occupied by a primitive camping area, which appears to be infrequently utilized. The site is heavily invaded by bur oak saplings that are mostly dwarfed (less than 0.5 m tall), probably due to regular mowing in the past. Past mowing has also promoted the growth of Kentucky bluegrass, and both yellow sweet clover and black medick have invaded the area, probably along the trail to the campsites. Despite past mowing, the site has a surprisingly high forb density and includes much bastard toadflax, prairie birdsfoot violet, candle anemone, and frostweed, the latter not previously reported from northeast Nebraska. The native grasses seem to have been suppressed by mowing, but are still present in scattered patches along the margins. Sedges that are typically found in tall-grass prairie have fared better and are fairly common. Though degraded, this site appears to have a fairly high restoration potential. Although past mowing has promoted growth of cool-season exotic grasses and suppressed many of the native grasses, it has also limited invasion by woody species. If it is eventually decided not to maintain the primitive camping sites atop the bluff, it is likely that shrubs and trees would shade out the remaining prairie plants fairly quickly. Controlled burns in the spring would promote warm season grasses and also slow the spread of invading woody species, though a rotation of spring and fall burns might eventually be the best approach to maintain the area as prairie.

Some small areas of native tall-grass prairie seem to coexist with seeded restored prairie on the east-facing slope west of the south fork of the reservoir. On the lower slopes are patches of what appears to be heavily smooth brome infested prairie with abundant prairie forbs including compassplant, narrowleaf bluets, stiff goldenrod, butterfly milkweed and grayhead prairie coneflower. Upslope from these sites is a large patch of bur oak woodland, which indicates the grassy slopes were probably wooded once and that the prairie species were likely seeded here at a later date. Parts of these lower slopes are visibly terraced, but nonetheless there is some evidence of native prairie on this hillside as well, particularly south of the oak woods. A small seep in the uplands west of the picnic area is lined with native species including Hale's meadow sedge. The presence of this particular sedge suggests it is highly unlikely to have been seeded into this area, since it would be very difficult to harvest seed of this small, early-flowering plant which is very rarely found in upland prairie. Overall, it seems likely that the entire slope west of the south fork of the reservoir was probably open oak woodland with patches of tall-grass prairie. Many of the most conspicuous forbs currently present were likely seeded.

Bur Oak Forest

A small patch of fairly representative bur oak forest 5-10 acres in size is located on a north-facing bluff south of the inlet stream on the west end of the SRA. The canopy is dominated by bur oak nearly throughout, though there are some differences in between

found along the Buffalo Run trail in the south part of the Park. It is far steeper than the loop road prairies and is dominated by little bluestem with some sideoats grama and sun sedge. Forb density is much higher, with the common species including stiff sunflower, prairie blue-eyed grass, prairie turnip, white prairie clover, skeletonplant and whorled milkweed. Exotics are very sparse in this site, and only a few patches of invasive smooth sumac are present. Controlled fall and spring burns will help maintain this site in good condition. The other sites could benefit from mostly spring burns to control Kentucky bluegrass.

Northeastern upland forest

The most abundant and best-preserved community in the Park is the upland forest. The upper slopes are commonly dominated by large bur oaks with spreading crowns. Scattered hackberry frequently occur in the canopy as well, especially along some of the upland forest margins, where it is sometimes locally dominant. Common subcanopy trees include hackberry, slippery elm, green ash, and hop hornbeam. A shrub layer is often well developed on the upper slopes, especially at the forest margin. Large eastern red cedars and rough dogwood often form a shrubby boundary along the upper edge of the forest that sometimes grades into a shrub patch of sumac and young dogwood in the open grasslands atop the bluffs. Under the oaks, the common shrubs are rough dogwood and prickly ash. Herbaceous plants of upper slopes and edges include Canada black snakeroot, white snakeroot, and hairy wildrye. In many places the upper and middle slopes contain rich forest of bur oak with a well-developed herbaceous understory including Virginia creeper, bloodroot, Canada violet, and longbeak sedge.

The lower slopes are often quite rich and in places contain some basswood in the canopy, along with bur oak, green ash, or hackberry. Hop hornbeam is the dominant subcanopy tree of low slopes, and often grows with red mulberry and rock elm. Chokecherry is the most common shrub, but is usually not abundant. The herbaceous layer is rich with Virginia creeper, bloodroot, Canada violet, wood sedge, few-flowered sedge, yellow wood violet, Virginia waterleaf, pale touch-me-not, longbeak sedge, inflated narrowleaf sedge, honewort, and aniseroot.

The upland forest at Ponca State Park is fairly uniform overall, but the wooded draws in the central part of the Park are richer than those of the north or south ends. In these rich draws, the upper slope woods are often restricted to a narrow marginal band, with lower slope vegetation extending far upslope. The ravines in the vicinity of the trail 4 are typical. These areas contain fairly deep ravines surrounded by a narrow band of upper slope forest of bur oak with hackberry and slippery elm. The greater part of the slopes are dominated by bur oak, with hop hornbeam and slippery elm frequent in the subcanopy, and a shrub layer that is poorly developed except for some patches of chokecherry. The herbaceous understory is rich and contains Virginia creeper, bloodroot, Virginia waterleaf, Canada violet, and longbeak, common wood, and few-flowered sedges. Protected north and east facing slopes are dominated by basswoods with hop hornbeam, often with extensive mats of longbeak sedge beneath. Near the ravine bottoms, hackberry and black walnut appear in the canopy and rock elm in the

usually occurring with the similar jack-in-the-pulpit. Fourteen green dragon plants were seen in this area in 2001.

Another rich upland forest site is located in the upper half of fishery canyon above the ponds. The upper end of the draw is dominated by red and bur oaks and green ash on upper slopes, with black walnut common near the bottom. The subcanopy is predominately basswood, hackberry and red elm. A conspicuous shrub layer of dogwood and coralberry is present, while the herbaceous layer is dominated by Virginia creeper, eastern poison ivy, pointed tickclover, hairy wildrye and clustered black snakeroot. The lower parts of the draw are dominated by basswood with an understory of hop hornbeam, scattered shrubs and a rich herbaceous understory that includes nodding fescue, wingstem, black snakeroot, longbeak sedge and Virginia creeper. The lowest portion of the canyon is open and weedy and contains many species that appear to have escaped from cultivation.

Despite the high quality of parts of the upland forest, this community seems to be under particularly heavy grazing pressure from whitetail deer (more deer were observed at this site than any other in the eastern region during this study). The near absence of a well-developed shrub layer in many parts of the SRA was among the most obvious visible signs of overgrazing. Overgrazing can also promote the spread of exotic species through the SRA. At this time, few problematic exotics are established in the forest, apart from scattered multiflora rose and autumn olive, which is reproducing along the forest margin on the east side. Dame's rocket appears to be spreading in low forest in some places, especially along the stream on the west side. All three could become serious problems if left unchecked. Additionally the removal of large female junipers from some of the places where they are abundant on upper slopes would help improve the quality of much of the upper slope forest by allowing the herbaceous understory species a chance to compete.

Eastern Floodplain Woodland

A large patch of cottonwood woodland is present in the floodplain south of the highway. The most mature woods are located on the north and west side of the floodplain and are dominated by an open cottonwood canopy 60 feet high, with a heterogeneous subcanopy of American elm, silver maple, and green ash to 30 ft. high. A few spots contain basswood, black walnut and box elder, and patches of hackberry and the exotic white mulberry are scattered. A fairly well developed tall shrub layer of rough dogwood 8-10 feet tall is present, along with a short shrub layer of coralberry. Abundant understory herbs include wood nettle, jack-in-the-pulpit, Davis' sedge, whitegrass, nodding fescue, goldenglow and Ontario aster. Poison ivy is common climbing the trees. Green dragon is scattered through much of the woods, though most of the plants at this site were non-flowering.

Some younger woodlands are present closer to the river in the east portion of the floodplain, but are fairly poor quality. These woods have a very open canopy of cottonwood and peachleaf willow about 40 feet tall, and a subcanopy of silver maple and diamond willow. The understory is entirely overtaken by reed canarygrass. This

appear to remain flooded most of the season and contain submersed aquatic plants, though often not in great number. The beaver pond contains the most deeply flooded wetland community in the floodplain. The margins of this pool are fairly densely vegetated by submersed aquatic plants, forming a pondweed open water marsh community containing sago pondweed, leafy pondweed, horned pondweed, longleaf pondweed, coontails, and green algae of the genus *Chara*. A few shallower pools occur in branch channels to the east, but usually have little submersed flora other than scattered longleaf pondweed and *Chara*. To the south of the beaver pond is the aforementioned bulrush marsh, which occurs in ground that is wet to shallowly flooded most of the year. In many places, the exotic narrowleaf cat-tail and the native rice cutgrass dominate similarly wet areas in the floodplain.

The water level in most of the channels is quite variable, due likely to fluctuations in the amount of water released upriver at Gavins Point Dam. The margins of most of the flooded areas are occupied by a shoreline community made up of numerous short-lived annuals and a few perennial hydrophytes. These communities usually consist of concentric zones of vegetation. The margins of the wet channels often contain sprangletop, needle spikerush, water plantain, and hooded arrowhead. Numerous annuals and a few perennials occupy the very variable areas several feet beyond the waterline including Torrey's rush, slender-leaf false foxglove, winged loosestrife, marsh St. John's wort, rayless alkali aster, seaside crowfoot, teal lovegrass and others. Above farther still, more perennial species appear such as blue vervain, great blue lobelia, in addition to annuals and biennials such as common evening primrose and the very abundant partridge pea.

Marshes and sometimes also shoreline areas tend to occur adjacent to sedge wet meadow communities. These areas are best developed in shallow channels that remain moist but not flooded most of the year, such as the channel in the south part of the tract. Here wooly, crested, fox, and troublesome sedge may be common with a wide variety of other plants such as blue vervain, bald spikerush, inland rush, prairie wedgegrass, and water horehound. Some or all of these species may be present along the outer fringes of shoreline areas as well, but usually sedges are not as conspicuous in those areas. Canada thistle and reed canarygrass pose threats to this community, along with purple loosestrife.

On the east side of the channels in the north part of the Schram Tract, sedge wet meadow grades into perennial sandbar community. These sites are periodically flooded and are dominated by a mixture of woody and mostly perennial herbaceous species. The lower parts of the perennial sandbar community that border the channels may be dominated by perennial hydrophytes such as three-square bulrush, intermediate scouringrush, and field horsetail, but these soon grade into a mixture of young diamond willow, cottonwoods, sandbar willow, asters, goldenrods and switchgrass. Large portions of the perennial sandbar community are densely vegetated and difficult to walk through. In many cases they are also infested by the noxious purple loosestrife, especially in areas directly north and east of the beaver pond. Purple loosestrife may be problematic in sedge wet meadow, marsh and shoreline communities as well. At this point there are few places where it is locally common in the floodplain, but it is widely scattered through the entire

subcanopy. Wood nettle, pale touch-me-not, Virginia waterleaf, longbeak sedge and aniseroot are the common herbaceous plants of ravine bottoms.

The forest in north and southeast ends of the Park tends to contain a larger extent of upper slope forest vegetation and are therefore generally not as diverse. One exception is the very deep ravine directly east of the east shelter. The slopes are very protected, and the flora resembles that of rich lower slopes in the central part of the Park, though in many places the lowest slopes are rather eroded. Florida lettuce and the shrub bladdernut, were seen only in this ravine within the Park.

Exotics are not common on the rich lower slopes of the forest, but a single colony of the highly invasive garlic mustard was found along the horse trail north of the Park office, and represents a very serious threat to this community. Leafy spurge is also present on some of the more open wooded upper forest slopes in the southeast part of the Park, but does not appear to thrive in dense shade. Eastern red cedar is often common on upper slopes in the Park, but probably does not represent as great a threat to the forest communities at this time.

Freshwater marsh

Intact and relatively undisturbed wetland habitats are plentiful on the Schram Tract. Several riparian communities are present, but the one considered highest quality in this survey was freshwater marsh, which occurs in narrow strips in the bottom of the abandoned side channels in the north half of the tract. One of the highest quality areas is a small strip of freshwater marsh that occurs to the south of the beaver pond. The bottom of the channel is dominated by patches of softstem bulrush, bald spikerush, Torrey's rush and rice cutgrass, with scattered river bulrush and prairie bulrush. Though it has fairly low species diversity (as is typical for this community) there are also few exotics. Purple loosestrife, which is established in several wetland communities in this area, represents the biggest threat to this site, though the exotic narrowleaf cattail and reed canarygrass could also overtake it. The riparian communities of the Schram Tract are best appreciated in relation to the overall floodplain ecosystem, which is described in greater detail in the following section.

Other communities

The addition of the Schram tract greatly increases the natural diversity of the Park. A number of communities are represented there that are not preserved on Park division lands elsewhere along the Missouri River. The communities that are most exemplary and which probably have the greatest wildlife value are the wetlands in the old side channels. Though none of the other individual communities found in this tract were recorded as exemplary in 2001, the intact river bottom ecosystem provides a good example of the range of communities that occur along the Missouri River in northeast Nebraska, and is a very valuable addition to the Park.

In general, the communities found in the floodplain occur along a moisture gradient that varies in relation to height above the river surface. A few small pools in the channels

area east of the beaver marsh. Much persistence will be necessary to eliminate the threat of purple loosestrife in this area.

The perennial sandbar community found on to the east of the old channel intergrades with non-wetland communities in places. The areas that lie on slightly higher ground tend not to contain young willow and cottonwood and instead are dominated by grasses such as switchgrass and the exotic Kentucky bluegrass and weedy perennial forbs such as Canada goldenrod. This community has provisionally been called Missouri River terrace grassland and is best represented in portion of the floodplain west and south of the wetland channels. High quality terrace grassland is rare in Nebraska, probably because much of this community type has either been converted to agriculture or has naturally succeeded to woodland communities.

South and west of the mouth of the north channel, patches of young cottonwood-dogwood woodland occupy much of the floodplain. Young riparian woodland is rare along the channelized portion of the Missouri River, and is poorly studied elsewhere in Nebraska. Two patches of woods are present, separated by a shallow channel that represents the north end of the south chute. The woods are quite open and dominated by scattered cottonwoods 25-30 feet tall, with a poorly developed subcanopy of small green ash 10-15 feet tall. Young eastern red cedars to eight feet tall are also scattered throughout. A shrub layer is present, but is not nearly as dense as it often is in more mature phases of this community. Patches of rough dogwood to 6 feet tall and smaller scattered individuals of prickly ash and false indigobush make up the bulk of the shrub stratum. The understory is somewhat variable. In lower places intermediate scouringrush is often common and occasional dead or dying diamond willow may be present, especially closer to wetland channels. Most of the rest of the woodland contains understory species typical of the open terrace grassland such as switchgrass, Canada goldenrod, Kentucky bluegrass, sedges and assorted forbs including Maximilian's sunflower, hoary tickclover, heath aster, western ragweed, daisy fleabane, whorled milkweed and Canada lettuce. Easter poison ivy and Virginia creeper occasionally climb the trees along the woodland margin. The highest areas within the woods contain only patches of cottonwoods with switchgrass, Canada wildrye and sand dropseed in the herbaceous layer. Much of the terrace grassland and some parts of the woods have been farmed in the recent past, but are surrounded by native vegetation and should be able to recover naturally over time. Leafy spurge is present in places, especially in and near the woods. Eastern red cedar and Russian olive, which are widely scattered in the woods, could potentially become problematic.

The most xeric community in the Schram Tract is ironically located next to the Missouri River channel on the east side of the perennial sandbar area. Here a series of small sparsely vegetated sand dunes is present. Patches of trees, especially young "thickets" of cottonwood are found on crests of many dunes, but the slopes are sparsely vegetated by weedy annuals including cocklebur, woolly bugseed, winged pigweed, partridge pea, slender Russian thistle and kochia. Patches of sandbar and diamond willows may be scattered as well. This area seems to represent a young condition of the Missouri River dune grassland community, which has only recently been described in Nebraska. Woolly

Species of Concern

Though no state or federally protected species have been recorded within the SRA boundaries, the interior least tern and piping plover were observed in the Platte River channel adjacent to the SRA in the 1980's. Pallid and lake sturgeon have also been recorded from the river channel nearby. Sturgeon chub was collected in shallow water along the north bank of the Platte River adjacent to the SRA in 1991. Scaleshell mussel may also be present in the river channel, but surveys have not been conducted. The mature riparian forest adjacent to the river provides potential bald eagle nesting habitat, especially in the southwest part of the SRA or on the adjacent private land to the west. Potential habitat for southern flying squirrel is present in the upland forest on the north side of the SRA. The tern and plover habitat within the river channel is subject to yearly water flows and cannot be managed directly. Limiting the extent of development in the floodplain and possible future purchase of additional land in the floodplain (such as west of the current SRA boundary) could allow additional habitat for shorebirds and possibly nesting bald eagle. Posting signs to alert fisherman of the presence of sturgeon in the river channel would also help, if such signs are not already in place.

No threatened or endangered plants are known from Schramm Park, but western fringed prairie orchid is known from upland prairie nearby in southern Sarpy County, and could be present in tall-grass prairie in the west part of the SRA. American ginseng is also possible on rich, protected slopes in the upland forest, though the likelihood of either species being present in the SRA is fairly low.

Several animal species of concern that are not legally protected have been recorded at Schramm Park including peregrine falcon, whip-poor-will, western ribbon snake, Graham's crayfish snake, and brook stickleback. Plant species of concern are recorded from the SRA include green dragon, clasping-leaved milkweed, long-awned woodgrass, Texas sedge, American alumroot and dwarf chinkapin oak. The alumroot, which was collected in 1942, is known in Nebraska only from this locality. Additionally, depauperate, sterile plants of Turk's-cap lily were observed in a narrow strip of vegetation between two trails on the east side of the SRA, along with sterile plants of green dragon.

Exemplary communities

Tall-grass prairie

Three relatively large (>5 acres) tracts of prairie were recorded in the west part of the SRA. All are dominated by big bluestem and have a fairly low species diversity. The most visible tract is along the north side of the road below the 4H building. This site has very few exotics, but also the lowest species diversity of the three. Little bluestem is scattered in the prairie in addition to big bluestem, and much round-headed bush clover is visible. Other scattered forbs include partridge pea, many-flowered scurfspea, western ironweed, Illinois bundleflower, hoary vervain, flowering spurge and false boneset. A single flowering plant of clasping-leaved milkweed was also found along the two track trail near the base of the prairie slope. This tract had been burned earlier in the season.

bugseed has been collected only once before in Nebraska in a similar community downstream.

The ecosystem containing all these communities represents a very valuable addition to the Park. Reconnecting these channels to the river and restoring natural flows would improve the quality of the wetland communities found there and additionally enhance habitat for sturgeon and sturgeon chub.

Management priorities

1. Garlic mustard is probably the most controllable of the invasive species that threaten the Park at this point. It is currently restricted to a patch of about 20 by 20 meters in a level opening in the bluffs north of the Park headquarters. The area is at the intersection of a horse trail and a hiking trail, and is already beginning to spread northward along one trail. Repeated hand-pulling of pre-fruited stems in the spring and rosettes in the fall should eliminate the threat. Since hand pulling also stimulates germination of garlic mustard seeds, this will need to be carried out over a period of several seasons to control. Occasional surveys of frequently used trails for other infestations are also a good idea.
2. Purple loosestrife has been sprayed in the past, but only on a very limited basis. The largest concentration of purple loosestrife is found near the channel north of the beaver pond, but it is widely scattered in all but the highest areas of the floodplain from the north chute eastward. Surveying and spot spraying of plants through this area is a high priority, as the loosestrife could soon get out of hand if not effectively controlled. It should be noted that the much less common, smaller and less hairy native winged loosestrife occurs along upper shorelines of some of the channels. Personnel carrying out the spraying should be able to recognize both species. Fortunately they are easy to distinguish once seen in the field.
3. Leafy spurge is thoroughly established through most of the uplands and control efforts need to be continued, most effectively by fall-spraying. Patches in the floodplain need to be controlled immediately, before they become too well established to effectively control.
4. Other invasive plants which may become problems in the near future include reed canarygrass (in floodplain wetlands on the Schram Tract) and common buckthorn (at the base of the bluffs below the Park office). Either of these could soon get out of control if not checked, particularly the reed canarygrass.
5. Thin cedars and carry out spring burns of open bluffs throughout the Park. Areas recognized as containing native prairie should be first priority, but other areas still have native flora which is being suppressed by smooth brome, Kentucky bluegrass and eastern red cedar. A survey of other areas worthy of management for prairie might be helpful. In places where brush is a problem, other options may be necessary.

6. Periodically survey the woods for American ginseng, so that areas containing it can be identified and protected.

Riverview Marina State Recreation Area

Riverview Marina is one of several rather small (38 acre) areas that provide access to the Missouri River. Most of the site is developed and no species of concern are recorded from the SRA. The river channel nearby contains habitat for pallid and lake sturgeon. No exemplary communities are present at the site, though a portion of a pond containing degraded native wetland is present.

Species of concern

Pallid and lake sturgeon have not been recorded close to Riverview Marina, but could well be present in the Missouri River adjacent to the site. Signs alerting fisherman to their presence should be posted and maintained. Scaleshell mussel is also possible. No plant or animal species of concern have been recorded from within the boundaries of the SRA.

Other communities

Riverview Marina contains portions of a couple of ponds that contain wetland species. The pond west of the road is bordered by degraded sandbar willow shrubland with an understory predominately of reed canarygrass. A few native buttonbushes are present along the west edge of the willows, and some native herbaceous hydrophytes are present, but overall the quality of the wetland habitats there is poor. A more intensive survey could perhaps locate small areas of high-quality wetland.

Management Priorities

No recommendations at this time.

Schramm Park State Recreation Area

Schramm Park SRA is small (171 acre) but surprisingly biologically rich area on the north side of the lower Platte River between Platte River and Mahoney State Parks. The uplands that constitute the bulk of Schramm Park are covered by oak forest, much of which is fairly high quality, despite heavy grazing pressure from whitetail deer. Small patches of variously degraded prairie are scattered among the forest, mostly on ridgetops and south-facing slopes. Many of these openings are heavily encroached by woody vegetation. Larger areas of fair quality prairie are present in the west fourth of the area and two of the larger ones had been managed through controlled burning in early 2001. The floodplain contains a fairly large area of mature riparian forest that is in fairly good condition, but most of the remaining floodplain is developed or variously degraded. Schramm Park has received much attention from biologists going back to at least the 1940's when it was known as the Gretna State Fish Hatchery

Species of Concern

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Exemplary communities

Tall-grass prairie

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appear to remain flooded most of the season and contain submersed aquatic plants, though often not in great number. The beaver pond contains the most deeply flooded wetland community in the floodplain. The margins of this pool are fairly densely vegetated by submersed aquatic plants, forming a pondweed open water marsh community containing sago pondweed, leafy pondweed, horned pondweed, longleaf pondweed, coontails, and green algae of the genus *Chara*. A few shallower pools occur in branch channels to the east, but usually have little submersed flora other than scattered longleaf pondweed and *Chara*. To the south of the beaver pond is the aforementioned bulrush marsh, which occurs in ground that is wet to shallowly flooded most of the year. In many places, the exotic narrowleaf cat-tail and the native rice cutgrass dominate similarly wet areas in the floodplain.

The water level in most of the channels is quite variable, due likely to fluctuations in the amount of water released upriver at Gavins Point Dam. The margins of most of the flooded areas are occupied by a shoreline community made up of numerous short-lived annuals and a few perennial hydrophytes. These communities usually consist of concentric zones of vegetation. The margins of the wet channels often contain sprangletop, needle spikerush, water plantain, and hooded arrowhead. Numerous annuals and a few perennials occupy the very variable areas several feet beyond the waterline including Torrey's rush, slender-leaf false foxglove, winged loosestrife, marsh St. John's wort, rayless alkali aster, seaside crowfoot, teal lovegrass and others. Above farther still, more perennial species appear such as blue vervain, great blue lobelia, in addition to annuals and biennials such as common evening primrose and the very abundant partridge pea.

Marshes and sometimes also shoreline areas tend to occur adjacent to sedge wet meadow communities. These areas are best developed in shallow channels that remain moist but not flooded most of the year, such as the channel in the south part of the tract. Here woolly, crested, fox, and troublesome sedge may be common with a wide variety of other plants such as blue vervain, bald spikerush, inland rush, prairie wedgegrass, and water horehound. Some or all of these species may be present along the outer fringes of shoreline areas as well, but usually sedges are not as conspicuous in those areas. Canada thistle and reed canarygrass pose threats to this community, along with purple loosestrife.

On the east side of the channels in the north part of the Schram Tract, sedge wet meadow grades into perennial sandbar community. These sites are periodically flooded and are dominated by a mixture of woody and mostly perennial herbaceous species. The lower parts of the perennial sandbar community that border the channels may be dominated by perennial hydrophytes such as three-square bulrush, intermediate scouringrush, and field horsetail, but these soon grade into a mixture of young diamond willow, cottonwoods, sandbar willow, asters, goldenrods and switchgrass. Large portions of the perennial sandbar community are densely vegetated and difficult to walk through. In many cases they are also infested by the noxious purple loosestrife, especially in areas directly north and east of the beaver pond. Purple loosestrife may be problematic in sedge wet meadow, marsh and shoreline communities as well. At this point there are few places where it is locally common in the floodplain, but it is widely scattered through the entire

usually occurring with the similar jack-in-the-pulpit. Fourteen green dragon plants were seen in this area in 2001.

Another rich upland forest site is located in the upper half of fishery canyon above the ponds. The upper end of the draw is dominated by red and bur oaks and green ash on upper slopes, with black walnut common near the bottom. The subcanopy is predominately basswood, hackberry and red elm. A conspicuous shrub layer of dogwood and coralberry is present, while the herbaceous layer is dominated by Virginia creeper, eastern poison ivy, pointed tickclover, hairy wildrye and clustered black snakeroot. The lower parts of the draw are dominated by basswood with an understory of hop hornbeam, scattered shrubs and a rich herbaceous understory that includes nodding fescue, wingstem, black snakeroot, longbeak sedge and Virginia creeper. The lowest portion of the canyon is open and weedy and contains many species that appear to have escaped from cultivation.

Despite the high quality of parts of the upland forest, this community seems to be under particularly heavy grazing pressure from whitetail deer (more deer were observed at this site than any other in the eastern region during this study). The near absence of a well-developed shrub layer in many parts of the SRA was among the most obvious visible signs of overgrazing. Overgrazing can also promote the spread of exotic species through the SRA. At this time, few problematic exotics are established in the forest, apart from scattered multiflora rose and autumn olive, which is reproducing along the forest margin on the east side. Dame's rocket appears to be spreading in low forest in some places, especially along the stream on the west side. All three could become serious problems if left unchecked. Additionally the removal of large female junipers from some of the places where they are abundant on upper slopes would help improve the quality of much of the upper slope forest by allowing the herbaceous understory species a chance to compete.

Eastern Floodplain Woodland

A large patch of cottonwood woodland is present in the floodplain south of the highway. The most mature woods are located on the north and west side of the floodplain and are dominated by an open cottonwood canopy 60 feet high, with a heterogeneous subcanopy of American elm, silver maple, and green ash to 30 ft. high. A few spots contain basswood, black walnut and box elder, and patches of hackberry and the exotic white mulberry are scattered. A fairly well developed tall shrub layer of rough dogwood 8-10 feet tall is present, along with a short shrub layer of coralberry. Abundant understory herbs include wood nettle, jack-in-the-pulpit, Davis'sedge, whitegrass, nodding fescue, goldenglow and Ontario aster. Poison ivy is common climbing the trees. Green dragon is scattered through much of the woods, though most of the plants at this site were non-flowering.

Some younger woodlands are present closer to the river in the east portion of the floodplain, but are fairly poor quality. These woods have a very open canopy of cottonwood and peachleaf willow about 40 feet tall, and a subcanopy of silver maple and diamond willow. The understory is entirely overtaken by reed canarygrass. This

found along the Buffalo Run trail in the south part of the Park. It is far steeper than the loop road prairies and is dominated by little bluestem with some sideoats grama and sun sedge. Forb density is much higher, with the common species including stiff sunflower, prairie blue-eyed grass, prairie turnip, white prairie clover, skeletonplant and whorled milkweed. Exotics are very sparse in this site, and only a few patches of invasive smooth sumac are present. Controlled fall and spring burns will help maintain this site in good condition. The other sites could benefit from mostly spring burns to control Kentucky bluegrass.

Northeastern upland forest

The most abundant and best-preserved community in the Park is the upland forest. The upper slopes are commonly dominated by large bur oaks with spreading crowns. Scattered hackberry frequently occur in the canopy as well, especially along some of the upland forest margins, where it is sometimes locally dominant. Common subcanopy trees include hackberry, slippery elm, green ash, and hop hornbeam. A shrub layer is often well developed on the upper slopes, especially at the forest margin. Large eastern red cedars and rough dogwood often form a shrubby boundary along the upper edge of the forest that sometimes grades into a shrub patch of sumac and young dogwood in the open grasslands atop the bluffs. Under the oaks, the common shrubs are rough dogwood and prickly ash. Herbaceous plants of upper slopes and edges include Canada black snakeroot, white snakeroot, and hairy wildrye. In many places the upper and middle slopes contain rich forest of bur oak with a well-developed herbaceous understory including Virginia creeper, bloodroot, Canada violet, and longbeak sedge.

The lower slopes are often quite rich and in places contain some basswood in the canopy, along with bur oak, green ash, or hackberry. Hop hornbeam is the dominant subcanopy tree of low slopes, and often grows with red mulberry and rock elm. Chokecherry is the most common shrub, but is usually not abundant. The herbaceous layer is rich with Virginia creeper, bloodroot, Canada violet, wood sedge, few-flowered sedge, yellow wood violet, Virginia waterleaf, pale touch-me-not, longbeak sedge, inflated narrowleaf sedge, honewort, and aniseroot.

The upland forest at Ponca State Park is fairly uniform overall, but the wooded draws in the central part of the Park are richer than those of the north or south ends. In these rich draws, the upper slope woods are often restricted to a narrow marginal band, with lower slope vegetation extending far upslope. The ravines in the vicinity of the trail 4 are typical. These areas contain fairly deep ravines surrounded by a narrow band of upper slope forest of bur oak with hackberry and slippery elm. The greater part of the slopes are dominated by bur oak, with hop hornbeam and slippery elm frequent in the subcanopy, and a shrub layer that is poorly developed except for some patches of chokecherry. The herbaceous understory is rich and contains Virginia creeper, bloodroot, Virginia waterleaf, Canada violet, and longbeak, common wood, and few-flowered sedges. Protected north and east facing slopes are dominated by basswoods with hop hornbeam, often with extensive mats of longbeak sedge beneath. Near the ravine bottoms, hackberry and black walnut appear in the canopy and rock elm in the

Exemplary Communities

Tall-grass prairie

Several small prairie openings are present along a trail atop the forested bluff on the south side of the inlet stream. The area is rather small (0.5 ac) and consists of three connected prairie "islands" surrounded by oak forest. The prairie is occupied by a primitive camping area, which appears to be infrequently utilized. The site is heavily invaded by bur oak saplings that are mostly dwarfed (less than 0.5 m tall), probably due to regular mowing in the past. Past mowing has also promoted the growth of Kentucky bluegrass, and both yellow sweet clover and black medick have invaded the area, probably along the trail to the campsites. Despite past mowing, the site has a surprisingly high forb density and includes much bastard toadflax, prairie birdsfoot violet, candle anemone, and frostweed, the latter not previously reported from northeast Nebraska. The native grasses seem to have been suppressed by mowing, but are still present in scattered patches along the margins. Sedges that are typically found in tall-grass prairie have fared better and are fairly common. Though degraded, this site appears to have a fairly high restoration potential. Although past mowing has promoted growth of cool-season exotic grasses and suppressed many of the native grasses, it has also limited invasion by woody species. If it is eventually decided not to maintain the primitive camping sites atop the bluff, it is likely that shrubs and trees would shade out the remaining prairie plants fairly quickly. Controlled burns in the spring would promote warm season grasses and also slow the spread of invading woody species, though a rotation of spring and fall burns might eventually be the best approach to maintain the area as prairie.

Some small areas of native tall-grass prairie seem to coexist with seeded restored prairie on the east-facing slope west of the south fork of the reservoir. On the lower slopes are patches of what appears to be heavily smooth brome infested prairie with abundant prairie forbs including compassplant, narrowleaf bluets, stiff goldenrod, butterfly milkweed and grayhead prairie coneflower. Upslope from these sites is a large patch of bur oak woodland, which indicates the grassy slopes were probably wooded once and that the prairie species were likely seeded here at a later date. Parts of these lower slopes are visibly terraced, but nonetheless there is some evidence of native prairie on this hillside as well, particularly south of the oak woods. A small seep in the uplands west of the picnic area is lined with native species including Hale's meadow sedge. The presence of this particular sedge suggests it is highly unlikely to have been seeded into this area, since it would be very difficult to harvest seed of this small, early-flowering plant which is very rarely found in upland prairie. Overall, it seems likely that the entire slope west of the south fork of the reservoir was probably open oak woodland with patches of tall-grass prairie. Many of the most conspicuous forbs currently present were likely seeded.

Bur Oak Forest

A small patch of fairly representative bur oak forest 5-10 acres in size is located on a north-facing bluff south of the inlet stream on the west end of the SRA. The canopy is dominated by bur oak nearly throughout, though there are some differences in between

Management Priorities

1. Controlling the spread of garlic mustard. The infestation in the northwest part of the Park is the most serious threat to the Park, and perhaps the biggest threat in any Parks property in the state. It is already abundant on the upper slopes of the north facing bluffs from the west boundary to the draw west of the Wild Strawberry cabin area. In many places it forms dense stands and is beginning to spread downslope in draw bottoms. Left unchecked it will displace desirable understory herbs and ruin the aesthetic and wildlife value of the forest within a relative few years. It will require much effort to eliminate the infestation, so highest immediate priority must be directed into limiting its spread. The extensive series of unmarked trails in the forest along Stone Creek and in the Sjogren tract make them particularly vulnerable to eventual invasion by this species.
2. Removing large female eastern red cedars from the uplands in the southwest part of the Sjogren Wilderness tract.
3. Monitoring and controlling multiflora rose along Stone Creek, where it could become problematic.
4. Initiating controlled burns in the prairie tracts west of Fox Hollow and the Walter Scott lodge. Occasional spring burns in the tract south of the Oto teepee village, and eventually in the Sjogren Wilderness tract should be considered.
5. Thinning out eastern red cedars on the upper forest slopes of the Sjogren Wilderness tract.
6. Limiting or closing off unnecessary trails along Stone Creek and in the Sjogren Wilderness tract, which can serve as pathways for invasive species.
7. Conducting surveys for southern flying squirrel, especially on the Sjogren tract, where the best potential habitat is located.

Ponca State Park

Ponca State Park is one of the more exemplary areas in the State Park system. The recent addition of the Schram tract makes it both one of the largest and one of the most diverse Parks in the eastern region as well. Most of the uplands are covered with moderate to fairly high quality northeastern upland forest. The draws in the central part of the Park appear to be richer than those in the north or southeast ends. Garlic mustard, which appears to have shown up recently in the Park, represents the greatest potential threat to this community. Small patches of prairie are scattered atop the bluffs above the forest, though many are fairly degraded and could benefit from fire management. Several floodplain communities were recognized in the Schram tract, including pondweed open water marsh, freshwater marsh, sedge wet meadow, shoreline, perennial sandbar,

these areas with native species would improve the wildlife value of these sites in the long term.

Management Priorities

1. Experiment with controlled burns in the primitive camping area. Other management efforts might be considered in the future.
2. Thin out large female cedars from the upper slopes of the forest tract on the west end.
3. Consider seeding native species in some of the lowland areas on the west end of the reservoir.

Two Rivers State Recreation Area

Two Rivers State Recreation Area is a fairly large (622 acre) tract of floodplain that borders the Platte River. Much of the west and north sides of the area contain fair to good quality riparian woodland and forest which probably represent some of the best examples of this community in eastern Nebraska. The woodlands on the south side of the SRA are the highest quality, and these continue southward onto the WMA portion of the area, which was surveyed in detail by Robert Steinauer in 1999. Small wetland areas are scattered among the woods at the SRA, but most are fairly degraded.

Species of Concern

The portion of the Two Rivers SRA that borders the Platte River contains some fairly high quality sandbar habitats that also provide habitat for threatened and endangered species. Interior least tern is the only legally protected species recorded within the SRA. Terns were observed in the channel of the Platte River between 1994 and 1997. Habitat for the protected piping plover is also likely on sandflats in the river channel, and pallid and lake sturgeon, sturgeon chub and scaleshell mussel are possible in the river channel. The cottonwoods on the island in the Platte River channel provide possible nesting habitat for bald eagle. Leaving much of the south part of the riverfront undeveloped should assure protection for the shorebirds and eagles. No habitat for threatened or endangered plant species was found on the SRA.

Two Rivers has been reasonably well studied by biologists, particularly from the University of Nebraska at Omaha, and is surprisingly species-rich. Several non-protected species of concern have been recorded within the SRA in the last 30 years. American toad was recorded in 1982 and five plant species have been verified including hop sedge, first collected in 1972, green dragon and eastern star sedge, recorded in 1998, and mullein foxglove and narrowleaf paleseed, which were found in 2001. Additionally, lousewort was recorded in the WMA land adjacent to the south in 1999.

of the Oto teepee village. This site is dominated by big and little bluestem with a number of other native grasses and sedges, and has fairly high forb diversity including western ragweed, purple prairie clover, shell-leaf penstemon, prairie larkspur, frostweed, and prairie ragwort. Kentucky bluegrass is scattered in this prairie, but otherwise there are few exotics. The site is well drained and the soils fairly sandy, which is unusual for blufftop tall-grass prairie in this part of the state. This site could benefit from occasional spring burns to control bluegrass.

Larger prairie openings are found to the east of Stone Creek, on areas on west-facing slopes west of the Fox Hollow picnic area and the Walter Scott lodge. These sites contain much big bluestem, but also have much thatch and are invaded by eastern red cedars, so that the overall species diversity is fairly low. Removing cedars from the sites and instituting periodic spring burns should improve the quality of these sites as well as remove fuel that might promote accidental fires. The proximity of these remnants to developed areas offers an opportunity to use them to educate the public about natural processes in the grassland ecosystem.

Some unusual sandy upland prairie fragments are scattered on the southwest side of the Sjogren Wilderness tract. Indiangrass and sun sedge are among the dominants, though Kentucky bluegrass has invaded extensively. Shell-leaf penstemon and frostweed are common locally. These sites would also greatly benefit from removal of eastern red cedars and conducting prescribed burns in the spring.

Southeastern upland forest

Upland oak forest is extensive in the Park. In general, the upper slopes are dominated by large bur oaks, often with red oak and basswood. On lower slopes, basswood and red oak often dominate, and black walnuts are frequent in ravine bottoms. Four high quality forest sites were recognized in this survey.

The upper slopes of the most northwestern draw in the Park (northwest of the Pawnee teepee village) is dominated by bur oak and basswood with a sparse subcanopy of eastern red cedar, a few scattered gooseberries and a fairly sparse herbaceous layer dominated by Virginia creeper and white snakeroot. The middle slopes are richer and contain more basswood and have a richer subcanopy that includes hackberry, red mulberry and slippery elm, along with a distinct shrub layer of rough dogwood and coralberry. The herbaceous understory is more diverse and contains jack-in-the pulpit and enchanter's nightshade in addition to Virginia creeper. On the lower slopes, bur oaks are less prominent in the canopy, and black walnut and Kentucky coffeetree take their place in ravine bottoms. Hop hornbeam appears in the subcanopy of the lower slopes, and wood nettle and stinging nettle are more common in the herbaceous layer. Near the mouth of the draw, a few red oaks occur in the canopy, and additional species of shrubs and herbs appear, including chokecherry, elderberry, bladdernut, Virginia waterleaf, and pale touch-me-not. Much of the upper portion of this draw is infested by the highly invasive garlic mustard, and ground ivy is locally common on the slopes below. Despite these

mulberry and the native red mulberry. Rough dogwood is widely scattered and a short shrub layer of coralberry is conspicuous. Dominant herbs include wood nettle, nodding fescue, white snakeroot, jumpseed, sweet-scented bedstraw, woodreed, jack-in-the-pulpit, enchanter's nightshade and pale touch-me-not. Lower, wetter forest southward near the WMA contains a canopy of silver maple with a tall subcanopy of green ash and few other trees. Dogwood is moderately dense in these areas and the understory is primarily dominated by sedges and eastern poison ivy. The wet woods may represent the mature phase of the previously described cottonwood-silver maple phase of the eastern floodplain woodland. The presence of a single large cottonwood in this area seems to suggest it was formerly a cottonwood woodland.

A younger phase of the mature mesic forest is found northward. The canopy contains a few tall cottonwoods, a subcanopy of silver maple, green ash, elms and peach-leaved willow. Dogwood is moderate and coralberry present in the shrub layer. The herbaceous understory is dominated by mesic vegetation including hop sedge, needle spikerush, field horetail, quill sedge, false nettle, clustered black snakeroot, selfheal, white snakeroot and jumpseed. There are also open, wet areas that contain wetland and woodland species such as hop sedge, reed canarygrass, goldenglow, Ontario aster, dotted smartweed and false nettle.

Both riparian forest communities described at Two Rivers are relatively free of invasive exotics, save for the reed canarygrass in the wet bottoms. Yellow iris is established in wetland on the WMA and could potentially invade wet areas in the woods. However, a much more serious threat is posed by garlic mustard, which is extremely well established in Omaha and could always come in with traffic.

Other communities

A degraded riparian woodland/wetland complex is found at the north end of the SRA north of the road between the Cottonwood and Oak Grove campgrounds. The south part of this area contains an unusual wetland pool that has a 3-4 inch layer of peat along its periphery. Most of the area surrounding the pool is occupied with peachleaf and diamond willow, and is heavily infested with the exotic narrowleaf cattail and reed canarygrass. Nonetheless some species associated with peaty soils of the Nebraska Sandhills are present, including mild water pepper, bearded sedge, and marsh bedstraw. Wet woodland dominated by green ash and diamond willow with a shrub layer of rough dogwood is found to the north of the wetland. This area is also heavily infested with reed canarygrass, but contains native wetland species including winged loosestrife, ripgut sedge and common horsetail. Farther north strips of cottonwood-dogwood and eastern cottonwood woodland are present, though much of it is densely overgrown and nearly impenetrable. Further surveys might reveal patches of high quality native vegetation in the future.

Management priorities

1. Try to limit further development along the river to protect habitat for threatened and endangered species that utilize the river.

2. Slowing rate of runoff from paved roads into forested ravines. This is especially problematic in the ravine north of the Kiewit lodge, where some of these narrow, deep washes extend nearly to the road.
3. Thinning cedars at the margin of upland forest, especially in the vicinity of the prairies. Controlled burns conducted on the prairies can also include adjacent upper forest slopes.
4. Conducting surveys for southern flying squirrel in the deep ravine in the northwest part of the Park.

Pelican Point State Recreation Area

Pelican Point is a 36-acre strip of floodplain bordering the Missouri River. Most of the site is developed for camping, though some intact cottonwood-dogwood woodland occurs as a narrow band along the west and south sides. A few parts of the woods along the south side of the site are of moderately high quality, but most of the woodland is fairly degraded.

Species of Concern

No habitat for threatened or endangered species is present on the terrestrial portion of the SRA, but habitat for pallid and lake sturgeon and scaleshell mussel is present in the adjacent river channel. A pallid sturgeon (state and federally listed as endangered) was caught in the river near the boat ramp in 1996. A sign alerting fishermen to the presence of sturgeon is posted nearby. Lake sturgeon and scaleshell mussel occupy similar habitats and could also be present. No other plant or animal species of concern are known from the site, and previous biological survey has been limited to informal vegetation survey of the woods.

Exemplary communities

Cottonwood Dogwood Floodplain Woodland

A narrow strip of riparian woodland along the southwest side of the SRA seems to be the highest quality natural area on the site. It is between 1 and 2 acres in size and has a tall canopy of cottonwoods (about 60 ft. high) with a subcanopy of scattered American elms between 20 and 25 ft. high, and a tall shrub layer of scattered dogwoods 10-15 ft. tall. The herbaceous understory is fairly dense, but not highly diverse, with Virginia creeper, poison ivy and American germander the most common species. Climbing vines (including Virginia creeper and poison ivy) are conspicuous. A single shrub of Amur honeysuckle was observed in the south part of the site. This species, which has been found at scattered sites along the Missouri River, is reportedly very invasive in states to our east and could become problematic here. The shrub seen here was not large enough to flower yet, and should be eliminated before it reaches reproductive size.

NORTHWEST REGION

Overview

Region 1 includes the Nebraska Panhandle, north-central Nebraska and the western Sandhills region. Fifteen state-listed threatened and endangered species have been recorded within the boundaries of Region 1 within the last twenty years. Four of these are small fishes that are restricted to small, clear streams, mostly in the Sandhills and Niobrara River drainage, including finescale dace, northern redbelly dace, blacknose shiner, and Topeka shiner. Other larger animals, such as river otter, interior least tern, piping plover and bald eagle are often associated with areas along large rivers and lakes. Swift fox and mountain plover are typically found in prairie in the Panhandle. White lady's slipper and western prairie fringed orchid are rare in wet meadows in the Sandhills. Two species of very limited distribution, which just enter the state from the west, are Ute lady's tresses, known from a single site along the Niobrara River in Sioux County and Colorado Butterfly Plant, known from a very few scattered locations in Kimball County. Including Oliver Reservoir SRA.

Habitats suitable for the above species, except the Ute Ladys' tresses, are found within Parks properties in the region. Surveyed areas that were recognized as having high potential to contain habitat for legally protected species include Fort Robinson State Park (swift fox), Long Pine SRA (finescale and northern redbelly dace), Merritt Reservoir SRA (finescale and redbelly dace, and blacknose and Topeka shiner), and Oliver Reservoir SRA (Colorado butterfly plant, swift fox and mountain plover). Areas with a slight chance of containing threatened and endangered habitat include Bowring Ranch SHP (blowout penstemon and western prairie fringed orchid) and Smith Falls State Park (small white lady's slipper orchid).

Seven of the eighteen Parks units in the northwest region were considered lower priority and were not surveyed because they were considered unlikely to contain habitat for any state protected species or exemplary plant communities. These were Bluewater Overlook Historical Site, Box Butte SRA, Bridgeport SRA, Cottonwood Lake SRA, Lake Minatare SRA, Long Lake SRA and Walgren Lake SRA. Of these, two have reports of state protected species. Finescale dace was collected in the Niobrara River in the vicinity of Box Butte Reservoir prior to construction of the dam. It is possible that it could be present at the upper end of the property. Bald eagle roosts were reported from Lake Minatare, and though nesting pairs have not been observed there, they are recorded nearby at the much less heavily utilized Lake Alice. Non-protected species of concern have been recorded from all the unsurveyed Parks properties with the exception of Bluewater Battlefield, and though it is possible that further surveys may reveal small examples of good quality plant communities, the possibility of the presence of threatened and endangered species habitat is fairly low. Among these sites, the ones that should be considered as priorities for future surveys are Box Butte Reservoir and Lake Minatare for possible protected species habitat, and Bluewater Battlefield, Cottonwood Lake, Long Lake and Walgren Lake for exemplary communities.

Exemplary communities

Tall-grass prairie

A small half acre strip of prairie occupies a narrow interfluvium north of the County Cork cabin area. The prairie is mostly surrounded by upland forest dominated by bur oak, eastern red cedar and dogwood, and the cedars are invading the site, especially near the north end. Little bluestem is the dominant species, with some big bluestem, spring panicum and sedges. Forb density and diversity is fairly high and conspicuous species include western ironweed, yarrow, prairie birdsfoot violet, frostweed, prairie ragwort and field pussytoes. Portions of the prairie are infested with Kentucky bluegrass and smooth brome. The quality of this site would improve if the large cedars were removed and periodic springtime controlled burns initiated. A strip of mowed lawn separates the prairie from the cabin area and could be used as a firebreak. The proximity of this prairie to a developed site would both make it fairly easy to manage and open the possibility of future use of the prairie for environmental education.

Very narrow patches of tall grass prairie are also present near the north end of the interfluvium north of the Running Deer cabin area as well, but these are heavily shrub-invaded. Nonetheless frostweed is also scattered in this area. These sites could also benefit from similar management practices.

Southeastern upland forest

The oak forest along the bluffs in the east half of the Park are not as rich or diverse as similar areas downstream at Schramm SRA or Platte River State Park. The uppermost slopes in this area are frequently dominated by bur oak with scattered red oak, green ash, hackberry or bitternut hickory in the canopy and eastern red cedar common in the subcanopy. Cedars, rough dogwood and prickly ash often form a thicket along the margin of the woods and the latter two may form a tall shrub layer under the canopy nearby. Coralberry is also prominent as a short shrub and Virginia creeper makes up the bulk of a relatively sparse herbaceous understory.

The upper slopes of the ravine north of the Kiewit lodge contain species typical of upper slope forest in the Park. The lower slopes are similar, except that slippery elm becomes the most abundant subcanopy tree below. The bottom of the ravine (and many of the side draws) are severely downcut by runoff from the paved road above the ravine. Occasional basswood are found on some of the slopes at the edge of the ravine bottom, and in some places that are not severely eroded, a rich herbaceous understory of bluntleaf woodsia, hog peanut, white snakeroot, and white-tinge sedge is apparent. Farther down the ravine the canopy becomes mostly composed of red oaks with occasional hackberry and black walnut in the subcanopy.

The ravine west of the County Cork cabin area is longer and somewhat richer than the preceding. It has red oak in addition to bur oak and black walnut in the upper slope canopy, and red oak and basswood dominant on the middle and lower slopes. Slippery elm is common in the subcanopy throughout, and Virginia creeper and sedges dominate

potential threat include common buckthorn at Long Pine SRA, Russian olive at Ash Hollow and Fort Robinson, and Scotch thistle at Fort Robinson.

Though native, eastern red cedar has invaded and seriously degraded upland pine woods at some sites, especially along the Niobrara River. It is particularly problematic at Keller Park. Cheatgrass and reed canarygrass are exotic species that invade grassland and wetlands respectively and are difficult to control. Carefully controlled burns could help reduce cheat populations at Ash Hollow and Wildcat Hills. Reed canarygrass is not as serious a problem in the northwest region as it is elsewhere in the state, but at Oliver Reservoir it is an even greater threat to Colorado butterfly plant habitat than Canada thistle.

Ash Hollow State Historical Park

Ash Hollow State Historical Park is a moderately large (1001 ac) site located in the rocky bluffs on the south side of the North Platte River. The north parcel of the Park occupies the lowest 1.5 miles of the hollow and a portion of the uplands extend about half a mile on either side. The south parcel, known as Windlass Hill is a 64-acre upland tract on the south side of the canyon about 1.5 miles south of the north tract. The uplands at both sites are mostly covered by western mixed-grass prairie with rock outcrops scattered on hilltops and eroded slopes of the canyon and draws. Fairly high quality prairie and rock outcrop are present, the outcrops being best developed on the north end of the Park. A couple of small woodland areas are present in hollow on the north tract, including a juniper woodland found at the base of a side-draw, and a fairly degraded riparian deciduous woodland in the bottom of the canyon itself. Though freshwater springs are present, no natural wetland communities occur, though some small patches of wet ground occur in the woods. Much of the bottom of Ash Hollow consists of a gravelly "sand draw" surrounded by degraded grassland. Though some interesting plants occur in these sand and gravel flats, few high quality areas are present in the canyon bottom overall.

Ash Hollow has received far more attention from geologists than biologists, though botanical records that can be placed near the Park with certainty are known back to at least the 1950's.

Species of concern

No threatened or endangered species have been recorded from Ash Hollow, nor does there appear to be suitable habitat for such species. Although the site is within the geographic range of swift fox, the rocky, rugged nature of the uplands at the Park probably preclude the presence of soils suitable for den digging away from the highway.

Several non-protected species of concern have been recorded at or near the Park. A golden eagle nest was observed along the west edge of the Park in 1976, a single American bittern was observed in or near the Park in 1983, and a single male Bell's vireo was recorded in the Park in 1990, where it apparently had been present for several years. The only plant species of concern recorded from Ash Hollow are curved-pod fumewort, which was collected in or near the Park in 1951 and 1966, and summer milkvetch, which

3. Thinning eastern red cedars in upland woods in areas where they are abundant, such as at in some of the oak woodland south of the highway at South Shore. This should allow herbaceous species a chance to become re-established and help control erosion.
4. Initiating controlled burns in prairie uplands from which eastern red cedars have been removed.
5. Removing Amur maple plantings from the Weigand-Burbach area and monitoring their spread.

Louisville State Recreation Area

Louisville Lakes is a moderately small (192 acre) area which contains several sandpit lakes and also a fairly long extent of riverfront on the south side of the Platte River. Most of the site is developed, except for a strip of riparian woods that occurs along the south side of the river that is fairly extensive but mostly in fair to poor condition. A smaller extent of very degraded woods occurs on the east end of the site in the vicinity of the sewage plant.

Species of Concern

The Platte River in the vicinity of Louisville has received much attention from biologists going back to at least the 1930's. Interior least tern and piping plover have been recorded from the Platte River channel at the SRA since the early 1990's. Suitable habitat is present on sandbars and islands in the river adjacent to the SRA. Pallid sturgeon was also recorded nearby in 1995 and the state threatened lake sturgeon, sturgeon chub, and scaleshell mussel may also be present. Signs alerting people to the presence of these species should be in place. Because of the extensive development, it seems unlikely that nesting bald eagle would be present along the river channel, though potential habitat exists.

The non-riverine portion of the SRA has not been studied as well, but has received attention from botanists since at least the 1970's. Non-protected plant species of concern include slender fimbry, which was collected in 1973. Sand croton has been collected on numerous occasions but is not likely to be considered for protection.

Other communities

No exemplary plant communities have been recorded within the SRA. The most conspicuous natural community at the site is the band of riparian woods that borders the river. The woods are classifiable as eastern floodplain woodland and are dominated by a tall canopy of cottonwoods with a subcanopy mostly of American elm and the invasive white mulberry. Occasional native trees including silver maple, red mulberry and hackberry are also present. The woods are very brushy, with dense stands of rough dogwood and chokecherry in places and a short shrub layer of coralberry and scattered gooseberry. The understory is varied and contains many native species, the most

(or aboveground briefly following heavy rains). These areas have soils mostly of coarse sand and gravel and are very well drained. The plants that occupy sand draws include many found in the ill-defined "riverine gravel flats" community of the Nebraska Natural Heritage classification and the two may need to be combined. Sand draw vegetation is present for much of the length of Ash Hollow, but is best developed near the south end of the Park. The gravelly soil is sparsely to densely vegetated with perennial grasses such as prairie sandreed, sand dropseed, blue grama and scattered patches of sand bluestem. Annual and perennial forbs are common and conspicuous, the most frequent being blazing star, silky wormwood, slender knotweed, lemon pectis, goldenaster, common ragweed, clammyweed and numerous weedy annuals including exotics such as slender Russian thistle and cheatgrass. This community is fairly distinctive near the south end of the Park, but elsewhere grades into the surrounding grassland. Some gravelly hills on the east side of the valley have similar species and merit further study.

Other communities

Rock outcrops occur as a mosaic with western mixed-grass prairie throughout the uplands at the Park. The most diverse outcrops seen during the survey were located along the crests of the north facing bluffs that border the Platte River floodplain at the north end of the Park. Among the rock outcrop plants that approach the east edge of their range here are silky milkvetch, mountain cat's-eye, alpine golden wild buckwheat, and calcareous cat's-eye, which were seen atop the bluffs on the east side of the hollow. The bluffs on the west side, where summer milkvetch was collected, were not surveyed. The vegetation of these outcrops is richer than most outcrops seen east of the Wildcat Hills, but are not as high quality as most rock outcrops communities in the west half of the Panhandle.

Canyon bottom grassland communities are poorly studied in the Nebraska and are not accommodated by the Nebraska Heritage community classification. The grassland that occupies the bottom of Ash Hollow is fairly disturbed and variable. The grassland near the sand draw is dominated by the same species as the sand draw, namely sand dropseed, prairie sandreed, sand bluestem and blue grama. Among the conspicuous forbs are blazing star, plains prickly pear, silky wormwood, clammyweed and lemon pectis. The ubiquitous cheatgrass is the most common exotic invader. Level grassland in higher portions of the canyon bottom, such as at the base of the slopes, appears to be similar to the western sandy slope prairie community, which is commonly associated with escarpments in the Panhandle. The highest quality example observed was at the base of the bluffs on the west side of the hollow and this site was dominated by needle-and-thread and prairie sandreed, with little bluestem and sideoats grama often common, along with blazing star and yuccas. Parts of this area appear to be regularly mowed, and these sites appear completely different, being dominated by sand dropseed and blue grama, with little bluestem common in places. Dwarf milkweed, round-leaved groundcherry, and shaggy evolvulus are among the common forbs seen in these mowed prairies.

Riparian woodland is also developed in the bottom of Ash Hollow in the vicinity of the springs, but is highly disturbed. Cottonwoods dominate the canopy, and green ash, after which the hollow is named, are frequent in the subcanopy. Junipers and Russian olive

sturgeon may inhabit parts of the lake adjacent to Game & Parks property. Signs should be in place to alert boaters and fishermen to the presence of these species. Scaleshell, a state endangered mussel, has been recorded from the river channel below Gavins Point Dam, and occupies habitats similar to those favored by sturgeon. Future surveys for this mussel in the lake and other points below the dam may be useful.

Prior to this survey, only one fish and one plant species of concern had been recorded within the boundaries of the SRA. Johnny darter was collected in 1987 at the Weigand-Burbach area and spatterdock, a relative of water lily, was collected at Weigand in 1893. The spatterdock is no longer present and was doubtlessly extirpated by flooding following the construction of the dam, if not sooner. Blue sucker is the only other non-protected species of concern that has been recorded in the lake outside of the SRA boundary. In 2001, two additional plant species of concern, rock elm and wild sarsaparilla were found in a deep, forested ravine at the Deep Water area. Wild sarsaparilla had not been recorded in Nebraska outside of the Niobrara River valley since 1893.

Exemplary Communities

Northeastern Upland Forest

Northeastern upland forest is, by and large, poorly developed in the SRA, due in part to the fact that the deep ravines in which the best examples of this community tend to occur are now mostly underwater. Most of the upland forest at Lewis & Clark SRA represents upper slope forest that has fairly low species diversity and is heavily invaded by eastern red cedar. This is especially true at the South Shore area, where the woods south of the highway are dominated by bur oaks with a nearly impenetrable subcanopy of large eastern red cedars and little or no herbaceous understory. In many places, the slopes of ravines are nearly unvegetated and severely eroded. The few areas that have only scattered cedars generally have much more herbaceous understory. One small, shallow, forested draw on the east side of the lake inlet represents moderately high quality upper slope forest. This area, which was first sampled in 1999, is located along the road south of the parking area. It has a canopy of bur oaks and scattered green ash 40 to 50 feet tall, and a subcanopy of slippery elm that at times is nearly as tall as the canopy trees. Patches of chokecherry form a sparse tall shrub layer, and the herbaceous understory contains Virginia creeper, hairy wildrye, American germander, and white snakeroot. Lower slopes of the ravine are sparsely wooded and in many places extensively invaded by common buckthorn.

A high quality low slope forest community is located on the west side of the entrance road to Deep Water area. Here a deep, forked draw contains forest of bur oak and basswood with a subcanopy of hop hornbeam and rock elm. Chokecherry is the conspicuous shrub here as well and the understory of the lower slopes is rich with Virginia creeper, moonseed, white-tinge sedge, hairy wildrye, and longbeak sedge. The upper slopes are dominated primarily by bur oak with some hop hornbeam scattered in the subcanopy in spots where eastern red cedar is not too abundant. Sedges and littleseed ricegrass dominate the herbaceous layer of the upper slopes. A moderately large colony

medick conspicuous. A few uncommon native wetland plants are present, but their density is fairly low. Small degraded sedge wet meadows are found nearby on the north side of the river, but by and large these are very weedy and often infested with Canada thistle.

Management Recommendations

1. Controlling Canada thistle in meadows along the west end of the SRA appears to be the highest priority at this time.

Bowring Ranch State Historical Park

Bowring Ranch SHP is a 325-acre portion of a much larger working cattle ranch in the western Sandhills north of Merriman. Sandhills dune prairie makes up most of the Park, but a large portion of the east half of the Park is an interdunal valley that contains a large wetland complex of marsh and wet meadow that includes a small patch of sandhills fen. Little or no biological work appears to have been carried out at this site in the past.

Species of Concern

Bowring Ranch is within the geographic range of blowout penstemon, but no large blowout complexes that could support a population were observed at the Park or on aerial photos. Habitat that could support western fringed prairie orchid is present in the hay meadows surrounding the wetlands in the east part, but the site occurs west of that species' known geographic range and the meadows mostly appear too wet and invaded by exotics to support the quality habitat necessary for it to thrive. No species of concern have previously been recorded from the SRA, though trumpeter swan was observed at a lake to the east of the site in 1985. Several historical records of plant species of concern are known from the Merriman area and although none of these were found during this survey, three of them (dwarf raspberry, clammy hedge hyssop, and smooth goosefoot) are possible at the SRA. The only species of concern recorded from the site in 2001 is bog aster, which occurs in a small fen area near the west end of the valley.

Exemplary communities

Sandhills fen

The valley to the east of the ranch buildings contains a large and very heterogeneous complex of wetlands of mostly average to poor quality. A small area in the west part of the valley qualifies as sandhills fen in that it contains a layer of saturated fibrous peat at least 12 inches thick and at least one species (bog aster) diagnostic of this fairly rare community. The fen at Bowring Ranch is only about 10 acres large at most and has a lower species diversity than most fens found farther to the south and east in the Sandhills. The dominant species at this site include Nebraska sedge, bald spikerush, Baltic rush, and Sartwell's sedge, with northern reedgrass in common in slightly higher areas and prairie sedge, lesser panicled sedge, bluejoint and scattered cattails common in lower areas with very soft peat. Typical forbs include bugleweed, field mint, tufted loosestrife, northern water dock, fen willowherb, and small bedstraw. Woody vegetation is mostly absent

marsh. Though much of the herbaceous understory is invaded by reed canarygrass, many native smartweeds and sedges remain.

A third riparian woodland site occurs in a narrow band along the margin of the river in the northeast part of the new floodplain addition. It contains large cottonwoods and scattered sycamore and is heavily invaded by white mulberry. The understory is extremely degraded and contains few native plants, but much garlic mustard, poison hemlock, and reed canarygrass. This site also contained the aforementioned active bald eagle nest.

All the floodplain woodland tracts seen in the Park are heavily degraded and may be difficult to restore. Removal of invasive white mulberries might promote growth of native subcanopy trees, but might also increase the spread of reed canarygrass and garlic mustard in these habitats. Garlic mustard is particularly threatening, since it has become an aggressive invader elsewhere along the Missouri River in Nebraska, overtaking riparian woods and often spreading into upland bluffs and suppressing the native understory. The spread of garlic mustard should be monitored and controlled in the woods west of the boat ramp, where it is still localized and controllable. The far north woodland (near the eagle nest) is heavily infested, but is fairly isolated from the other riparian woodlands. Populations are difficult to eliminate, but limiting traffic through this area would help to slow its spread further.

Management priorities

1. Controlling garlic mustard in the riparian woodland sites mentioned above. It is extensively established in the northeast part of the floodplain addition, which is connected by a long, narrow strip of reed canarygrass-infested willow shrubland to the riparian woodland area near St. Deroin. A single patch of rosettes was observed near the center of the woodland area west of the boat ramp, very near the base of the upland forest bluffs. The latter population should be located and destroyed as soon as possible, and the woods along the river should be periodically monitored for garlic mustard thereafter. Garlic mustard may eventually invade the upland bluff forest, especially along trails.
2. *Sericea lespeדה*, an aggressively invasive legume that may be designated noxious in Nebraska is extensively established in the large, open grassland area in the southwest part of the Park (along trail 5A). This weed, like garlic mustard, requires immediate control and periodic monitoring
3. Control of reed canarygrass in the areas surrounding the wet meadow in the southeast part of the Park. This may be fairly difficult. Other extensive infestations (along the riverfront in the northeast part, and immediately west of the boat ramp) may be difficult or impossible to eradicate and will provide a source for future invasions.

prairie on ridgetops, where it is sometimes associated with rock outcrops. Pine Ridge sandy slope prairie occupies moderate upland slopes and may be dotted with pines (as in Morgan's "savanna" community). This community grades into open canopy pine woodland on many upper and middle slopes and a more densely shaded (though not truly close-canopied) forest on lower slopes and bottoms of ravines. In the broadest ravine bottoms, northwestern canyon bottom woodland, meadow, and riparian habitats are present (all included in the riverine floodplain woodland community by Morgan), though the best developed areas along Chadron Creek are also the most heavily developed.

A vascular plant species list was begun by students at Chadron State under the direction of Dr. Ronald Weedon at about the time of Morgan's survey, but it was never completed.

Species of concern

Despite a history of biological survey work in the Park since the 1930's, relatively few species of concern have been recorded. Lewis' woodpecker was observed in the Dead Horse burn area in the north part of the Park in 1986. Common poorwill was recorded from either within or very near the Park boundaries in 1992. Four of the five plant species of concern recorded from the Park were collected by the late William Tolstead in 1939-1940 and included prostrate juniper, Great Plains bladderpod, veiny meadow rue and tower mustard. Tower mustard was recollected in 2001, but the other species were not found. The only other plant species of concern collected in the Park between 1940 and 2001 was the saprophytic orchid Wister's coral-root, which was collected in the late 1960's, representing the first known record of this species in the state.

A total of 171 plant species were recorded in the Chadron State College survey of the Park, but none were species of concern. A specimen of iron skyrocket was recently identified among these collections. This plant is not previously recorded as occurring in Nebraska and probably came in as an introduction along the road. In addition to the tower mustard, two new element species were recorded in 2001, namely rattlesnake plantain and fireweed, which represent only the second and third known Nebraska collections of these species, respectively. No threatened or endangered species have been recorded from within or near the Park boundaries and suitable habitat for protected species is unknown in the Park.

Exemplary communities

Western Coniferous Forest

Most of the pine woodland in the Park is fairly open and not particularly diverse. Some of the deepest and narrowest canyons, along the south side of the Park, are rather rocky and contain little vegetation. The best-developed coniferous forest in the Park was observed in the upper portion of the ravine that runs northeastward on the west side of the cabin area. Much of the upper portion of the ravine is fairly open and the lower slopes contain a rather open canopy of tall, slender Ponderosa pines with a short subcanopy of widely scattered green ash and American elm. The woods are rather brushy, with a well-developed shrub layer of abundant chokecherry and vines such as bittersweet and riverbank grape. Creeping juniper and Oregon grape form a conspicuous short shrub

enchanter's nightshade, may apple, yellow wood violet and yellow ironweed. Common graminoids include common wood sedge, Davis' sedge, James' sedge and burreed sedge. Ravine bottoms often are dominated by wood nettle with stinging nettle, clustered black snakeroot, honewort and numerous sedges. Two high quality lowland forest areas recorded in the north half of the Park are in Spring Hollow and in the large ravine west of the north ridge trail. Both have few exotic species and are in very good condition.

Four ravines were surveyed on the north-facing bluff on the south side of the road to the cave. The ravine along the trail southeast from Trailhead 9 has fairly high diversity and very few exotics. The ravine along the Hardwood trail south of the water pump is somewhat less diverse than the preceding one and contains more exotics including multiflora rose and blackberry lily. The ravine directly to the east of this is fairly diverse and nearly free of exotics, except for a small patch of ground ivy, and is fairly high quality. The ravine south of Trailhead 5 along the trail south of the camping area is similarly diverse and free of exotics except for a few plants of multiflora rose. Most of the deep north-facing ravines in this part of the park are quite similar, except for differences in composition of exotic species.

The bulk of the forest communities are in fairly good condition with only localized infestations of exotics. The lower slope forest sites require little attention beyond control of weedy species. Blackberry lily is locally abundant in places in the southeast part of the Park, but does not seem to be spreading rapidly. The more invasive multiflora rose is scattered in openings in the south part of the Park, particularly along trails. The spread of this shrub should be monitored and controlled.

Some of the upland forest communities in the north part of the Park could benefit from spring or fall controlled burns to reduce the extent of shrub thickets and create more prairie islands and openings for regeneration of oak trees in the upland woods. It is likely that savanna-like conditions may have existed along the upper forest margins prior to the fire suppression that followed European settlement. Six of the plant species of concern found in the Park (pale Indian plantain, purple milkweed, mullein foxglove, great St. John's-wort, violet bush clover, and whorled mountain mint) are indicative of upland savanna habitats and are currently restricted to narrow strips of grassland along trails. Most of these species are found in the north part of the Park.

Eastern sedge wet meadow

A wet meadow community is found at the mouth of the ravine near trailhead 9, bordering the spring-fed stream just south of the road. Here a saturated open meadow of about 1000 square meters occurs which is dominated by hydrophytes including dark-green bulrush, bald spikerush, fowl mannagrass and shoreline sedge. A few trees of black and peachleaf willow are scattered along the south side. Though the meadow is in fairly good condition, large colonies of reed canarygrass border it on the south and west sides. Few intact wet meadow communities remain in southeast Nebraska and this was the only intact wetland community seen in the Park. It is mostly in fairly good condition, but is

Management Priorities

1. Thinning small pines in upland woodland stands to help the grassy understory recover.
2. Control of intermediate wheatgrass and crested wheatgrass on slopes in the Deadhorse burn area. Spring burns in areas with particularly bad infestations might help, but more work is needed to determine whether this is feasible.
3. Periodic surveys for leafy spurge, which has proven problematic elsewhere in the Pine Ridge, especially in ravine bottoms. Plumeless thistle was observed near the ravine south of the Dead Horse burn area in 2001, but does not seem to be a threat here.

Fort Robinson State Park

Fort Robinson is the second largest property in the Parks system (22673 acres) and has a terrestrial land area twice as large as that for all the Parks properties in the east region combined. The majority of the land in the Park consists of rolling uplands covered by Pine Ridge sandy slope prairie with lesser amounts of western mixed-grass prairie, rock outcrops, and various groupings of disturbance vegetation in place of pine woodland removed by the 1989 fire. Due to time constraints, the uplands in the area of the 1989 fire were not included in this survey, which focused on remaining upland woods, riparian areas and the floodplain of the White River.

The only large area of the Park not impacted by the 1989 fire was the northeast portion of the Park including the Red Cloud Buttes and Spring Creek drainage. Pine woodlands are intact in these areas, but not particularly extensive and few areas of high quality woodland are present. Open uplands contain grassland communities similar to those found in the areas excluded from this survey. Though no high quality grasslands were recorded in this survey, a number of well-developed rock outcrops that occur along the shoulders of the Red Cloud buttes are among the most diverse in the Pine Ridge.

The areas in the valley of Soldier Creek and the White River are level to rolling and often highly disturbed due to many years of extensive human activity. Degraded prairie and western floodplain woodland are present along the White River, but these communities are usually heavily invaded by exotics including Russian olive. An unusual wet woodland community not previously described in Nebraska was found to the east of the Fort complex, but it too is highly degraded and invaded by exotics such as reed canarygrass. Wetland vegetation in the Park is mostly restricted to the margins of small permanent streams such as Spring Creek and Soldier Creek.

Because of its long history, Fort Robinson and its environs have received attention from biologists since the late 19th century, but unfortunately no comprehensive list of species in the Park or descriptions of vegetation in the Park has ever been compiled.

Ten additional animal species of concern have been recorded from the Park, including three snakes: worm snake, timber rattlesnake, and smooth green snake; six birds: ruffed grouse, whip-poor-will, peregrine falcon, blue-gray gnatcatcher, Louisiana waterthrush, and Carolina wren; and a lamprey: chestnut lamprey.

No threatened or endangered plant species have been recorded in the Park, though the state threatened American ginseng has been recorded in upland bluff forest downstream near Rulo. Suitable habitat for American ginseng is present in high-quality forested ravines throughout the Park, and future surveys may reveal its presence. Yellow lady's slipper orchid has been recorded anecdotally within the Park, and may be considered for protection in the near future. It is not known whether these populations are still extant. Twenty-six plant species of concern have been documented from the Park including: spikenard, pale Indian plantain, purple milkweed, long-awned wood grass, cutleaf toothwort, Frank's sedge, eastern star sedge, nodding chickweed, late coral-root, Wister coral-root, bulblet fern, mullein foxglove, showy orchis, great St. John's wort, violet bush clover, wild crabapple, Indian pipe, purple cliff brake, sycamore, may apple, whorled mountain mint, white oak, hooked buttercup, smooth ruellia, winter grape, and fox grape.

Exemplary communities

Upland tall-grass prairie

Small tall-grass prairie remnants less than one acre in size are scattered atop high, steep, narrow bluff ridges through the Park. The best-preserved examples are found atop interfluvial along the south side of the hiking trail east of trailhead 10. Five small prairie "islands" of fairly high quality were recorded in 2001. These patches contain very few exotic species, but are being encroached by shrubs typical of forest margins, namely rough dogwood and smooth sumac. The dominant grasses are big bluestem, little bluestem, sideoats grama, and Indiangrass. The most common forbs include purple prairie clover, narrowleaf bluets, showy-wand goldenrod, stiff sunflower, roundhead bush clover, and prairie ragwort. Less common are heath aster, azure aster, aromatic aster, silky aster, skeletonplant, gray goldenrod, stiff goldenrod, dotted gayfeather, blue-eyed grass, flowering spurge, hoary puccoon, purple coneflower, wild petunia, false boneset, and daisy fleabane. Two native prairie shrubs, namely leadplant and prairie willow, are present in places. The westernmost patch (marked "A" on the map) is the smallest and steepest site. Of all the sites recorded, it has the least invading forest vegetation, but also has the biggest problem with exotics. Black medick and yellow sweet clover are scattered through the prairie especially along the trail at the summit of the slope (in fact the exotics seem to have entered the site along the hiking trail). The other sites have very few, if any exotics. Site B is larger and not as steep, and is more extensively invaded by woody plants. Site C is a narrow linear strip of prairie below the west Adirondack shelter on the trail. It is not as extensively encroached by shrubs as B. Site D is not readily visible from the hiking trail, but is larger and not as steep as C (at least in the lower part). Site E is below the east Adirondack shelter and is similar to D, but has more sumac.

These prairies, along with others in the Park, could benefit immediately from periodic controlled burns to improve species diversity and control woodland shrub invasion.

community and are dominated by prairie sandreed, little bluestem and sideoats grama, with Kentucky bluegrass and cheat among the common exotic invaders. Herbaceous species typical of coniferous woodland are tucked in protected sites here and there and include northern pussytoes, harebell, smooth blue aster, wild licorice, Oregon woodsia, mouse-ear chickweed and occasionally the low shrubs Oregon grape and creeping juniper.

Pines are widely scattered on the lower slopes of the bluffs, where Pine Ridge sandy slope grassland dominates. Prairie sandreed and little bluestem are the usual dominants, though sand bluestem, needle-and-thread and the exotic Kentucky bluegrass are also common, with conspicuous yuccas and patches of wolfberry.

Other communities

The majority of the uplands at the Park consist of variously degraded upland prairie with inclusions of disturbed areas that represent areas of pine woodland that burned in 1989. The bluffs contain rocky outcrops, usually occurring as a patchy mosaic with western mixed-grass prairie. The slopes below the bluffs are occupied by Pine Ridge sandy slope prairie, which on the lower slopes of the bluffs grades in to low hills of prairie sandreed, little bluestem and needle-and-thread, often heavily infested with Kentucky bluegrass. Patches of sandsage are characteristic in these sites, which form a series of low, rolling hills to the east of the buttes that continues to the edge of the White River floodplain.

Riparian habitats occur in the bottoms of some upland ravines within the Park, particularly along Soldier Creek and Spring Creek. Young riparian woods appear to be forming along Soldier Creek following the 1989 fire. South of the road crossing the creek near the west boundary of the Park, very open areas of small cottonwoods to 15 ft. tall and young box elder and green ash to 10 ft. tall occur with patches of shrubs such as buffalo currant, chokecherry and wolfberry. The herbaceous plants in the openings are typical of disturbed lowlands, and include natives such as showy milkweed and Canada goldenrod, along with exotic invaders such as smooth brome and Canada thistle. In places downstream, low wet woods are forming along the edge of the creek, consisting of dense patches of sandbar willow with scattered peachleaf willows and young cottonwoods along the periphery, and an occasional box elder. Herbaceous cover associated with these sites is likewise weedy and includes smooth brome, stinging nettle, Canada thistle, and in shadier spots, catnip.

The upper portion of Spring Creek in the northeast part of the Park winds through deeper ravines than the lower portion of Soldier Creek and appears not to have been as impacted by the fire. Steep banks along the creek are frequently dotted by scattered pines and green ash along with patches of chokecherry and wild plum with western poison ivy, woodbine and Canada wildrye in the understory. On the lower parts of some north-facing banks, red osier and common scouringrush form a band several meters wide just above the stream. In the narrow ravine bottoms along the creek, young woods of scattered cottonwoods, box elder and peachleaf willow are present with an occasional American elm or even a small black walnut. Better-drained areas in slightly higher

Lake 20. This area is dominated by cottonwoods and is extensively invaded by exotic woody species such as white mulberry, northern catalpa, and common buckthorn. Eastern red cedars are also abundant in places. A few small wet depressions occur on the east side of the woodland, and these contain an assortment native hydrophytes. Conspicuous plants of shaded depressions include Emory's sedge, woodreed, false nettle, whitegrass and dotted smartweed, while crested sedge, fog fruit, false nettle, field mint, common boneset, and fall sneezeweed occur where the tree canopy is more open. Reed canary grass is problematic in parts of these wetland areas.

An area of floodplain grassland occurs in an opening on the west side of the woods, and although it is heavily disturbed, it includes some native grasses and forbs typical of sandy prairie. Among the common grasses here are switchgrass, Canada wildrye sand lovegrass and purple lovegrass.

Much of the botanical work that has occurred at Fremont Lakes in the last 50 years has concentrated on the moist, sandy shores that border some of the lakes. No species of concern have been collected, but some uncommon ephemeral annual plants such as dense-tuft hair sedge and western umbrella sedge have been collected numerous times. The shore communities observed in 2001 are mostly small, patchy and degraded. The largest area of intact shoreline vegetation was observed in the vicinity of Brick's Bay on the north side of Lake 10. This site was moderately diverse and of average quality.

Management concerns

Controlling common buckthorn. Of all the exotic species at the SRA, buckthorn probably represents the biggest threat. It is scattered in the woods south of Lake 20, but could readily spread to treelines and thickets elsewhere on the site. Purple loosestrife, which is thoroughly established upstream on the Platte, could eventually appear here and should be looked for periodically.

Indian Cave State Park

Indian Cave State Park is the largest Parks unit in the east region (3397 acres) and is situated along the Missouri River on the Nemaha-Richardson county line in the southeast part of the state. The majority of the Park consists of upland loess bluffs clothed with average to fairly high quality southeastern upland forest, with scattered small patches of tall-grass prairie on the highest ridgetops. Some of the larger, level upland areas are developed or appear to have been farmed or heavily grazed in the past and are in poor condition. The floodplain along the river is very narrow through most of the Park, but several strips of degraded eastern floodplain woodland are present. Much of the remaining floodplain has been farmed or developed, and what remains is often infested with reed canarygrass. Small wetland areas are present at the mouth of some ravines and at the bases of the loess bluffs. The only high quality wetland site found is a patch of eastern sedge wet meadow along a stream in the southeast part of the Park.

Keller Park State Recreation Area

Keller Park is a relatively small (196 acres) but rugged area that includes part of the lower portion of Bone Creek and some of the valley on either side. The southeast and west end of the site contains moderately to very steep slopes covered with open woods dominated by Ponderosa pine and bur oak. All the wooded slopes are heavily infested with eastern red cedar, though usually not to the point of forming the impenetrable stands typical of much woodland downstream in the Niobrara River drainage. Upland mixed-grass prairie of varying quality is found on the high interfluvium on the west end of the SRA, while most of the uplands bordering the SRA on the south side have been converted to cropland.

Though the floodplain of Bone Creek is heavily wooded in places, riparian woodland communities are poorly developed, tend to be heavily invaded by cedars, and have a weedy understory. The channel of Bone Creek appears to have been straightened in places, resulting in a deeply downcut streambed and a swift current through the SRA. A few poorly developed wetlands are present near small seepage draws below the fish ponds west of the footbridge, though extensive wetlands occur in the WMA just south of the SRA. Purple loosestrife was observed on one of the draws below the ponds, and could pose a serious threat to wetlands along the entire creek.

Very little biological survey work has been carried out along this portion of Bone Creek.

Species of concern

Although no species of concern have been recorded with certainty within the boundaries of the SRA, several non-protected species of concern have been found very close to the SRA, and perhaps occur within its borders. Curved-pod fumewort was collected on the bank of Bone Creek near the east boundary of the property in 1970. A nesting sharp-shinned hawk was also recorded from a patch of cedars along the creek in 1991, possibly on the WMA. Although plains topminnow was found in a tributary of Bone Creek a couple of miles upstream in the 1980s, the deep swift portion of the creek in the SRA is probably unsuitable for it or the protected species of fish that occur in this part of the State including northern redbelly dace, finescale dace, and blacknose shiner. No other threatened or endangered species habitat is present at Keller Park.

Exemplary communities

Western mixed-grass prairie

A small remnant of intact upland prairie of good quality was located on the west side of the creek above the old homestead near the west end of the SRA. This area, just 3000 meters square, occurs on a level blufftop and is dominated by threadleaf sedge and needle-and-thread with much blue grama and prairie sandreed. Leadplant is conspicuous, with scattered yucca and skunkbrush sumac forming a sparse short shrub layer. Forb density is not particularly high, but among the more conspicuous species are purple coneflower, dotted gayfeather, prairie turnip, cutleaf ironplant, narrowleaf milkweed and

silveleaf scurfpea. Few exotics are present in this particular site. The surrounding areas of prairie are generally dominated by needle-and-thread and prairie sandreed, but are more disturbed and often heavily invaded by Kentucky bluegrass and cheat along with the native, but invasive shrub smooth sumac. Grassland dominated by little bluestem and blue grama is also developed on some of the upper bluff slopes nearby, but most of these areas are not extensive and are sometimes fairly eroded. A very narrow and rather degraded strip of upland grassland is present along the south boundary of the SRA, abutting a cropfield.

Mixed woodland

Mixed upland deciduous/coniferous woodlands cover the valley walls on the west and southeast sides of the SRA. The woods are denser and higher quality on the slopes of the narrow tributary canyon on the far west side of the SRA. The steep upper slopes of the canyon are occupied by Ponderosa pine with scattered eastern red cedar and green ash and a sparse to dense shrub layer of chokecherry. Prairie grasses such as prairie sandreed and Canada wildrye occupy openings beneath. Kentucky bluegrass and smooth sumac often invade open areas along the periphery. On the lower, more protected slopes, bur oak is dominant with occasional green ash and often a dense shrub layer of chokecherry, prickly ash, wolfberry and sometimes red osier, especially near the base of the slope. Herbaceous ground cover is sparse and relatively species poor on the oak slopes, with littleseed ricegrass, western poison ivy, common wood sedge, fragile fern and harebell among the more frequently seen species.

Similar woods of lesser quality are present on the north facing bluffs east of Bone Creek, in the southeast part of the SRA. Pines and cedar dominate the upper slopes while oak and cedar cover the lower slopes, with additional cedars often extremely abundant at the bases of the slopes, and scattered green ash and elms in draws. The woods are quite open and prairie grasses and Kentucky bluegrass dominate the understory, with few woodland species present.

Other communities

The floodplain of Bone Creek for the most part is a fairly degraded and weedy grassland that is densely invaded by eastern red cedar in places. Some very small areas of wetland occur to the north of the fish ponds on the west side of the creek. Narrow bands of sedge-bulrush wet meadow occupy narrow drainage channels below the ponds and are dominated by three-square bulrush, Emory's sedge, Canada goldenrod, and winged loosestrife. A large channel that appears to be a former channel of Bone Creek contains a relatively well-developed spring/seep community that includes fen water parsnip, yellow monkey flower, watercress, bottlebrush sedge, water speedwell and brookgrass, in addition to species typical of the sedge-bulrush meadow community. A single large purple loosestrife plant was seen in the vicinity of these wetlands north of the fishing ponds. Spread of this species poses a serious threat to these areas, as well as to wetlands throughout the drainage, particularly in the nearby WMA.

Management recommendations

1. Remove purple loosestrife from the wetlands north of the fish ponds. This species should be periodically monitored and controlled in wet areas thereafter.
2. Thinning woodlands by removing cedars, particularly on the south side of the site and in areas in the floodplain where they are a nuisance. This should provide areas for natural communities to thrive and also reduce the possibility of a destructive fire.

Long Pine State Recreation Area

Long Pine SRA is a relatively small (154-acre) strip of canyon on either side of Long Pine Creek, south of U.S. Hwy 20. Long Pine Creek is a relatively large clear water stream bordered by wetland seeps in places. The slopes of the valley on either side of the creek are mostly covered with mixed upland woods of Ponderosa pine and bur oak, with islands of mixed-grass prairie on the upper slopes that are often encroached by eastern red cedar and shrubs. The level uplands on the west side of the canyon contain a mosaic of mixed-grass prairie with sparsely vegetated gravel exposures.

Species of Concern

Long Pine Creek contains habitat for three state threatened or endangered fish species; blacknose shiner (E), finescale dace (T) and northern redbelly dace (T). Numerous disjunct species of Rocky Mountain forests have been recorded from the vicinity of Long Pine, mostly in the 1890's, but none were seen on the SRA during this survey, nor can their historic presence on the site be verified. During this survey, Missouri cactus was recorded from gravelly upland prairie on the west side of the valley.

Exemplary communities

Spring/Seep

The best-developed wetland community at the site occurs along the east side of the creek. A small seep about 10 meters square occurs at the base of a moderate upland bluff. The head of the seep area is circular and dominated by common arrowhead, rice cutgrass, common cattail and devil's pitchfork, with an area of open water on the west side covered with duckweed. A narrow outlet channel connects the seep to the stream and contains several species typical of saturated soils such as spotted touch-me-not, marsh fern, and northern clearweed. Numerous additional forbs that are typical of seepage marsh are present in the channels and along the head of the spring including false nettle, spotted Joe-Pye-weed, common boneset, dotted smartweed, willowleaf aster and late goldenrod. A degraded wet meadow dominated by Kentucky bluegrass and invaded by eastern red cedar borders the seepage wetlands. A few patches of the invasive reed canarygrass are present along the outlet of the seep, but it appears unable to compete in the saturated soils of this community.

Northern sand gravel prairie

The shoulders of the uplands west of the valley of the creek contain many exposures of coarse sand and gravel that contain well-developed examples of northern sand-gravel prairie. The dominant species of these somewhat sparsely vegetated sites include hairy grama, blue grama, needle-and-thread, prairie sandreed, sand dropseed and ledge spike-moss. Forbs are nearly as prevalent as grasses and among the most conspicuous are western ragweed, narrowleaf goldenaster, green thread, yellow woollywhite, fringed sage, dotted gayfeather and Missouri spurge. Missouri cactus was found in a small gravelly area near the nature trail on the upper slope of the valley. Small pines and yuccas dot some of these sites, but otherwise they contain very little coarse or woody vegetation. The richest examples occur along shallow draws on the south side of the entrance road, some of which have been filled with woody debris.

Other communities

Upland prairie dominated by prairie sandreed, big bluestem and little bluestem occurs on interfluvies on upper slopes on the east side of Long Pine Creek. Small exposures of gravel are present in places that are covered by spike-moss. Eastern red cedar is rapidly invading these areas and threatens to squeeze out the prairie entirely from the uplands.

The draws on the east side of the creek are dominated by Ponderosa pine and bur oak with an understory of eastern red cedar and hop hornbeam. Kentucky bluegrass is the most abundant herbaceous understory plant on moderate slopes, while littleseed ricegrass is the dominant plant of steeper slopes, where it is often found with grove sandwort, which is locally common. Near the south end of the property, the creek is bordered by abruptly steep slopes that are rich with vines. The invasive common buckthorn was observed along a narrow bank at the base of the slope and could become a problem. The woods on the west side of the valley are similar, but more open and grassy than those on the east side.

Management recommendations

1. Controlling the spread of exotic weeds such as common buckthorn appears to be the highest priority at this time.

Merritt Reservoir State Recreation Area

Merritt Reservoir is the largest body of water in the northwest region and the third largest property in the Parks system overall (9053 ac). The lake includes the confluence of Boardman Creek with the Snake River, creating two long "arms" containing the flooded valleys of these two streams. The north side of the reservoir and the Boardman Creek branch abruptly abuts high, choppy sandhills covered by fairly homogeneous sandhills dune prairie with extensive patches of shrubs in places. Level meadows and small marshes occur along the south side of Boardman Creek and along parts of the Snake River at the west end of the reservoir, but are better developed (and much more accessible) along the former. The inlet channels of both creeks are meandering and lined

with bands of marsh vegetation in peaty and mucky soils, and more extensive wetland occurs at the west end of the lake. Open woods occur on the south bank of the Snake River valley near the west end of the property, but are not as well developed as woodlands downstream from the reservoir.

Biological survey work at the reservoir has mostly been limited to fish surveys along the Boardman Creek inlet. Northern redbelly and finescale dace have been recorded from the Snake River and Boardman Creek upstream from the property and blacknose shiner is known from a recent collection in the drainage just south of Boardman Creek. Although Merritt SRA is slightly west of the known range of interior least tern and piping plover, bare sandy shores and bars that are utilized by shorebirds are common along the upper half of the reservoir and surveys may yet reveal their presence. Two fish, one bird and one plant species of concern were recorded from the property prior to this survey and five additional plant species of concern were found during this survey. Additional survey work may reveal Merritt Reservoir to be one of the more biologically rich and valuable properties in the Parks system.

Species of Concern

Merritt Reservoir is within or near the range of four threatened or endangered fish species. Of these, only the finescale dace has been recorded at or near the reservoir. It was collected just upstream from the reservoir in 1973 in Boardman Creek and just within the property along the same creek in 1980 and 1981. The uppermost portion of Boardman Creek and the Snake River within the SRA contain habitat suitable for finescale and northern redbelly dace, both of which have been collected in these streams upstream from Merritt Reservoir. The state endangered blacknose and Topeka shiners could occur in these areas as well, though they are less likely. Blacknose shiner was collected in nearby Gordon Creek in 1996 and Topeka shiner is known from the North Loup River in southeast Cherry County. Pearl dace, a species of concern that is not protected, was collected in the Snake River near Merritt dam in 1973 and is likely present in the upper part of the SRA as well. The only other animal species of concern recorded from the SRA is peregrine falcon, which was reported from the shore of the reservoir in 1988. Broad, bare and relatively inaccessible sandy shores are present on the north side of the reservoir over much of its length, and large sandbars covered by shallow water are utilized by shorebirds. Habitat like this is suitable for interior least tern and plover, and surveys for these protected species might be productive.

Although Merritt Reservoir is within the range of the endangered blowout penstemon, few areas of extensive blowouts were observed at the SRA and it appears none are of a sufficient size to support populations. One species of concern, Holzinger's Venus'-looking-glass, was recorded from sandy uplands at Merritt in 1972 and smooth goosefoot, which occurs in similar areas of loose sand, was added in 2001. Prostrate juniper was found in sandhills prairie on the south side of the Snake River valley near the west end of the property and it is unlikely any more plant species of concern are present in uplands at Merritt. Wetlands along the upper part of Boardman Creek and the Snake River are potentially home to a number of plant species of concern. During this survey bulbous water hemlock was observed along both streams, and wild rice was found along the

Snake River. Finally, cottongrass bulrush was collected in a wet meadow south of the Boardman Creek campground. This species was previously known from a single plant collected near Burwell in 2000. This population of at least 50 patches verifies its presence as a native species in the State.

Exemplary Communities

Northern sedge wet meadow

Although the south side of the reservoir has more level topography than the north side, few areas of level wetlands are found except for the areas immediately along the Snake River and Boardman Creek on the upper end. A single area of sedge wet meadow was observed a quarter mile south of the Boardman camping area on the south side of the road. This area is approximately five acres and is a mosaic of wet meadow and wet-mesic prairie with scattered patches of willows and cattails. The wet meadow areas have a shallow layer of peat overlaying sand, and were unusually dry at the time of the survey. The best-developed areas are south of the highway and are generally dominated by Nebraska sedge, though in places prairie cordgrass is abundant. Other abundant species in the meadow community include bald spikerush, pointed broom sedge, Emory's sedge, wooly sedge, Torrey's rush, willowleaf aster, Canada goldenrod, blue vervain, marsh bedstraw, fen willowherb, field mint, cottongrass bulrush, rough bentgrass and the exotic reedtop, with scattered small diamond willow and an occasional large peachleaf willow. Lower areas such as swales may be dominated locally by cattails, spotted touch-me-not and sensitive fern, along with Nebraska sedge.

Peat marsh

The portion of Boardman Creek at the west end of the property contains a winding channel lined by a patchwork of northern sedge wet meadow, peat marsh, and cattail marsh with widely scattered box elders and patches of false indigobush. Probably the most noteworthy of the three is the peat marsh community, which generally occurs as small patches between areas of wet meadow and brush. One of the better patches observed on the north side of the creek had a four to five inch layer of fibrous peat over sandy muck. The dominant species of this patch were sensitive fern, northern reedgrass, sawbeak sedge and needle spikerush, with fen willowherb, northern water dock, spotted touch-me-not, swamp smartweed, spotted Joe-Pye-weed, field mint, bugleweed, nodding beggarticks, mad dog skullcap and ditch stonecrop. Patches of sandbar willow and false indigobush may be scattered along the margins and wetter areas may have abundant common arrowhead and common burreed. Similar communities are present along the Snake River near the extreme west end of the SRA.

Other communities

The northern sedge wet meadow at Boardman Creek borders areas of wet-mesic prairie that are better developed on the north side of the road. Closer to the wet meadows, this community is dominated by switchgrass and Indiangrass, with much invasive Kentucky bluegrass and smooth brome. Forbs are scattered but numerous and include daisy fleabane, cotton batting cudweed, American birdsfoot trefoil, Canada goldenrod,

Flodman's thistle and black-eyed susan. The interface between wet-mesic prairie and wet meadow is often habitat for the threatened western fringed prairie orchid, but none was seen at this site. To the north of the highway, the wet mesic prairie gives way to Sandhills dry valley prairie dominated by needle-and-thread, little bluestem, sand bluestem, switchgrass and patches of Kentucky bluegrass. Needle-and-thread drops out at the boundary of these communities. Among the common forbs in this community are leadplant, Scribner panicum, scaly gayfeather, prairie coneflower, purple coneflower, blue prairie lettuce and wavyleaf thistle. The uncommon wooly milkweed was observed as well. Low to high sand ridges are scattered through the meadow, especially to the north and east. These are dominated by needle-and-thread and sand bluestem with abundant leadplant.

The rolling sandhills on the north side of the lake and the Boardman Creek branch are dominated by little bluestem, sand bluestem and sand muhly, with goldenaster and plains sunflower the most abundant forbs. Yuccas are common, as are patches of short shrubs most commonly including chokecherry and western poison ivy.

The extreme west end of the SRA contains several communities including an open juniper woodland on the south face of the Snake River valley. Wetlands are extensive in this area and are in need of further study. A complex of willows, cattails and bulrush marsh interspersed with narrow strips of peat marsh line margins of the stream above the reservoir. Extensive patches of cattail, bulrush and reed marsh are present downstream at the upper end of the lake. Further surveys of this difficult to access area could reveal a number of additional exemplary communities and species of concern.

Management Recommendations

Further survey work is needed to assess the full range of diversity before a management plan can be put in place, in the meantime the area should be monitored for the presence of purple loosestrife.

Oliver Reservoir State Recreation Area

Although it is only the fifth largest property in the northwest region (1187 ac), Oliver Reservoir State Recreation Area contains potential habitat for more endangered species than any Parks property in the region. The plant communities of highest quality are on the south side of the lake and below the dam. Western mixed-grass prairie covers the bulk of the uplands on the south side of the lake, with small areas of rock outcrops interspersed. The best-developed rock outcrops at the site are on the south side of Lodgepole Creek below the dam and they are probably the most diverse examples of this community found anywhere in the Parks system. The outlet stream below the dam contains wetland and riparian meadow communities that are among the few remaining examples of the natural vegetation that formerly lined much of Lodgepole Creek. Though wetland communities are found at the upper end of the lake, most are degraded and exceedingly weedy. Nonetheless, the state and federally listed (threatened) Colorado butterfly plant has been recorded from this area.

Species of concern

Because of its location in the southwestern Panhandle, Oliver Reservoir has an abundance of species of concern whose geographic range barely enters the state. In addition to the aforementioned Colorado butterfly plant, mountain plover and swift fox are present very near the site and potential habitat for both is present on the property. A total of three non-protected fish, one reptile, two bird and three plant species of concern have been recorded on or near the property.

In 1992, the state threatened Colorado butterfly plant was recorded from two sites on the north side of the reservoir, one near the point on the west side of the bay just west of the dam, the other along the inlet at the upper end. This plant is restricted to a small area in Wyoming and Colorado and barely enters Nebraska along Lodgepole Creek. It is known in Nebraska from recent collections from degraded sites along the creek and may have invaded the state recently. Outside the state, it is known from moist, open areas along the margins of stream channels that are disturbed by occasional flooding. The habitats it occupies at Oliver Reservoir are commonly dominated by sandbar willow and invaded by reed canarygrass and Canada thistle. These species tend to form dense stands that invade openings in which the butterfly plant needs in order to thrive. Periodic flooding was probably the major historical factor in maintaining populations of butterfly plant, but because of the cropfields that surround the upper end of the reservoir, a large flood at this site would likely increase siltation which would only further promote the spread of reed canarygrass. Managing for this species would require regular removal of undesirable weedy species, which might best be accomplished through high-intensity short-term rotational grazing at the west end of the property.

Mountain plover is known from areas peripheral to the SRA. In Kimball County, it tends to utilize harvested wheat fields and other areas with very short vegetation. High-intensity short term grazing and even occasional carefully timed controlled burns of the prairie on the south side of the reservoir could provide potential habitat for this species. Finally swift fox is also known from the vicinity of the SRA and could occur on the south or west ends of the site.

Other animal species of concern recorded from Oliver Reservoir SRA recently include short horned lizard, collected in 1988, and plains topminnow and orangethroat darter, which were collected at the upper end of the reservoir in 1995. Common snipe was observed at the west end of the reservoir in 1992, and a golden eagle was recorded from a sandstone ledge near the property in 1985. Another fish species of concern, common shiner, was also collected in Lodgepole Creek in 1934, possibly near the west end of the site.

Plants of concern collected at Oliver Reservoir include silverweed, which was collected in 1953, poison suckleya, collected in 1970; two-leaf waterweed, collected in 1980, and Britton's skullcap, collected in 1997. None of these was relocated in 2001, though all but perhaps silverweed are likely still present.

Exemplary communities

Western mixed-grass prairie

Upland prairie in fairly good condition is found on the south side of the reservoir. Needle-and-thread and threadleaf sedge dominate this community, with abundant blue grama and conspicuous yuccas. Forb density is not particularly high in this area, and among the most visible species are scarlet globe mallow, fewflower scurfpea, plains prickly pear and several others. Surfacing rock outcrops are frequent. This area, which has a high percentage of cover in short grasses, has potential as mountain plover habitat.

Rock outcrop

Though rock outcrops are not uncommon in the prairie on the south side of the lake, a very diverse, well-developed rock outcrop complex occurs on the south side of the channel of Lodgepole Creek just below the dam. A small hill consisting of rocky ledges interspersed with western mixed-grass prairie is dotted by prairie shrubs including skunkbrush sumac, yucca and winterfat. Species diversity at this site is exceptionally high when considering the prairie plants and rock outcrop plants together. Among the most common species overall are the graminoids threadleaf sedge, prairie sandreed and little bluestem. The most common outcrop forbs include broom snakeweed, nailwort, winged wild buckwheat, goldenweed, silky milkvetch, fringed sage and mountain cat's-eye. Few exotics are present and the site is mostly undisturbed except for recent plantings of approximately 100 small pine trees on the side of the outcrop closest the parking lot. The vast majority of these were dead at the time of the survey in September.

Sedge-Bulrush wet meadow

The highest quality wetland communities at the reservoir are found below the dam along the channel of Lodgepole Creek. Wet meadow occurs as a patchy band along the north side of the creek, where it is interspersed with shrubs. Among the dominants in the wet meadow patches include Baltic rush, three-square bulrush, common spikerush, bottlebrush sedge, Nebraska sedge, field mint, with blue vervain and swamp smartweed common and conspicuous. Redtop and Canada thistle are established in places within this community, which is rather patchy and discontinuous.

Other communities

The communities in which Colorado butterfly plant occurs in Nebraska are poorly documented, but it is known to have been found on shores at the upper end of the lake. These areas are rather degraded and weedy, and the plant was not relocated in 2001. The channel of Lodgepole Creek above the reservoir is bordered by muddy shores covered by small annual and perennials including red goosefoot, brooklime speedwell, and teal lovegrass. The narrow shoreline is bordered by patches of cattail with soft stem bulrush rarely occurring with it. The cattail zone grades into a band of reed canarygrass and Canada thistle, which in turn grades into a shrub zone of sandbar willow with an understory of reed canarygrass. On slightly higher ground in the floodplain, smooth brome and numerous weedy upland species dominate. The area is in very poor condition,

and invasion by reed canarygrass probably limits the amount of habitat the butterfly weed has available.

The vegetation below the dam represents a higher quality example of the riparian vegetation associated with Lodgepole Creek. Beneath the cliffs on the south side of the outlet stream is a series of shrub patches that border a flat, wet, disturbed terrace along the creek. A band of willows lines the margin of the terraces and cattails and bulrushes the banks of the stream itself. Wet meadow vegetation is developed in a discontinuous band along the north side of the stream, which grades into a western floodplain meadow community that is in fairly good shape in comparison with most examples of this community in the Panhandle. This moderately alkaline meadow is dominated by western wheatgrass, saltgrass, clustered field sedge, needle-and-thread and the exotic Kentucky bluegrass. Forb density is low, and conspicuous species include blue lettuce, white sage, scarlet globe mallow and fringed sage. This area has degraded considerably in the last 10 years due to creation and subsequent abandonment of a food plot and by off-road vehicle traffic, probably due in part to efforts to control Canada thistle in this area. This community subtly passes into a western wheatgrass-needle-and-thread dominated phase on slightly higher ground which is also quite disturbed.

Management Recommendations

1. Remove weedy vegetation to open up areas for Colorado butterfly plant along the upper end of the reservoir. This might be accomplished through short-term high intensity grazing.
2. Possible initiation of high-intensity rotational grazing in the uplands on the south side of the reservoir and/or occasional controlled burns to manage for possible mountain plover habitat.
3. Eliminate current tree plantings on the outcrops below the dam and restricting further plantings to the uplands north of the lake.
4. Periodically mow or burn the meadows on the north side of Lodgepole Creek below the dam to increase species diversity and control Canada thistle.

Smith Falls State Park

Though one of the smaller properties in the northwest region and the smallest State Park in Nebraska at only 200 acres, Smith Falls is among the most biologically diverse and interesting areas in the Parks system. The Park contains a one-half mile stretch of the Niobrara valley including two fairly large springbranch canyons with large waterfalls. The drainage of Turkey Feather Falls, west of Smith Falls, contains one of the better examples of paper birch dominated forest along the Niobrara River. Birch forest extends from there west to Smith Falls, representing one of the largest examples of this community as well. The majority of the bluffs on the south side of the river contain mixed woodland with much red cedar on the upper slope, which extends southward along Smith Falls Creek. Mixed-grass prairie occurs in openings on these upper slopes, and a

broad, level table of mixed-grass prairie occurs at the summit of the bluffs, and grades into Sandhills dune prairie southward. The floodplain on the south side of the river contains peat marsh with bordering wet meadows formed hillside springs on the east side of Smith Falls. These communities are rather uncommon in the Niobrara River valley, and are threatened by the spread of purple loosestrife. Communities on the north side of the river are more degraded and were not included in this survey.

Smith Falls has received attention from botanists since the 1930's, with probably the most well-known plant species of concern present here being *Populus ×smithii*, an alleged hybrid between quaking and bigtooth aspen, the latter of which is not known to occur within several hundred miles of this site. Five non-protected plant species of concern were recorded from Smith Falls and vicinity from 1936-1993, and during this survey two were recollected, and six additional species of concern were recorded. This area could benefit from further biological survey work, particularly by zoologists.

Species of Concern

No threatened or endangered species have been recorded from the Park and the likelihood of any being found is fairly slight. Small white lady's slipper was recently found in a meadow bordering a spring fed marsh on the south side of the Niobrara River. Similar habitat is found at Smith Falls, but the past heavy grazing of the site prior to formation of the Park perhaps precludes its presence. Plant species of concern recorded from the Park include ninebark, collected in 1936; snowberry, in 1941, wild sarsaparilla and spinulose wood fern, from Turkey Feather falls in 1982; and longbract green orchid from east of Smith Falls in 1993. Wild sarsaparilla and spinulose wood fern were relocated at Turkey Feather falls during this survey, the latter forming what is likely the largest and most robust population of this uncommon fern in the state. Six additional species of concern were located in 2001 including northern green orchid from Turkey Feather Falls and along Smith Falls Creek; prostrate juniper from upland woods near the east end of the Park; prairie fameflower from upland prairie west of Smith Falls Creek; pine drops from banks of that creek; and Bebb's sedge and bulbous water hemlock from wetlands in the floodplain. The hybrid aspen was not relocated during this survey, but many thriving quaking aspens were seen. No animal species of concern are known from the Park.

Exemplary Communities

Northern springbranch canyon forest

The ravine that contains Turkey Feather Falls is a good example of this community, which is restricted to the Niobrara River valley. The upper slopes of the ravine, as is true for most springbranch canyons, are covered by mixed woods of Ponderosa pine and bur oak with numerous red cedars and a few black walnut in the subcanopy. Springbranch canyon forest begins just above the falls and continues downstream nearly to the floodplain. Paper birch and hop hornbeam dominate, with scattered large quaking aspen on steep slopes. The herbaceous understory includes bristle-leaved sedge, western poison ivy, wood nettle, smooth blue aster, and enchanter's nightshade. A very large population of spinulose wood fern covers the slopes at the base of the falls. Wild sarsaparilla, another species indicative of this community, occurs as small patches downstream.

Though springbranch forests with richer herbaceous understory occur downstream from the Park, few have the high density of paper birch and especially quaking aspen in their canopy as this site. Springbranch canyon forest is very poorly developed on the lower part of Smith Falls Creek, though birch dominated forest with numerous small springs cover the lower portion of the bluffs east of Smith Falls.

Spring/Seep

Numerous seeps and springs occur in the bluffs between Smith Falls and Turkey Feather Falls. One of the best examples is found along the hiking trail about fifty meters east of the boardwalk. The seep begins on a protected, north-facing slope dominated by paper birch, hop hornbeam and eastern red cedar. Patches of chokecherry, wild black currant and young green ash form a shrub layer in the vicinity. Among the common herbaceous plants of the seep are conspicuous patches of sensitive and marsh ferns and abundant mosses and liverworts, along with fowl mannagrass, rice cutgrass and northern clearweed at the base of the slope. The periphery of the seep has been invaded by redbud. Purple loosestrife is present and poses a threat to wetlands in this area.

Peat marsh

Most spring-fed streams along the south side of the Niobrara River have a well-established channel (or falls) that lead to the river and wetlands are usually not developed outside the stream channel. In a few areas, smaller springs and seeps may simply drain into a marsh in the floodplain below the bluffs, which over time may develop into a peat marsh community. The aforementioned spring east of Smith Falls drains into a relatively large (4000 square meters) complex of marsh and meadow that is rather heterogeneous and remarkably species rich. The periphery of the marsh is surrounded by wet meadow containing much field horsetail and willowleaf aster. Bebb's sedge was found scattered in this area in 2001. A layer of fibrous peat about six inches deep occurs at the surface through most of the marsh that becomes softer and more mucky nearer the river. For the most part the marsh is dominated by Nebraska sedge and northern clearweed, interspersed with patches of shortbeak sedge, common arrowhead, northern water dock, tall mannagrass, common burreed, bald spikerush, three-square bulrush, and unfortunately, purple loosestrife. Four weakly definable "patch types" based on dominant species and soil type were observed within the peat marsh area:

Nebraska sedge type – is found in areas containing shallow, degraded peat overlying sand.

Shortbeak sedge-spikerush-arrowhead type – occurs in areas of shallow fibrous peat overlying shallow degraded peat over sand.

Nebraska sedge-(burreed)-arrowhead type – occurs in areas with six inches degraded peat overlying fibrous peat or (in places where burreed is present) areas of thick soft, but still fibrous, peat.

Threesquare bulrush – burreed- arrowhead type – occurs in areas of 6 inches of firm to somewhat soft and fibrous peat over sand. Bulbous water hemlock was found in this area.

The areas with fibrous peat at the surface (shortbeak sedge-spikerush- arrowhead and threesquare bulrush- burreed- arrowhead) have the highest species diversity, but also seem to be most prone to invasion by purple loosestrife, along with the surrounding wet meadows.

Management recommendations

1. Control purple loosestrife in the floodplain on the south side of the river. This may need to be done by carefully spot-spraying in the fall. Biological controls are being tested at the Niobrara Valley Preserve (NVP) downstream and should be considered here.
2. Thinning junipers may be necessary in places in upland woods to encourage understory vegetation and lessen threat of fire. Fire management of springbranches is being tested at NVP. Though the Park has little problem at this time with dwindling aspen and birch populations that are stimulated by fire, this might be considered as part of a long-term management strategy.

Wildcat Hills State Recreation Area

Wildcat Hills SRA is a relatively small (531-acre) area that spans nearly the entire width of the Wildcat Ridge. The north side of the SRA contains several deep ravines separated by interfluvies with steep, eroded rocky outcrops along the north end, which are common along the north side of the Wildcat Hills. The crests of the interfluvies are covered by mixed-grass prairie of fairly good quality. The slopes are covered by disturbed grasslands dotted with Ponderosa pine and Rocky Mountain red cedar, with patches of mountain mahogany shrubland conspicuous throughout. Fairly rich pine forest occurs in the bottom of the deepest ravines, which are home to two uncommon orchid species.

The road that crosses the SRA approximates the drainage divide between the North Platte River and Pumpkin Creek. The portion of the SRA on the south slope of the ridge is closed to the public and was not included in this survey.

Historically, most biological inventories of the Wildcat Ridge have focused on Scott's Bluff. The SRA has received limited attention from biologists since the 1960's and was included in a botanical survey of the Wildcat Ridge conducted in 1996.

Species of Concern

Prior to 1996, the only record of a species of concern from Wildcat Hills SRA was a sighting of a common poorwill from a pine-dominated slope in 1986. Six plant species of concern were recorded from the SRA in 1996, including matted prickly-phlox and Parry's rabbit brush from rock outcrops in the northeast part of the SRA, and spotted

coral-root, pinedrops, northern green orchid and Ross' sedge from a deep, forested ravine. Prickly-phlox is known from only a very few sites within the state, and was relocated in 2001, along with Parry's rabbit brush, which is found in Nebraska only in the Wildcat Hills.

No threatened or endangered species are known from the SRA. The only species that could potentially be present, is swift fox, which has been recorded within twenty miles of the SRA and could be present, possibly on the south slope.

Exemplary communities

Rock Outcrop

Fairly species-rich rock outcrops are scattered along the north side of the Wildcat Hills, with the most extensive at Scott's Bluff. A well-developed rock outcrop plant community is recorded from the north end of the rocky interfluvies along the east side of the SRA. This site has scattered shrubs of Parry's rabbit brush and skunkbrush sumac, with a variety of herbaceous plants including desert sandwort, rock muhly, broom snakeweed, mountain cat's-eye, nailwort, lavender-leaf sundrops, matted prickly phlox, slender musineon, white locoweed, tufted milkvetch and ballhead ipomopsis.

Western coniferous forest

The best example of coniferous forest seen at the SRA is in the bottom of the deep ravine north from the pumphouse below the visitors center. Ponderosa pines cover most of the lower slopes, with rocky mountain red cedar and scattered box elders in the subcanopy. Chokecherry is the most common tall shrub of the lower slopes, with western poison ivy and wolfberry forming a short shrub layer. Vines such as woodbine and riverbank grape are also conspicuous. The ravine bottom contains a small springfed stream lined with herbaceous plants of moist, partially-shaded ground such as woolly sedge, sweet-scented bedstraw, late goldenrod, false Solomon's-seal, agrimony and common scouringrush. On better-drained low slopes, littleseed ricegrass, hairy wildrye, marsh muhly, northern bedstraw, and northern pussytoes are among the common species. Noteworthy species typical of pine forest in the Pine Ridge region include the uncommon saprophytes pinedrops and spotted coral-root on low slopes and northern green orchid in the ravine bottom. None of these were seen in 2001. A few exotic invaders such as Russian olive and Canada thistle are present in the canyon bottom, and the latter is becoming problematic.

Other communities

The summits of the interfluvies are covered with western mixed-grass prairie dominated by threadleaf sedge, blue grama, and needle-and-thread with much yucca, skunkbrush sumac and spiny plains prickly pear. Most of the areas are heavily infested with cheatgrass. Threadleaf sedge drops out on the gently sloping shoulders of the ridges, which are dominated by prairie sandreed, needle-and-thread, sand bluestem and the shrub sandsage. Steep side slopes of the ravines are covered by often very weedy, disturbed grassland of blue grama, needle-and-thread and occasional threadleaf sedge, which is

often heavily invaded by cheatgrass. Large patches of mountain mahogany are conspicuous, with scattered shrubs of skunkbrush sumac. Lower slopes of the uplands are dominated by a mix of tall and short grasses similar to that found on gentle upper slopes. Prairie sandreed and sand bluestem dominate with blue grama and patches of wolfberry, in addition to cheatgrass. Scattered pines are often frequent on these slopes, and are found in nearly all communities in the SRA. In places, evergreen trees are dense enough to form patches of mixed coniferous woodland of pine and cedar.

Management Recommendations

1. Control Canada thistle in canyon bottoms by spot spraying
2. Look into the possibility of small, carefully-timed controlled burns on upper slopes to discourage spread of cheatgrass.

Appendix
Scientific names of animals and plants

ANIMALS

Amphibians

American toad (*Bufo americanus*)

Birds

Cooper's hawk (*Accipiter cooperi*)
sharp-shinned hawk (*Accipiter striatus*)
golden eagle (*Aquila chrysaetos*)
ruffed grouse (*Bonasa umbellus*)
American bittern (*Botaurus lentiginosus*)
whip-poor-will (*Caprimulgus vociferus*)
piping plover (*Charadrius melodus*)
mountain plover (*Charadrius montanus*)
trumpeter swan (*Cygnus buccinator*)
merlin (*Falco columbarius*)
peregrine falcon (*Falco peregrinus*)
common snipe (*Gallinago gallinago*)
whooping crane (*Grus americana*)
bald eagle (*Haliaeetus leucocephalus*)
Lewis' woodpecker (*Melanerpes lewisii*)
Eskimo curlew (*Numenius borealis*)
common poorwill (*Phalaenoptilus nuttallii*)
blue-gray gnatcatcher (*Poliophtila caerulea*)
Louisiana waterthrush (*Seiurus motacilla*)
pygmy nuthatch (*Sitta pygmaea*)
interior least tern (*Sterna antillarum athalassos*)
Carolina wren (*Thryothorus ludovicianus*)
Bell's vireo (*Vireo bellii*)

Bivalves

scaleshell (*Leptodea leptodon*)

Fishes

lake sturgeon (*Acipenser fulvescens*)
brook stickleback (*Culaea inconstans*)
blue sucker (*Cycleptus elongatus*)
Johnny darter (*Etheostoma nigrum*)
orangethroat darter (*Etheostoma spectabile*)
plains topminnow (*Fundulus sciaticus*)
common shiner (*Luxilus cornutus*)
sturgeon chub (*Macrhybopsis gelida*)
pearl dace (*Margariscus margarita*)
blacknose shiner (*Notropis heterolepis*)
Topeka shiner (*Notropis topeka*)
northern redbelly dace (*Phoxinus eos*)
finescale dace (*Phoxinus neogaeus*)
bluntnose minnow (*Pimephales notatus*)
pallid sturgeon (*Scaphirhynchus albus*)

Insects

Salt Creek tiger beetle (*Cincindela nevadica lincolniana*)
American burying beetle (*Nicrophorus americanus*)

Lampreys

chestnut lamprey (*Ichthyomyzon castaneus*)

Mammals

southern flying squirrel (*Glaucomys volans*)

river otter (*Lutra canadensis*)

black-footed ferret (*Mustela nigripes*)

whitetail deer (*Odocoileus virginianus*)

swift fox (*Vulpes velox*)

Reptiles

worm snake (*Carphophis amoenus*)

timber rattlesnake (*Crotalus horridus*)

false map turtle (*Graptemys pseudogeographica*)

smooth green snake (*Liophorophis vernalis*)

short-horned lizard (*Phrynosoma hernandesi*)

Graham's crayfish snake (*Regina grahamii*)

massasauga rattlesnake (*Sistrurus catenatus*)

western ribbon snake (*Thamnophis proximus*)

PLANTS

Amur maple (*Acer ginnala*)

box elder (*Acer negundo*)

silver maple (*Acer saccharinum*)

yarrow (*Achillea millefolium*)

maidenhair fern (*Adiantum pedatum*)

slender-leaf false foxglove (*Agalinis tenuifolia*)

swamp agrimony (*Agrimonia parvifolia*)

agrimony (*Agrimonia striata*)

crested wheatgrass (*Agropyron cristatum*)

redtop (*Agrostis gigantea*)

ticklegrass (*Agrostis hyemalis*)

rough bentgrass (*Agrostis scabra*)

water plantain (*Alisma subcordatum*)

garlic mustard (*Alliaria petiolata*)

wild onion (*Allium canadense*)

wild leek (*Allium triococcum*)

common ragweed (*Ambrosia artemisiifolia*)

western ragweed (*Ambrosia psilostachya*)

giant ragweed (*Ambrosia trifida*)

toothcup (*Ammannia* spp.)

leadplant (*Amorpha canescens*)

false indigobush (*Amorpha fruticosa*)

hog peanut (*Amphicarpaea bracteata*)

sand bluestem (*Andropogon hallii*)

candle anemone (*Anemone cylindrica*)

northern pussytoes (*Antennaria howellii* ssp. *neodioica*)

field pussytoes (*Antennaria neglecta*)

spreading dogbane (*Apocynum androsaemifolium*)

columbine (*Aquilegia canadensis*)

tower mustard (*Arabis glabra*)

Short's rockcress (*Arabis shortii*)

wild sarsaparilla (*Aralia nudicaulis*)

spikenard (*Aralia racemosa*)
 common burdock (*Arctium minus*)
 desert sandwort (*Arenaria hookeri*)
 grove sandwort (*Arenaria lateriflora*)
 green dragon (*Arisaema dracontium*)
 jack-in-the-pulpit (*Arisaema triphyllum*)
 pale Indian plantain (*Arnoglossum atriplicifolium*)
 Indian plantain (*Arnoglossum plantagineum*)
 perennial western sagewort (*Artemisia campestris* var. *scouleriana*)
 silky wormwood (*Artemisia dracunculus*)
 sandsage (*Artemisia filifolia*)
 fringed sage (*Artemisia frigida*)
 clasping-leaved milkweed (*Asclepias amplexicaulis*)
 swamp milkweed (*Asclepias incarnata*)
 wooly milkweed (*Asclepias lanuginosa*)
 dwarf milkweed (*Asclepias pumila*)
 purple milkweed (*Asclepias purpurascens*)
 showy milkweed (*Asclepias speciosa*)
 narrowleaf milkweed (*Asclepias stenophylla*)
 butterfly milkweed (*Asclepias tuberosa*)
 whorled milkweed (*Asclepias verticillata*)
 pawpaw (*Asimina triloba*)
 asters (*Aster* spp.)
 bog aster (*Aster borealis*)
 rayless alkali aster (*Aster brachyactis*)
 heath aster (*Aster ericoides*)
 smooth blue aster (*Aster laevis*)
 panicled aster (*Aster lanceolatus*)
 aromatic aster (*Aster oblongifolius*)
 azure aster (*Aster oolentangiensis*)
 Ontario aster (*Aster ontarionis*)
 meadow heath aster (*Aster pansus*)
 willowleaf aster (*Aster praealtus* var. *nebraskensis*)
 silky aster (*Aster sericeus*)
 summer milkvetch (*Astragalus hyalinus*)
 poison milkvetch (*Astragalus racemosus*)
 silky milkvetch (*Astragalus sericoleucus*)
 tufted milkvetch (*Astragalus spatulatus*)
 saline spearscale (*Atriplex dioica*)
 blackberry lily (*Belamcanda chinensis*)
 Oregon grape (*Berberis repens*)
 fen water parsnip (*Berula erecta*)
 paper birch (*Betula papyrifera*)
 nodding beggarticks (*Bidens cernua*)
 devil's pitchfork (*Bidens frondosa*)
 false nettle (*Boehmeria cylindrica*)
 rattlesnake fern (*Botrychium virginianum*)
 sideoats grama (*Bouteloua curtipendula*)
 blue grama (*Bouteloua gracilis*)
 hairy grama (*Bouteloua hirsuta*)
 long-awned wood grass (*Brachyelytrum erectum*)
 false boneset (*Brickellia eupatorioides*)
 tassleflower (*Brickellia grandiflora*)
 cheatgrass (*Bromus japonicus* and/or *B. tectorum* et al.)
 smooth brome (*Bromus inermis*)
 dense-tuft hair sedge (*Bulbostylis capillaris*)

bluejoint (*Calamagrostis canadensis*)
northern reedgrass (*Calamagrostis stricta*)
prairie sandreed (*Calamovilfa longifolia*)
lavender-leaf sundrops (*Calylophus lavandulifolius*)
harebell (*Campanula rotundifolia*)
cutleaf toothwort (*Cardamine concatenata*)
plumeless thistle (*Carduus acanthoides*)
musk thistle (*Carduus nutans*)
sedges (*Carex* spp.)
white-tinge sedge (*Carex albicans*)
slough sedge (*Carex atherodes*)
Bebb's sedge (*Carex bebbii*)
Bicknell's sedge (*Carex bicknellii*)
common wood sedge (*Carex blanda*)
shortbeak sedge (*Carex brevior*)
Bush's sedge (*Carex bushii*)
bearded sedge (*Carex comosa*)
crested sedge (*Carex cristatella*)
Davis' sedge (*Carex davisii*)
lesser panicled sedge (*Carex diandra*)
bristle-leaved sedge (*Carex eburnea*)
Emory's sedge (*Carex emoryi*)
threadleaf sedge (*Carex filifolia*)
Frank's sedge (*Carex frankii*)
Hale's meadow sedge (*Carex granularis* var. *haleana*)
inflated narrowleaf sedge (*Carex grisea*)
sun sedge (*Carex heliophila*)
shoreline sedge (*Carex hyalinolepis*)
bottlebrush sedge (*Carex hystericina*)
James' sedge (*Carex jamesii*)
ripgut sedge (*Carex lacustris*)
hop sedge (*Carex lupulina*)
troublesome sedge (*Carex molesta*)
Nebraska sedge (*Carex nebrascensis*)
few-flowered sedge (*Carex oligocarpa*)
wooly sedge (*Carex pellita*)
clustered field sedge (*Carex praegracilis*)
prairie sedge (*Carex prairea*)
eastern star sedge (*Carex radiata*)
stellate sedge (*Carex rosea*)
Ross' sedge (*Carex rossii*)
Sartwell's sedge (*Carex sartwellii*)
pointed broom sedge (*Carex scoparia*)
burreed sedge (*Carex sparganioides*)
longbeak sedge (*Carex sprengelii*)
sawbeak sedge (*Carex stipata*)
quill sedge (*Carex tenera*)
Texas sedge (*Carex texensis*)
Northwest territory sedge (*Carex utriculata*)
fox sedge (*Carex vulpinoidea*)
bitternut hickory (*Carya cordiformis*)
shagbark hickory (*Carya ovata*)
brookgrass (*Catabrosa aquatica*)
northern catalpa (*Catalpa speciosa*)
bittersweet (*Celastrus scandens*)
hackberry (*Celtis occidentalis*)

buttonbush (*Cephalanthus occidentalis*)
 mouse-ear chickweed (*Cerastium arvense*)
 nodding chickweed (*Cerastium nutans*)
 coontails (*Ceratophyllum demersum*)
 redbud (*Cercis canadensis*)
 mountain mahogany (*Cercocarpus montanus*)
 partridge pea (*Chamaecrista fasciculata*)
 Fremont's goosefoot (*Chenopodium fremontii*)
 red goosefoot (*Chenopodium rubrum*)
 maple-leaved goosefoot (*Chenopodium simplex*)
 smooth goosefoot (*Chenopodium subglabrum*)
 Parry's rabbit brush (*Chrysothamnus parryi*)
 woodreed (*Cinna arundinacea*)
 enchanter's nightshade (*Circaea lutetiana*)
 bulbous water hemlock (*Cicuta bulbifera*)
 Canada thistle (*Cirsium arvense*)
 Flodman's thistle (*Cirsium flodmanii*)
 wavyleaf thistle (*Cirsium undulatum*)
 longbract green orchid (*Coeloglossum viride*)
 bastard toadflax (*Comandra umbellata*)
 poison hemlock (*Conium maculatum*)
 spotted coral-root (*Corallorhiza maculata*)
 Late coral-root (*Corallorhiza odontorhiza*)
 Wister's coral-root (*Corallorhiza wisteriana*)
 wooly bugseed (*Coripsermum villosum*)
 rough dogwood (*Cornus drummondii*)
 red osier (*Cornus sericea*)
 curved-pod fumewort (*Corydalis curvisiliqua* ssp. *occidentalis*)
 hazelnut (*Corylus americana*)
 Missouri cactus (*Coryphantha missouriensis*)
 slender hawksbeard (*Crepis atriobarba*)
 sand croton (*Croton glandulosus*)
 mountain cat's-eye (*Cryptantha cana*)
 calcareous cat's-eye (*Cryptantha thyrsiflora*)
 honewort (*Cryptotaenia canadensis*)
 winged pigweed (*Cycloloma atriplicifolium*)
 shining flatsedge (*Cyperus bipartitus*)
 umbrella flatsedge (*Cyperus diandrus*)
 rusty flatsedge (*Cyperus odoratus*)
 awned flatsedge (*Cyperus squarrosus*)
 straw-colored flatsedge (*Cyperus strigosus*)
 small white lady's slipper (*Cypripedium candidum*)
 yellow lady's slipper (*Cypripedium calceolus*)
 bulblet fern (*Cystopteris bulbifera*)
 southern fragile fern (*Cystopteris protrusa*)
 white prairie clover (*Dalea candida*)
 purple prairie clover (*Dalea purpurea*)
 mullein foxglove (*Dasistoma macrophylla*)
 prairie larkspur (*Delphinium carolinianum* ssp. *virescens*)
 blue larkspur (*Delphinium nuttallianum*)
 Illinois bundleflower (*Desmanthus illinoensis*)
 hoary tickclover (*Desmodium canescens*)
 pointed tickclover (*Desmodium glutinosum*)
 Illinois tickclover (*Desmodium illinoense*)
 sessile-leaved tickclover (*Desmodium sessilifolium*)
 Deptford pink (*Dianthus armeria*)

saltgrass (*Distichlis spicata*)
spinulose wood fern (*Dryopteris carthusiana*)
purple coneflower (*Echinacea angustifolia*)
barnyardgrass (*Echinochloa crusgalli*)
yerba-de-tajo (*Eclipta prostrata*)
Russian olive (*Elaeagnus angustifolia*)
autumn olive (*Elaeagnus umbellata*)
needle spikerush (*Eleocharis acicularis*)
bald spikerush (*Eleocharis erythropoda*)
common spikerush (*Eleocharis palustris*)
two-leaf waterweed (*Elodea bifoliata*)
Canada wildrye (*Elymus canadensis*)
hairy wildrye (*Elymus villosus*)
Virginia wildrye (*Elymus virginicus*)
fireweed (*Epilobium angustifolium*)
fringed willowherb (*Epilobium ciliatum*)
purple willowherb (*Epilobium coloratum*)
fen willowherb (*Epilobium leptophyllum*)
field horsetail (*Equisetum arvense*)
intermediate scouringrush (*Equisetum x ferrisii*)
common scouringrush (*Equisetum hyemale*)
teal lovegrass (*Eragrostis hypnoides*)
Carolina lovegrass (*Eragrostis pectinacea*)
purple lovegrass (*Eragrostis spectabilis*)
sand lovegrass (*Eragrostis trichodes*)
marsh fleabane (*Erigeron philadelphicus*)
daisy fleabane (*Erigeron strigosus*)
winged wild buckwheat (*Eriogonum alatum*)
alpine golden wild buckwheat (*Eriogonum flavum*)
rattlesnake master (*Eryngium yuccifolium*)
western wallflower (*Erysimum asperum*)
spotted Joe-Pye-weed (*Eupatorium maculatum*)
common boneset (*Eupatorium perfoliatum*)
white snakeroot (*Eupatorium rugosum*)
flowering spurge (*Euphorbia corollata*)
leafy spurge (*Euphorbia esula*)
Missouri spurge (*Euphorbia missurica*)
prairie gentian (*Eustoma grandiflorum*)
shaggy evolvulus (*Evolvulus nuttallianus*)
nodding fescue (*Festuca subverticillata*)
slender fimbry (*Fimbristylis autumnalis*)
hillside strawberry (*Fragaria vesca*)
green ash (*Fraxinus pennsylvanica*)
leopard lily (*Fritillaria atropurpurea*)
western umbrella sedge (*Fuirena simplex*)
showy orchis (*Galearis spectabilis*)
northern bedstraw (*Galium boreale*)
woods bedstraw (*Galium circaezans*)
marsh bedstraw (*Galium tinctorium*)
small bedstraw (*Galium trifidum*)
sweet-scented bedstraw (*Galium triflorum*)
Colorado butterfly plant (*Gaura neomexicana* ssp. *coloradensis*)
downy gentian (*Gentiana puberulenta*)
white avens (*Geum canadense*)
rough avens (*Geum laciniatum*)
sea milkwort (*Glaux maritima*)

ground ivy (*Glechoma hederacea*)
 honey locust (*Gleditsia triacanthos*)
 tall mannagrass (*Glyceria grandis*)
 fowl mannagrass (*Glyceria striata*)
 wild licorice (*Glycyrrhiza lepidota*)
 cotton batting cudweed (*Gnaphalium stramineum*)
 rattlesnake plantain (*Goodyera oblongifolia*)
 clammy hedge hyssop (*Gratiola neglecta*)
 broom snakeweed (*Gutierrezia sarothrae*)
 Kentucky coffeetree (*Gymnocladus dioica*)
 rough pennyroyal (*Hedeoma hispida*)
 narrowleaf bluets (*Hedyotis nigricans*)
 fall sneezeweed (*Helenium autumnale*)
 frostweed (*Helianthemum bicknellii*)
 hairy sunflower (*Helianthus hirsutus*)
 Maximilian's sunflower (*Helianthus maximiliani*)
 ashy sunflower (*Helianthus mollis*)
 Nuttall's sunflower (*Helianthus nuttallii*)
 stiff sunflower (*Helianthus pauciflorus*)
 dame's rocket (*Hesperis matronalis*)
 needle-and-thread (*Hesperostipa comata*)
 narrowleaf goldenaster (*Heterotheca stenophylla*)
 goldenaster (*Heterotheca villosa*)
 American alumroot (*Heuchera americana* var. *hirsuticaulis*)
 Japanese hops (*Humulus japonicus*)
 Virginia waterleaf (*Hydrophyllum virginianum*)
 yellow woollywhite (*Hymenopappus tenuifolius*)
 marsh St. John's wort (*Hypericum majus*)
 great St. John's wort (*Hypericum pyramidatum*)
 touch-me-not (*Impatiens* spp.)
 spotted touch-me-not (*Impatiens capensis*)
 pale touch-me-not (*Impatiens pallida*)
 ballhead ipomopsis (*Ipomopsis congesta*)
 iron skyrocket (*Ipomopsis laxiflora*)
 yellow iris (*Iris pseudacorus*)
 black walnut (*Juglans nigra*)
 Baltic rush (*Juncus arcticus* var. *balticus*)
 inland rush (*Juncus interior*)
 Torrey's rush (*Juncus torreyi*)
 junipers (*Juniperus scopulorum* and/or *J. virginiana*)
 creeping juniper (*Juniperus communis*)
 prostrate juniper (*Juniperus horizontalis*)
 eastern red cedar (*Juniperus virginiana*)
 kochia (*Kochia scoparia*)
 winterfat (*Kraschennikovia lanata*)
 Canada lettuce (*Lactuca canadensis*)
 Florida lettuce (*Lactuca floridana*)
 blue prairie lettuce (*Lactuca ludoviciana*)
 blue lettuce (*Lactuca tatarica* ssp. *pulchella*)
 wood nettle (*Laportea canadensis*)
 rice cutgrass (*Leersia oryzoides*)
 whitegrass (*Leersia virginica*)
 duckweed (*Lemna* spp.)
 sprangletop (*Leptochloa fascicularis*)
 matted prickly-phlox (*Leptodactylon caespitosum*)
 roundhead bushclover (*Lespedeza capitata*)

sericea lespedeza (*Lespedeza cuneata*)
 violet bush clover (*Lespedeza violacea*)
 Great Plains bladderpod (*Lesquerella arenosa*)
 common bladderpod (*Lesquerella ludoviciana*)
 narrowleaf paleseed (*Leucospora multifida*)
 lance-leaved gayfeather (*Liatris lancifolia*)
 dotted gayfeather (*Liatris punctata*)
 scaly gayfeather (*Liatris squarrosa*)
 Turk's-cap lily (*Lilium canadense*)
 butter-and-eggs (*Linaria vulgaris*)
 false pimpernel (*Lindernia dubia*)
 small flower half-chaff sedge (*Lipocarpa micrantha*)
 fog fruit (*Lippia lanceolata*)
 hoary puccoon (*Lithospermum canescens*)
 great blue lobelia (*Lobelia siphilitica*)
 tall fescue (*Lolium arundinaceum*)
 Amur honeysuckle (*Lonicera maackii*)
 American birdsfoot trefoil (*Lotus unifoliolatus*)
 common water horehound (*Lycopus americanus*)
 bugleweed (*Lycopus uniflorus*)
 skeletonplant (*Lygodesmia juncea*)
 yellow loosestrife (*Lysimachia ciliata*)
 tufted loosestrife (*Lysimachia thrysiflora*)
 winged loosestrife (*Lythrum alatum*)
 purple loosestrife (*Lythrum salicaria*)
 goldenweed (*Machaeranthera grindelioides*)
 cutleaf ironplant (*Machaeranthera pinnatifida*)
 wild crabapple (*Malus ioensis*)
 black medick (*Medicago lupulina*)
 yellow sweet clover (*Melilotus officinalis*)
 moonseed (*Menispermum canadense*)
 field mint (*Mentha arvensis*)
 doublemint (*Mentha ×gentilis*)
 ten-petal mentzelia (*Mentzelia decapetala*)
 blazing star (*Mentzelia nuda*)
 yellow monkey flower (*Mimulus glabratus*)
 large-flower monkeyflower (*Mimulus guttatus*)
 Indian pipe (*Monotropa uniflora*)
 white mulberry (*Morus alba*)
 red mulberry (*Morus rubra*)
 alkali muhly (*Muhlenbergia asperifolia*)
 nodding muhly (*Muhlenbergia bushii*)
 rock muhly (*Muhlenbergia cuspidata*)
 sand muhly (*Muhlenbergia pungens*)
 marsh muhly (*Muhlenbergia racemosa*)
 slender musineon (*Musineon tenuifolium*)
 giant chickweed (*Myosoton aquaticum*)
 green needlegrass (*Nassella viridula*)
 watercress (*Nasturtium officinale*)
 catnip (*Nepeta cataria*)
 spatterdock (*Nuphar variegata*)
 white water lily (*Nymphaea odorata*)
 common evening primrose (*Oenothera villosa*)
 sensitive fern (*Onoclea sensibilis*)
 Scotch thistle (*Onopordum acanthium*)
 plains prickly pear (*Opuntia macrorhiza*)

spiny plains prickly pear (*Opuntia polyacantha*)
 aniseroot (*Osmorhiza longistylis*)
 hop hornbeam (*Ostrya virginiana*)
 white locoweed (*Oxytropis sericea*)
 American ginseng (*Panax quinquefolius*)
 spring panicum (*Panicum acuminatum*)
 Scribner panicum (*Panicum oligosanthos* var. *scribnerianum*)
 switchgrass (*Panicum virgatum*)
 nailwort (*Paronychia* spp.)
 woodbine (*Parthenocissus vitacea*)
 western wheatgrass (*Pascopyrum smithii*)
 lemon pectis (*Pectis angustifolia*)
 lousewort (*Pedicularis canadensis*)
 silverleaf scurfpea (*Pedimelum argophyllum*)
 prairie turnip (*Pedimelum esculentum*)
 purple cliff brake (*Pellaea atropurpurea*)
 shell-leaf penstemon (*Penstemon grandiflorus*)
 blowout penstemon (*Penstemon haydenii*)
 funnelform penstemon (*Penstemon tubaeformis*)
 ditch stonecrop (*Penthorum sedoides*)
 reed canarygrass (*Phalaris arundinacea*)
 timothy (*Phleum pratense*)
 Hood's phlox (*Phlox hoodii*)
 reed (*Phragmites australis*)
 lopseed (*Phryma leptostachya*)
 round-leaved groundcherry (*Physalis hederifolia* var. *comata*)
 clammy groundcherry (*Physalis heterophylla*)
 ninebark (*Physocarpus opulifolius*)
 northern clearweed (*Pilea fontana*)
 Austrian pine (*Pinus nigra*)
 Ponderosa pine (*Pinus ponderosa*)
 littleseed ricegrass (*Piptatherum micranthum*)
 blackseed ricegrass (*Piptatherum racemosum*)
 alkali plantain (*Plantago eriopoda*)
 northern green orchid (*Platanthera aquilonis*)
 western prairie fringed orchid (*Platanthera praeclara*)
 sycamore (*Platanus occidentalis*)
 meadow bluegrass (*Poa arida*)
 Canada bluegrass (*Poa compressa*)
 Kentucky bluegrass (*Poa pratensis*)
 may apple (*Podophyllum peltatum*)
 clammyweed (*Polanisia dodecandra*)
 whorled milkwort (*Polygala verticillata*)
 swamp smartweed (*Polygonum coccineum*)
 dotted smartweed (*Polygonum punctatum*)
 slender knotweed (*Polygonum ramosissimum*)
 arrow-leaved tear-thumb (*Polygonum sagittatum*)
 jumpseed (*Polygonum virginianum*)
 smooth-barked cottonwood (*Populus ×acuminata*)
 cottonwood (*Populus deltoides*)
 bigtooth aspen (*Populus grandidentata*)
 quaking aspen (*Populus tremuloides*)
 leafy pondweed (*Potamogeton foliosus*)
 longleaf pondweed (*Potamogeton nodosus*)
 sago pondweed (*Potamogeton pectinatus*)
 silverweed (*Potentilla anserina*)

wooly cinquefoil (*Potentilla hippiana*)
selfheal (*Prunella vulgaris*)
wild plum (*Prunus americana*)
chokecherry (*Prunus virginiana*)
many-flower scurfpea (*Psoraleidium floribundum*)
fewflower scurfpea (*Psoraleidium tenuiflorum*)
pinedrops (*Pterospora andromedea*)
whorled mountain mint (*Pycnanthemum verticillatum* var. *pilosum*)
mountain mint (*Pycnanthemum virginianum*)
white oak (*Quercus alba*)
bur oak (*Quercus macrocarpa*)
chinkapin oak (*Quercus muehlenbergii*)
dwarf chinkapin oak (*Quercus prinoides*)
red oak (*Quercus rubra*)
black oak (*Quercus velutina*)
seaside crowfoot (*Ranunculus cymbalaria*)
hooked buttercup (*Ranunculus recurvatus*)
prairie coneflower (*Ratibida columnifera*)
grayhead prairie coneflower (*Ratibida pinnata*)
common buckthorn (*Rhamnus cathartica*)
skunkbrush sumac (*Rhus aromatica* var. *trilobata*)
smooth sumac (*Rhus glabra*)
wild black currant (*Ribes americanum*)
gooseberry (*Ribes missouriense*)
buffalo currant (*Ribes odoratum*)
multiflora rose (*Rosa multiflora*)
lowland toothcup (*Rotala ramosior*)
dwarf raspberry (*Rubus pubescens*)
black-eyed susan (*Rudbeckia hirta*)
goldenglow (*Rudbeckia laciniata*)
wild petunia (*Ruellia humilis*)
smooth ruellia (*Ruellia strepens*)
northern water dock (*Rumex orbiculatus*)
hooded arrowhead (*Sagittaria calycina*)
common arrowhead (*Sagittaria latifolia*)
saltwort (*Salicornia rubra*)
willows (*Salix* spp.)
peachleaf willow (*Salix amygdaloides*)
long-beaked willow (*Salix bebbiana*)
diamond willow (*Salix eriocephala*)
sandbar willow (*Salix exigua* ssp. *interior*)
crack willow (*Salix fragilis*)
prairie willow (*Salix humilis*)
black willow (*Salix nigra*)
meadow willow (*Salix petiolaris*)
slender Russian thistle (*Salsola collina*)
elderberry (*Sambucus canadensis*)
bloodroot (*Sanguinaria canadensis*)
Canada black snakeroot (*Sanicula canadensis*)
northern black snakeroot (*Sanicula marilandica*)
clustered black snakeroot (*Sanicula odorata*)
false melic (*Schizachne purpurascens*)
little bluestem (*Schizachyrium scoparium*)
hardstem bulrush (*Schoenoplectus acutus*)
three-square bulrush (*Schoenoplectus pungens*)
softstem bulrush (*Schoenoplectus tabernaemontani*)

dark-green bulrush (*Scirpus atrovirens*)
cottongrass bulrush (*Scirpus cyperinus*)
pale bulrush (*Scirpus pallidus*)
Britton's skullcap (*Scutellaria brittonii*)
marsh skullcap (*Scutellaria galericulata*)
mad dog skullcap (*Scutellaria lateriflora*)
ledge spike-moss (*Selaginella rupestris*)
prairie ragwort (*Senecio plattensis*)
buffaloberry (*Shepherdia argentea*)
night-flowering catchfly (*Silene noctiflora*)
compassplant (*Silphium laciniatum*)
prairie blue-eyed grass (*Sisyrinchium campestre*)
tall water parsnip (*Sium suave*)
false Solomon's-seal (*Smilacina stellata*)
goldenrods (*Solidago* spp.)
Canada goldenrod (*Solidago canadensis*)
late goldenrod (*Solidago gigantea*)
gray goldenrod (*Solidago nemoralis*)
stiff goldenrod (*Solidago rigida*)
showy-wand goldenrod (*Solidago speciosa*)
Indian grass (*Sorghastrum nutans*)
greenfruit burreed (*Sparganium emersum*)
common burreed (*Sparganium eurycarpum*)
prairie cordgrass (*Spartina pectinata*)
scaleseed (*Spermolepis inermis*)
scarlet globe mallow (*Sphaeralcea coccinea*)
Ute lady's-tresses (*Spiranthes diluvialis*)
alkali sacaton (*Sporobolus airoides*)
sand dropseed (*Sporobolus cryptandrus*)
bladdernut (*Staphylea trifolia*)
poison suckleya (*Suckleya suckleyana*)
seablite (*Suaeda calceoliformis*)
snowberry (*Symphoricarpos albus*)
wolfberry (*Symphoricarpos occidentalis*)
coralberry (*Symphoricarpos orbiculatus*)
prairie fameflower (*Talinum rugospermum*)
dandelion (*Taraxacum officinale*)
stemless tetraeneuris (*Tetraeneuris acaulis*)
American germander (*Teucrium canadense*)
purple meadow rue (*Thalictrum dasycarpum*)
veiny meadow rue (*Thalictrum venulosum*)
greenthread (*Thelesperma megapotamicum*)
marsh fern (*Thelypteris palustris*)
intermediate wheatgrass (*Thinopyrum intermedium*)
basswood (*Tilia americana*)
eastern poison ivy (*Toxicodendron radicans*)
western poison ivy (*Toxicodendron rydbergii*)
tall spiderwort (*Tradescantia ohiensis*)
clovers (*Trifolium* spp.)
strawberry clover (*Trifolium fragiferum*)
arrowgrass (*Triglochin maritima*)
Holzinger's Venus'-looking-glass (*Triodanis holzingeri*)
cattails (*Typha* spp.)
narrowleaf cattail (*Typha angustifolia*)
common cattail (*Typha latifolia*)
elms (*Ulmus* spp.)

American elm (*Ulmus americana*)
Siberian elm (*Ulmus pumila*)
slippery elm (*Ulmus rubra*)
rock elm (*Ulmus thomasii*)
stinging nettle (*Urtica dioica*)
bladderwort (*Utricularia macrorrhiza*)
blue vervain (*Verbena hastata*)
hoary vervain (*Verbena stricta*)
yellow ironweed (*Verbesina alternifolia*)
western ironweed (*Vernonia baldwinii*)
brooklime speedwell (*Veronica americana*)
water speedwell (*Veronica anagallis-aquatica*)
nannyberry (*Viburnum lentago*)
Canada violet (*Viola canadensis*)
prairie birdsfoot violet (*Viola pedatifida*)
yellow wood violet (*Viola pubescens*)
blue wood violet (*Viola sororia*)
winter grape (*Vitis cinerea*)
riverbank grape (*Vitis riparia*)
fox grape (*Vitis vulpina*)
bluntleaf woodsia (*Woodsia obtusa*)
Oregon woodsia (*Woodsia oregana*)
cocklebur (*Xanthium strumarium*)
yucca (*Yucca glauca*)
horned pondweed (*Zannichellia palustris*)
prickly ash (*Zanthoxylum americanum*)
wild rice (*Zizania palustris*)